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INTERNATIONAL COMMISSION ON STRATIGRAPHY**

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**International Union of Geological Sciences
International Commission on Stratigraphy (ICS)
CONSOLIDATED ANNUAL REPORT
FOR 2004**

Compiled by Felix M. Gradstein, *chair*, and James G. Ogg, *secretary-general* of ICS

This Consolidated Annual Report of 2004 ICS 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 2005 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.

International Commission on Stratigraphy (ICS)

1. TITLE OF CONSTITUENT BODY

International Commission on Stratigraphy (ICS)

Submitted Jointly by:

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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 year 2004 structure of ICS consists of the Executive Committee, an executive task group (Stratigraphic Information Services), and 14 Subcommissions dealing with the major chronostratigraphic units, and aspects of stratigraphic classification and time scales.

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

Subcommissions:

Quaternary
 Neogene
 Paleogene
 Cretaceous
 Jurassic
 Triassic
 Permian
 Carboniferous
 Devonian
 Silurian
 Ordovician
 Cambrian
 Ediacaran
 Precambrian (*organized 2003*)
 Stratigraphic Classification

Executive Task Group: Stratigraphic Information Services

The subcommissions of ICS together have about 350 titular members. When the corresponding members of Subcommissions are added, several thousand stratigraphers worldwide participate in the activities of ICS. In addition, many countries have national stratigraphic committees, with which ICS 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 Subcommissions 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 subcommissions include at least 30 more nations.

Websites:

ICS main site	www.stratigraphy.org
Quaternary	www.quaternary.stratigraphy.org.uk
Neogene	www.geo.uu.nl/sns
Paleogene	wzar.unizar.es/isps/index.htm
Lutetian GSSP task group	wzar.unizar.es/perso/emolina/ypresian.html
Triassic	paleo.cortland.edu/sts/
Albertiana newsletter:	www.bio.uu.nl/%7Epalaeo/Albertiana/Albertiana01.htm
Permian (newsletter)	pri.boisestate.edu/Permophiles/
Link to Permian research:	www.geo.ucalgary.ca/asrg
Devonian	sds.uta.edu/
Silurian	www.silurian.cn/home.asp
Previous newsletters	iago.stfx.ca/people/mmelchin/SILURIAN.HTM
Ordovician	www.ordovician.cn
GSSP discussion site	seis.natsci.csulb.edu/ordstrat2/default.htm
Cambrian	www.uni-wuerzburg.de/palaeontologie/ISCS/index.html
Stratigraphic Classification	www.geocities.com/issc_arg (commercial site)
Stratigraphic Information Systems	
CHRONOS database network	www.chronos.org
(concept posted at:)	www.eas.purdue.edu/chronos

3a. Elected ICS Officers for 2004-2008:

(1) ICS Executive

For election of the new executive (below), an independent nominating committee was organized by Roger Cooper (New Zealand), which solicited nominations for all ICS voting members for Chair and Vice Chair. The present Chair and one Vice-Chair were eligible and desiring to serve a second term. The nominating committee selected two candidates were selected for each office, then a postal ballot with statements from all candidates was sent by the present Secretary General to all ICS voting members. Winning candidates must receive at least 60% approval -- the voting was unanimous for Felix Gradstein to continue as Chair, and approximately 80% for Stan Finney to serve as Vice-Chair. The results were ratified by IUGS. The officer's terms of office officially began at the International Geological Congress (Florence, Aug 2004), and will extend until the next IGC in Norway (Aug 2008).

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 will appoint a 4th executive (Vice-Chair at large) later this year. This officer's role is primarily to assist the ICS and its subcommissions in organizing activities, promotion and field trips associated with that International Geological Congress.

(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.

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 has an active link to the NSF (Washington) scientific database initiative called "*CHRONOS*", and to INQUA regarding the stratigraphy of the Quaternary.

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 Ocean Drilling Project (ODP). 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 2004

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

ICS Executive Committee

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. Contributing factors to this satisfactory situation are the ICS-wide Strategic Planning initiatives that kicked off with the 2002 Urbino workshop, the extensive website coverage, broad linkages to new stratigraphic initiatives such as the *CHRONOS* network, Quaternary and Precambrian stratigraphy clarification, and closer integration of the global geochronologic and stratigraphic communities brought about, in part, by the Geologic Time Scale 2004 (GTS2004) program. The Executive seeks to maintain this energy and momentum of this truly global organization during 2005 and beyond (*see section on new initiatives*).

The following is a partial summary of achievements during 2004:

- Ongoing standardization of the International Chronostratigraphic Scale
 - Approval and ratification of the GSSPs for the Lopingian series/Wuchiapingian stage (late Permian) and the Ediacaran Period (late Neoproterozoic). In particular, the Ediacaran Period, which marks the fascinating interval of Earth's history and origin of simple animal-like forms between the termination of the "Snowball Earth" glaciations (~630 Ma) and the earliest widespread burrowing and bilateral animals (542 Ma) received widespread publication and news items, including the BBC, *Science*, *Nature*, Discovery Channel and many international newspapers.
 - Approval and ratification of the subdivision and nomenclature of the Carboniferous Period into chronostratigraphic series and stage units.
 - Currently voting on approval of GSSPs for Ladinian (middle Triassic), for Changhsingian (late Permian) and for Hirnantian (late Ordovician).
- 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 will have second planning workshop on "Future Directions in Stratigraphy", to be chaired by Stan Finney in 2005 in Leuven, Belgium.

- The Precambrian Subcommittee (approved by IUGS in 2004) is considering “natural” divisions of 80% of Earth’s history. The Ediacaran Subcommittee (terminal Proterozoic) will continue its role in subdividing this newly recognized period of geologic time.
 - Consolidation of the Stratigraphic Information Services task group, enlarging the public information array at its widely-used website at www.stratigraphy.org (hosted on **CHRONOS** server, Iowa State Univ.), and integrated a web-service to display regional stratigraphic schemes tied to the International Chronostratigraphic Scale.
 - Established formal links with the journal *Lethaia* as the primary outlet for ICS-sponsored scientific studies.
 - Awarded two Stratigraphic Prizes to be awarded during the 32nd IGC in Florence in 2004 – the Digby McLaren Prize for lifetime stratigraphic accomplishments (to Jan Hardenbol, formerly with Exxon) and the ICS Prize for an outstanding piece of stratigraphic research by a young stratigraphers (to Steven Hesselbo, Oxford University). The ICS prize committee was chaired by Nicol Morton.
- Selected Major Products under ICS Executive
 - F.M. Gradstein, J.G. Ogg *et al.* brought the new International Geologic Time Scale to completion (GTS2004, published by Cambridge University Press). This six-year project involved nearly 40 ICS collaborators and had active sponsorship from the petroleum industry, IUGS, the World Geological Map, **CHRONOS**, Geological Survey of Canada, U.S. Geological Survey, and Cambridge University Press. Virtually all Phanerozoic stage boundaries have clear descriptions and much better defined ages, including estimation of uncertainties. The entire time scale is illustrated by superior (color) graphics at various scales, formats, and audiences.
 - Published the new International Stratigraphic Chart (in *Episodes*), and an overview of established GSSPs (in *Lethaia*) during summer 2004.
 - Summary charts of the International Geologic Time Scale were distributed to all participants (~5000) at the IGC in Florence (August 2004). This packet included a summary of the definition of all GSSPs. Approximately 2000 copies of the GTS2004 time scale poster (printed by Geological Survey of Canada) were distributed at-cost by the Commission on the Geologic Map of the World (CGMW) at their Florence IGC booth. In addition, approximately 1000 plastic cards of the time scale were distributed free at the IUGS/ICS booth, and several hundred “mouse pads” of the International Stratigraphic Chart were sold at-cost through the CGMW booth. This major drive for promoting the International Stratigraphic Chart and the compilations within GTS2004 was partially supported by donations from ExxonMobil, Chevron, Shell, BP and Statoil petroleum companies.
 - Presented summaries of the current status of “Quaternary” to clarify its situation to international audiences through a pair of publications in *Episodes* (by Brad Pillans, chair of INQUA Commission on Stratigraphy, and by James Ogg, ICS secretary-general). These articles and the publication of GTS2004 charts brought clarity to public ignorance and misconception about the status of the Quaternary in a time-scale context.

SUMMARY OF IGC (Florence) EVENTS

All subcommissions had activities at the 32nd International Geological Congress (Florence, 2004):

ICS Executive Committee

Convening a Special Symposium on "*The Geologic Time Scale*"

Held the ICS business meeting with a special scientific contribution on the Ediacaran Period by Andrew Knoll, and including hearings on issues of concern to the global geologic community (e.g., deciding on procedures to officially define the temporal extent and possible chronostratigraphic status of the term "Quaternary").

Quaternary Subcommission

Co-sponsored two sessions -- one on *Pleistocene mammalian stratigraphy* and a second on *Pleistocene chronostratigraphy*.

Neogene Subcommission

Workshop hosted by Subcommission on Neogene biostratigraphy. In addition, an extensive guidebook was prepared for the IGC field trip to emphasize the Neogene Astronomical Time Scale. Although this field trip was later cancelled, the guidebook was distributed.

Paleogene Subcommission

Organized the symposium "*Paleogene correlations and stratigraphic standards*"

Cretaceous Subcommission

One session hosted by the subcommission.

Jurassic Subcommission

Symposium "*The Jurassic World: Outside the Park*"

Triassic Subcommission

Four symposia: (1) *Permian-Lower Triassic events*, (2) *Triassic-Jurassic boundary events*, (3) *Triassic in Tethys Realm*, and (3) *Tethys reconstruction*; and one workshop (*Upper Triassic workshop*) were organized by or extensively involved the Triassic Subcommission and its members.

Permian Subcommission

Symposiums on the *Permian-Triassic*, and on *The Lower Permian Cisuralian Stages*. Plus a business meeting.

Devonian Subcommission

Symposium on "*High-resolution stratigraphy for the subdivision of the Devonian stages*". The subcommission discussed the subdivision of the Emsian, Givetian, Frasnian and Famennian stages.

Silurian Subcommission

General Symposium "*Paleobiodiversity and major biotic changes in Earth history*"

Ordovician Subcommission

Sponsorship of General Symposium "*The global Ordovician Earth system*"

Cambrian Subcommission

Task group meetings.

Terminal Proterozoic Subcommission

A discussion meeting on the Ediacaran biota, to be sponsored principally by IGCP Project 493, held in conjunction with the International Geological Congress. A new forward-looking agenda for Neoproterozoic stratigraphy was set.

Stratigraphic Classification Subcommission

Workshop on "*Post-Hedberg developments in Stratigraphic Classification*".

Quaternary Subcommittee (jointly with INQUA)

- Symposium on “*Early-Middle Pleistocene transition*” resolved that the base of the Middle Pleistocene be defined in a land-exposure of a marine section at a point “close to” the Matuyama/Brunhes magnetic boundary. Current candidate GSSP sections are Montalbano Jorica and Vale di Manche locations in southern Italy and Chiba in Japan.
- A 2-day meeting of the *Working group on the Middle/Late Pleistocene boundary* proposed that the base of the Late Pleistocene be equivalent to the base of the Eemian stage (base of Last Interglacial) and have a GSSP at 63.5 m below surface in the Amsterdam-Terminal borehole (Netherlands), which is also to be proposed as the Eemian Stage unit-stratotype for NW Europe.
- The base of the Holocene Series is currently intended to be a GSSA in the new NorthGRIP ice core with a temporal resolution of 10 yr or less.
- An international correlation chart for the most commonly used regional stratigraphic units and isotope stages has now been completed and will be published in early 2005.

Neogene Subcommittee

- Base-Serravalian GSSP candidate at Rad il Pellegrin on Malta has astronomical tuning nearly completed, which is considered to be a prime requisite for proposing the GSSP level.
- A revised standard geological time scale for the Neogene based on the astronomical dating method is published: Lourens et al., 2004. *The Neogene Period*. In: Gradstein, Ogg, Smith, et al., *A Geological Time Scale 2004*, Cambridge Univ. Press, UK.

Paleogene Subcommittee

- An information-packed website (wzar.unizar.es/isps/index.htm) replaced the Newsletter.
- The leading base-Chattian GSSP (mid-Oligocene) candidate is Monte Cagnero (central Italy); base-Priabonian (late Eocene) candidate is Alano (northern Italy); base-Lutetian (early Eocene) candidate is Agost (southern Spain); and base-Selandian and base-Thantetian (both in Paleocene) are Zumaya (northern Spain).

Cretaceous Subcommittee

- Two formal GSSP proposals (Hauterivian, Barremian) are being prepared for candidates in France (Le Charce) and Spain (in Betic Cordillera), respectively.

Jurassic Subcommittee

- Base-Pliensbachian GSSP proposal, from an international team led by Christian MEISTER (Switzerland), was unanimously approved by ICS during the summer of 2004 and submitted to IUGS for ratification. *See Workplan for 2005 and Jurassic Subcommittee full report for status of all remaining GSSP proposals, which must be completed by Sept 2006.*

Triassic Subcommittee

- Base-Ladinian GSSP was approved by Subcommittee and is undergoing vote by ICS.
- A flurry of newsletters, workshops and external publications are maintaining a high level of energy of international workers in solving the remaining boundary issues. It was necessary to establish a second website (<http://paleo.cortland.edu/sts/>) as a host to real-time discussion boards for each of the current boundary task groups.

Permian Subcommittee

- Base-Lopingian (base-Wuchiapingian Series) GSSP was approved by ICS and ratified by IUGS.
- Base-Changhsingian was voted and ratified by SPS and will be distributed at the beginning of 2005 to ICS for voting.

Carboniferous Subcommittee

- Base-Visean GSSP at Pengchong (southern China) approved without dissent by task group.

Devonian Subcommittee

- Sub-stages division systems – 2-fold for Emsian, 3-fold for Givetian, 3-fold for Frasnian and 4-fold for Famennian were decided (Aug 2004), and boundary definitions are now being decided.

Silurian Subcommittee

- New website established
- Final reports of re-study of base-Silurian GSSP

Ordovician Subcommittee

- GSSP proposals were submitted for the three boundaries remaining to be defined: the **base of the Middle Ordovician Series** and its lower stage (the **4th Stage**, yet to be named); the base of the **base of the middle stage of the Upper Ordovician Series** (the **6th Stage**, yet to be named), and the **base of the Hirnantian Stage**, the uppermost stage of the Upper Ordovician Series.
- Vote on the Wangjiawan GSSP for the **base of the Hirnantian Stage** was completed (Aug 2004), and the GSSP was approved unanimously. A revised GSSP proposal will be submitted to ICS for possible approval, then to IUGS for ratification in early 2005.

Cambrian Subcommittee

- The first intra-Cambrian subdivision (**Furongian Series** and **Paibian Stage** GSSP) was ratified by ICS and IUGS, and documentation was published in *Lethaia* **37**: 365-379 (2004).
- Dec'04 – Subcommittee voted on subdivision of the Cambrian into **four series**
- Dec'04 -- Subcommittee voted whether to focus GSSP investigations on the upper half of the Cambrian System.

Ediacaran (formerly Terminal Proterozoic) Subcommittee

- The GSSP for the **Ediacaran Period** was ratified by ICS and IUGS. It is placed at the base of the Nuccaleena Formation cap dolostone, immediately above the Elatina glaciogenic diamictite in the Enorama Creek Section, Flinders Ranges, South Australia.
- Ediacaran GSSP announcements (2004) appeared in *Episodes* **27**: 83-100, *Science* **305**: 621-622) and *Nature* **429**: 124-125. A paper describing the GSSP and its selection process has been submitted for publication to *Lethaia*.
- A IGCP project on Neoproterozoic ice ages has been proposed, which will form a locus for a thematic working group on global Neoproterozoic glacial horizons.

Precambrian Subcommittee

- New Subcommittee was approved, and currently ca. 20 international scientists are enlisted as voting members.

International Stratigraphic Classification Subcommittee

- Discussions continued on cycle-stratigraphy, sequence-stratigraphy and terminology for stratigraphic concepts.

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.

7. CHIEF PROBLEMS ENCOUNTERED IN 2004

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

- Progress on Global Stratotype Section and Point (GSSP) selection did not proceed in the timely manner indicated by several subcommission projections. In particular, there are two remaining Systems (Jurassic and Cretaceous) with no GSSPs at their base. Three Systems (Triassic, Carboniferous, Cambrian) have only a single ratified internal chronostratigraphic unit (series, stage). In contrast, the chronostratigraphy of several periods (Neogene, Permian, Devonian, Silurian, Ordovician) are either fully defined by ratified GSSPs or should complete this task in the next two years. Considering that the ICS mandate is for the establishment of a complete GSSP-defined chronostratigraphy for the entire Phanerozoic by 2008, then it is imperative that the numerous working groups in all subcommissions bring their investigations and debates to a satisfactory choice of a global-correlative boundary definition.
- Many subcommission chairs and other officers in 2005 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.
- 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.
- The Executive considers that its limited funding does not serve its membership. The severe lack of funding hampers production of Newsletters, subcommission websites and GSSP proposals, thereby jeopardizing the goals to have all Phanerozoic GSSPs ratified by 2008 and the establishment of a natural geologic scale for the Precambrian. In addition, the ICS can support only limited public outreach, therefore the appeal of stratigraphy is dwindling.

A multi-country, global fund-raising drive is needed to get the work done, but getting direct funding for GSSP research and ratification may be tough! One option under consideration is to form the ‘Association of Stratigraphic Geologists’ (ASG) with membership contributions, including potential income from journal and other semi-commercial ventures. A study is being conducted of successful professional organizations, such as IAMG, SEPM, AGU, etc.

Quaternary Subcommittee (joint with INQUA)

- No serious problems, except for a long-standing debate (since 1985) over the unresolved status of the definition (temporal extent) and rank of the term “Quaternary”. These questions have been assigned to a joint INQUA-ICS task group.

Neogene Subcommittee

- No serious problems, other than it has been taking longer than originally estimated to finalize the GSSPs for mid- and lower-Neogene. But progress is going well.

Paleogene Subcommittee

- Participation by members in less-affluent regions (e.g., Africa, Indian subcontinent, SE Asia, etc.) is hindered by lack of adequate funding.

Cretaceous Subcommittee

- Conflicting opinions on globally-useful boundary markers and correlations have hindered decisions on several boundaries, including a long-delayed decision on the base-Cretaceous! Some current candidates that have only biostratigraphic events (no demonstrated suitability for magnetostratigraphic or stable-isotopic horizons) are potentially “Euro-centric”, with applicable correlation only within western Europe.

Jurassic Subcommittee

- These remain as they have been in recent years, mostly related 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 members the importance it attaches to the GSSP programme and encouraged the relevant research funding bodies to give priority to funding relevant basic research.

Triassic Subcommittee

- Restructuring and fiscal restraint within the Chair’s organization (Geological Survey of Canada) threatens to seriously impair his ability to fulfill his STS duties.

Permian Subcommittee

- No major problems.

Carboniferous Subcommittee

- No major administrative problems.
- Provincialism of conodont and foram lineages between Eurasia and North America is seriously hampering the potential for envisioned GSSPs with global correlation for some stages.

Devonian Subcommittee

- No major problems.

Silurian Subcommittee

- Commitments on part of current secretary required appointment of a new secretary (Jan 2005); but M. Melchin will continue his active roles in task groups for re-studying boundary GSSPs.

Ordovician Subcommittee

- Requests for additional study and evaluation of candidate GSSPs for the base of the Middle Ordovician Series delayed formal ballot to 2005.

Cambrian Subcommittee

- No major problems, other than obtaining adequate funds for field investigations by the Stage Subdivision Working Group.

Ediacaran (formerly Terminal Proterozoic) Subcommittee

- Curiously, it was global publicity (BBC, *Nature*, etc.) on the Ediacaran System ratification that caused some mis-perceptions of international disagreement (e.g., *Vendian* of Russian usage versus *Ediacaran* of global applicability). In order that discussion over future GSSPs be seen to be consensus decisions by the wider geological community, the Subcommittee has expanded to include 40 research-active voting members from 17 different countries.

Precambrian Subcommittee

- None.

International Stratigraphic Classification Subcommittee

- No major problems. More one-on-one communication with ICS executive members and subcommittee chairs would be useful, especially when voting on GSSP proposals.

Stratigraphic Information System

- Despite the global web, it has proven important for SIS members to directly sit down together to plan, evaluate and integrate our visionary dreams of an all-purpose international-stratigraphy website. E-mail is not as effective as person-to-person discussions.

8. SUMMARY OF EXPENDITURES IN 2004 (ANTICIPATED THROUGH MARCH 2005):

The ICS Executive Bureau established the following budget for April 2004 – March 2005 after consideration for relative needs, planned activities, and funding requests of the subcommittees; and re-allocating based on the final (reduced) amount received from IUGS. All Subcommittees were limited to a maximum of \$750 for communications and administration costs. Funds and distributions are maintained by James Ogg (ICS secretary-treasurer) using a special account in the USA; and each subcommittee 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 April 2005 (e.g., another four months), which is the month when the next annual ("2006") funding suite is typically received from IUGS.

The budget is divided into 2 components: (A) the annual ICS operating budget, and (B) a special one-time allocation from IUGS to partly subsidize participation by ICS officers (especially retired ones) in attending the Florence International Geologic Congress (August 2004). All amounts are in \$US.

(A) ICS Operating Budgets and expenditures for 2004:

	Requested by ICS 2004	Reduced 2004 Allocation	<i>Comments on distribution</i>
Quaternary	\$1000	\$1000	
Neogene	2000	\$1900	
Paleogene	3500	\$3300	<i>Support for field workshops for potential GSSP evaluation</i>
Cretaceous	800	\$800	
Jurassic	3500	\$3400	<i>Support for field workshops for potential GSSP evaluation</i>
Triassic	3000	\$3000	<i>Support for field workshops for potential GSSP evaluation</i>
Permian	1000	\$900	
Carboniferous	1000	\$900	
Devonian	1500	\$1400	
Silurian	1000	\$900	
Ordovician	2500	\$2500	<i>Support for field workshops for potential GSSP evaluation</i>
Cambrian	900	\$900	
Ediacaran	0	\$500	<i>Previous officers didn't make a request, but new officers in May'04 asked for funds – came from Contingency.</i>
Precambrian	500	\$0	<i>Subcommission was reborn only in late 2003</i>
Classification	2000	\$1800	
Strat. Info. System	2500	\$2300	<i>Webmaster, web software, GSSP database (PaleoStrat) support, etc..</i>
<i>Subcommission Total</i>	\$26,700	\$25,500	
ICS Executive	3000	\$2500	<i>Meeting travel (e.g. ICS executive in Mar 2004), wire-transfers (including IUGS deduction of \$200), mailings, \$500 for Award trophies, etc.</i>
<i>Special travel needs (*)</i>	3500	\$3500	<i>Funded special requests as these arise – e.g., subsidies for workshops, GSSP field work (e.g., Permian); plus additional IGC Florence support</i>
Publications and Contingency	5000	\$4500	<i>Special Subcommission and ICS needs; expenditures in 2004 included \$2K for color charts in Episodes, \$600 for Lethaia color charges, late funding for Ediacaran, etc.</i>
TOTAL (all funds in USD)	38,200	\$36,000	<i>\$28000 for continuing operations; \$8000 for publications and special needs</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. The financial collapse of several countries had exasperated this situation in 2002. 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 \$800 grants by the ICS secretary-treasurer.

Most subcommissions maintain accounting in Euro or other currency. The drop in the value of the U.S. dollar implied an effective reduction in the operating budget of ICS for meeting their original budget requests (submitted in "Dec 2003" dollars but granted in "May 2004" dollars) and in supporting special requests for international travel and other contingencies.

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.

(B) Special IUGS grant (\$14,000) for Florence IGC travel support:

For simplicity and fairness, all subsidies were fixed amounts for registration (we encouraged half-price opportunities for session chairs and retired participants), for travel (within-Europe versus overseas), and for hotel. These amounts did not cover full costs for any participant. No food allowance was included, but ICS did host a dinner for all chairs that was supported by a donation from Elsevier publishing company.

\$5,000	10 registrations @ \$500 = ISSC-Embry, Tri-Yuri, Permian-Wardlaw, Dev-Russia, Ord-Albanesi, Ediac-Gehling, PreCamb-Bleeker, Webmaster
\$1,250	6 registrations @ \$250 = Paleogene-Luterbacher, ISSC-Cita, Cret-Rawson, Jur-Morton, Tri-Orchard, ICS-Ogg
\$2,400	5 within-Europe @ \$400 = Paleogene-Luterbacher, ISSC-Cita, Cret-Rawson, Jur-Morton, Dev-Bultynck
\$1,200	5 hotel bonuses @ \$200 to half-price registrants = Luterbacher, Rawson, Orchard, Cita, Morton
\$4,250	5 outside-Europe @ \$850 = Tri-Orchard, Ordov-Finney, Ediac-Gehling, Precamb-Bleeker, ICS-Ogg

\$14,100 [The \$100 over-run was paid from ICS contingency]

9. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED FOR April 2005-March 2006:

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

- ICS-wide "Strategic Planning" meeting in Leuven (Belgium) in September 2005 for setting strategic goals for the next 4 years.

- Publication (Jan 2005) of *Geologic Time Scale 2004* (Cambridge University Press), a 600-page book that is the culmination of five years of efforts by several ICS subcommissions and other specialists.
- Updated Mesozoic-Cenozoic global chronostratigraphic charts (biostratigraphy, sequences, geochemistry, magnetics, etc.), an Atlas of the Standard Geologic Time Scale, and a JAVA-application for user-defined detailed time-scale graphics to be hosted on www.stratigraphy.org, and linked to other stratigraphic websites such as NORGES and *CHRONOS*.
- Establish regional stratigraphic websites as part of the ICS web-system (e.g., for Indian subcontinent, for Arabia, for East Asia, for S. Africa, etc.). This will strengthen ICS in those regions and lead to better communications and quality in stratigraphy.
- Consider producing a “2006 Stratigraphic Calendar” with picture-quality content of GSSP sites and other important global features. Perhaps quality photos can be obtained by offering prizes.

Quaternary Subcommission

- This new subcommission has established 3 task groups to recommend GSSPs for base-Holocene, base-Upper Pleistocene, and base-Middle Pleistocene. It is likely that the Working Group on the *Pleistocene-Holocene Boundary* will be in a position to submit its proposal before the end of the year.

Neogene Subcommission

- Submit GSSP proposal for base-**Serravalian** in early 1995; and potentially for base-Langhian in late 2005.

Paleogene Subcommission

- Complete work on GSSPs for base-**Priabonian** (late Eocene) and base-**Chattian** (base-Oligocene).

Cretaceous Subcommission

- Five or more GSSP proposals (**Valanginian**, **Hauterivian**, **Barremian**, **Albian**, **Santonian**, **Campanian**) are anticipated for voting by the Subcommission.
- The International Symposium on the Cretaceous in Neuchâtel, Switzerland (5-9 September 2005) will be a major forum for resolving correlation problems and GSSP placements.

Jurassic Subcommission

- The base-Jurassic WG will decide the principle criterion for recognition of the base of the System and supplementary criteria at or very near this level. The sections which best illustrate these criteria should be candidates for the GSSP or auxiliary section.
- A deadline of **September 2006**, the date of the 7th International Jurassic Congress, has been set by the Jurassic Subcommission for submission of **all remaining Stage GSSP proposals** to the Subcommission.
- **Toarcian**, **Callovian**, **Oxfordian** and **Kimmeridgian** GSSP proposals will be prepared for Subcommission voting. The current candidates, respectively for these 4 GSSPs, are Peniche (Portugal), Swabia (southern Germany), Savouron (Provence, France) or Redcliffe Point (Doret, England), and Isle of Skye (northwest Scotland).

- A website will be established for the Subcommittee.

Triassic Subcommittee

- The Induan-**Olenekian** boundary and substage division of the Lower Triassic will be focus of a major international meeting on Triassic-Permian Chronostratigraphy and Biotic Recovery (Wuhan, China, May 2005).
- A proposal for the base-Anisian GSSP at Desli Caira (Romania) is anticipated.

Permian Subcommittee

- Ratification by ICS and IUGS on the base-**Changhsingian** GSSP.
- Votes by Cisuralian Working Group on base-**Sakmarian** and base-**Kungurian** GSSPs, and completion of proposal on base-**Artinskian** GSSP.

Carboniferous Subcommittee

- Submission to ICS of base-**Visean** GSSP.
- Base-Kasimovian and base-Gzhelian task group meetings (St. Petersburg, Aug 2005).

Devonian Subcommittee

- Ballots on final proposals for subdivision of the Givetian, Frasnian and Famennian stages.

Silurian Subcommittee

- **Base-Silurian** GSSP redefinition (as base of *Akidograptus ascensus* Graptolite Zone): Vote of titular members before July 05.
- Proposals on revision of **Llandovery/Wenlock boundary** by deadline August 06.

Ordovician Subcommittee

- Submission of Wangjiawan GSSP proposal for **base of Hirnantian Stage** to ICS for approval.
- Discussion and evaluation of GSSP proposals for **base of middle stage of Upper Ordovician Series** and for **base of Middle Ordovician Series**. Submission on approved proposals to ICS in second half of 2005.

Cambrian Subcommittee

- Evaluation of proposal for a stage-level **GSSP** to be placed at the horizon of the **FAD of the cosmopolitan agnostoid trilobite *Ptychagnostus atavus***, one of the most recognizable in the Cambrian.
- The Subcommittee expects to make substantial progress toward development of a proposal for a stage-level **GSSP** at the horizon of the **agnostoid trilobite *Lejopyge laevigata***.
- Decisions on several GSSPs will be made at the *Fourth International Symposium on the Cambrian System*, Nanjing, China, 2005.

Ediacaran (formerly Terminal Proterozoic) Subcommittee

- An **official unveiling of the Ediacaran GSSP** by the **Premier of South Australia** is being organized for April 2005.
- Multidisciplinary working groups organized to seek potential GSSP's for a "**Cryogenian**" period and for *subdivision of the Ediacaran*.

Precambrian Subcommittee

- First international workshop (Perth, Australia, 25 Sept 2005) focusing debate, and perhaps preliminary votes, on some of the major questions: e.g., status of the Hadean; GSSP for base of the Archean at oldest supracrustal rocks in the rock record, etc.
- Preparing a detailed plan and time line for ‘naturalizing’ of the Archean Eon subdivisions and identify best candidates for GSSP at the Archean-Proterozoic boundary.

International Stratigraphic Classification Subcommittee

- Continued discussions in sequence-stratigraphy and cycle-stratigraphy task groups. Establishing a time-frame and effective procedure for decisions to be reached for updating the International Stratigraphic Guide with the main concepts.

Stratigraphic Information Services

- Creating and testing a web-based service that allows user-defined high-resolution time scales and regional correlations.
- Completing on-line documentation and graphics of all GSSPs, then mounting images of the outcrops and all marker fossils.

Communications: Websites, Newsletters and Special Publications by ICS Subcommittees

In addition to the main website "www.stratigraphy.org" of ICS, most of the subcommittees 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 subcommittees 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 subcommittee websites, but hard copies are still necessary for distribution in countries without the necessary computer equipment.

10. BUDGET REQUEST TO IUGS FOR 2005 (US \$)

The following budget request is for operations and special initiatives through April 2006 (funds are generally transferred from IUGS to ICS in April; which implies ICS subcommittees must operate on an May-to-April fiscal year). It is important to note that the 2004 allocations of all subcommittees and other programs were reduced by almost 10% in 2004 (ICS had requested a total of \$38,200; and IUGS granted a total of \$36,000, but one must then include the drop in the value of the \$US dollar between the submission of “dollar-adjusted” requests and the receipt in funds – see re-allocation table and other remarks in Item #8 above). The column of "Initial Subcomm Request 2005" is taken from each Subcommittee annual report of 2004 (already adjusted for projected residual balances through March 2005). We (ICS Executive) have added an additional column of “ICS recommended allocation” based on past budgets and performance of the subcommittees and their itemized work plans for the next fiscal year.

Exchange rates: We have converted all budgets to \$US, using the assumption that one Euro is equivalent to 1.35 \$US and 1 British Pound is 0.5 \$US (Dec 2004 exchange rates).

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 2005 and early 2006. The ICS Contingency Fund is designed to support additional special needs of subcommission as these arise in the later part of 2005-2006. The Special Travel Needs fund is explained in Section #8 (see above), and is solely for subcommission use (not for ICS executive officers).

Strategic Planning Meeting (Leoben, September 2005) – During summer, 2002, a very successful Strategic Planning meeting by all ICS chairs was held in Urbino, Italy. This 3-day session enabled ICS to plan an extensive suite of activities, especially its future directions after the finalization of all GSSPs. Many of these goals have been partially achieved (e.g., the high-profile awards given at the IGC to leading international workers in Earth History, and the preparation of public charts for at-cost distribution). It is essential that the new 2004-2008 subcommission officers become involved and contribute their own innovative ideas to the future of ICS and stratigraphy during this century. Therefore, we have arranged another 3-day workshop to be held in Leuven (Belgium) during early September 2005. A special one-time only request of \$5000 is requested to help subsidize travel of participants to this workshop.

Budget Summary:

The initial total of all Subcommission and ICS Executive budget requests is \$59,740. 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 2004.

The ICS Chair and Secretary-General have adjusted these initial requests based on past year’s expenditures and allocations (a total of \$17K decrease in the initial requests), but with consideration of special programs in 2004, as indicated in the comments on the following table. We have tried to make the composite request for 2004 “routine subcommission & ICS operation” (\$42,000) similar to the funding levels in 2004 (\$36,000), but we needed to include a 15% adjustment for the drop in the value of the \$US dollar during the past year.

We therefore request a total allocation of **\$42,000** (*routine subcommission & ICS*), plus a one-time special grant of **\$5,000** (*for ICS Strategic Planning workshop*) from IUGS for the 2005 fiscal year = **\$47,000** total (USD).

	Final 2004 Allocation (Item#8 above)	Initial Subcomm Requests 2005	ICS recommended allocation	Comments on “<i>ICS recommended allocation</i>” to initial subcommission requests
Quaternary	\$1000	1000	\$1000	
Neogene	\$1900	3000	\$1500	
Paleogene	\$3300	4300	\$2500	Non-specific requests for task group support moved to contingency
Cretaceous	\$800	2200	\$2200	Major boundary symposium, Sept 05
Jurassic	\$3,400	5300	\$3000	Support for field workshops for GSSP evaluation. Travel subsidies moved to

				<i>“Special travel needs”</i>
Triassic	\$3,000	4000	\$3000	<i>Albertiana</i> newsletter subsidy was reduced. Major boundary meeting in China during May 2005
Permian	\$900	1400	\$1000	
Carboniferous	\$900	1200	\$1000	
Devonian	\$1400	1840	\$800	Travel subsidies moved to <i>“Special travel needs”</i>
Silurian	\$900	1200	\$500	Travel subsidies moved to <i>“Special travel needs”</i>
Ordovician	\$2500	3350	\$2500	Field workshop for GSSP evaluation. Travel subsidies moved to <i>“Special travel needs”</i>
Cambrian	\$900	5000	\$2000	Major symposium in China. Travel subsidies moved to <i>“Special travel needs”</i>
Ediacaran	\$500	5500	\$3000	Major dedication event & publicity. Travel subsidies moved to <i>“Special travel needs”</i>
Precambrian	\$0	3000	\$500	Travel subsidies moved to <i>“Special travel needs”</i>
Classification	\$1800	8700	\$500	Excessive initial request. Travel subsidies moved to <i>“Special travel needs”</i> to be allocated on a case-by-case evaluation.
Strat. Info. System	\$2300	3000	\$2500	<i>ICS web development support</i> . Travel subsidies moved to <i>“Special travel needs”</i>
<i>Subcommission Total</i>	25,500	49,240	\$29,000	
ICS Executive	2500	3500	\$3500	Educational chart series will be a major expense
<i>Special travel needs</i>	3500	5000	\$5000	<i>See explanation above. Pooled requests. Reserved for subcommission workshops, GSSP evaluations, and other special projects.</i>
<i>Contingency</i>	4500	4500	\$4500	
<i>SPECIAL – Strategic Planning</i>		5000	\$5000	<i>See explanation above – Special 2005 request only</i>
TOTAL (in USD)	36,000	69,540	47,000	

11. REVIEW CHIEF ACCOMPLISHMENTS OVER LAST FIVE YEARS (1999-2004)

A combined 4-year review was compiled as part of the ICS report for 2004, and the accomplishments for 2004 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 1999 (*listed in stratigraphic order*)

Neogene

- stabilization of the GSSP for the base of the **Pleistocene** Stage (1999)
- 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).

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 (currently undergoing voting in ICS).
- base of the **Triassic** System at Meisan, China (2001).

Permian

- 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

- base of the **Pennsylvanian** Subsystem, "Mid-Carboniferous boundary" at Arrow Canyon, Nevada, USA (1999).

Devonian

- all Devonian stage boundaries are defined by a GSSP

- In 2000, SDS published two volumes (*Courier Forschungsinstitut Senckenberg*, 220 (205 pp.) and 225 (347 pp.)), in which the GSSPs of all Devonian stages have been updated and their relative 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 **Upper Ordovician Series** (un-named stage) at Fågelsång in Sweden (2002).
- base of the upper 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).

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 4 YEARS (2005-2008)

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 2005-2006.

ICS Executive Committee

- Improve the financial foundation of ICS to better serve the international stratigraphic community, including vital stratigraphic work in developing nations and former “east-bloc” countries.
- Define GSSP sections for all stages of the Phanerozoic Era, and solidify subdivisions of the Precambrian. **All GSSPs will be ratified by 2008.**
- Replace the Precambrian suite of Global Standard Stratigraphic Ages (GSSAs) with a natural geologic time scale.
- Placing all important information on stratigraphic standardization into a suite of websites under appropriate subcommissions and a general ICS hub.
- Have both an active electronic journal called ‘E-Strata’, and a ‘new’ stratigraphy paper journal.
- Consider merits of and potentially forming the ‘Association of Stratigraphic Geologists’, closely linked to IUGS.
- Support the *CHRONOS* initiative to develop a suite of web-accessible international databases on all aspects of chronostratigraphy (paleontology, isotopes, cycles, magnetics, etc.). The *CHRONOS* workshop in November 2000 has recommended that the main coordination and responsibility for the continuity of this system be placed under the auspices of ICS.

Quaternary Subcommission

- The immediate objective of the Quaternary Subcommission is to formalize the divisions of the Pleistocene Series and the Holocene/Pleistocene boundary. No international stage-level subdivisions for the Pleistocene or Holocene will be formalized.
- An international correlation chart for the most commonly used regional stratigraphic units and isotope stages. *This has now been completed and will be published in early 2005.*
- Potentially, there may be two additional working groups (possibly jointly with the INQUA Commission on Stratigraphy and Geochronology) concerned with dating significant Pleistocene boundaries and with formalizing the status of very short-time divisions (durations of 1-5 kyr) currently being recognized in the late Quaternary, e.g. events, phases, oscillations etc. (sometimes referred to as 'sub-Milankovitch scale oscillations').

Neogene Subcommission

- The long-term objective of the SNS has always been and still is to define GSSP sections for all stages of the Neogene system. At present 3 Neogene stages lack a GSSP. The Subcommission is studying the classic concept of “type section for the body of stages” (former concept of “stratotype” for stage) in relation to stage boundary stratotypes. Key continuous sections in Sicily can serve both concepts and utilize the orbitally-tuned sedimentary record for precise placement of events.

Paleogene Subcommission

- Complete the work on the remaining GSSPs of Paleogene stages.

- Produce an updated version of an integrated Paleogene time scale.
- Produce standardized regional correlation charts, paleogeographic maps, and a state-of-the-art review of the stratigraphic tools used in the Paleogene.

Cretaceous Subcommittee

- To bring recommendations for the remaining 9 GSSPs before ICS as soon as possible, and not later than 2007:
 - 2005 -- Valanginian, Hauterivian, Barremian, Santonian and Campanian
 - 2005 will be the 7th *International Cretaceous Symposium*, Neuchâtel, Switzerland
 - 2006 -- Aptian and Coniacian
 - 2007 -- Berriasian (base of Cretaceous)
- To communicate the results as widely as possible.

Jurassic Subcommittee

- Of the 10 Jurassic Stages, 4 GSSPs have been ratified, and 4 are advanced in their preparation, leaving only 2 with selection of preferred candidate(s) still to be made. All are expected to be finalized by 2006.
- 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.
- September 2006 - 7th International Symposium on the Jurassic System, Poland.
- Stage Working Groups should consider defining 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.
- The future focus of the Subcommittee will evolve away from Stage-boundary GSSP proposals to further refinement of the chronostratigraphic scale by integration of multidisciplinary methods of correlation. In particular, establishment of databases would bring together and make available information from all sources associated with the "members and friends" of the Jurassic.
- The Paleoclimate Working Group should begin to produce a series of maps showing the paleoclimate of the Jurassic World during selected time-slices, with documentation of the supporting evidence. The Tectonic Events Working Group will map in time and space the major tectonic events (including basin subsidence/uplift).

Triassic Subcommittee

- Completion of Triassic GSSPs
 - 2004 – Ladinian (currently undergoing ICS vote)
 - 2005 – Olenekian and Anisian.
 - 2006 – Carnian, Norian and Rhaetian.
 - 2007 – Summary volume of all Triassic GSSPs. Emphasis switches to choice of non-marine auxiliary sections.

Permian Subcommittee

- Complete Late Permian stage GSSP ratification (Changhsingian) during 2004
- We currently anticipate that the last three GSSPs (Sakmarian, Artinskian, and Kungurian) should be ratified by 2006 or early 2007.

- 1. A vote by SPS on the **Sakmarian** proposal will be conducted during 2005.
- 2. A vote by SPS on the **Kungurian** should be ready for early 2006.
- 3. A vote by SPS on the **Artinskian** is anticipated during late 2006.
- Once this process is completed SPS will shift focus toward:
 - 1. Correlations into continental deposits, across provincial boundaries, and within the Tethys region.
 - 2. Detailed documentation of the geologic evolution of the Earth during the Permian with respect to the established chronostratigraphic framework.

Carboniferous Subcommittee

- Base Viséan GSSP should be selected within the next year.
- The other stage boundaries should be set by GSSPs within the next three years.
- Radiometric dating will be the emphasis of some subcommittee members. A merger of cyclostratigraphy with radiometric dating has potential for an ultra-high resolution time scale of the climatic and evolutionary trends through this period.
- International Carboniferous Congress is 2007 in Nanjing, China.

Devonian Subcommittee

- The subcommittee plans to come to conclusions on the substage subdivision of stages.

Silurian Subcommittee

- Restudy of previous GSSPs that are difficult to use for global correlation (e.g., Llandovery/Wenlock).

Ordovician Subcommittee

- Approval and ratification of three GSSPs remaining to complete subdivision of Ordovician System with goal of completion by 2005, and selection of names for 2nd, 3rd, 5th and 6th stages.
- Redirection of Subcommittee's focus to interdisciplinary investigation of the global Ordovician Earth system.

Cambrian Subcommittee

- Completion of global subdivision of Cambrian. Identification of the best horizons for establishing stage-level and series-level GSSPs within the Cambrian System
- Four regional correlation chart volumes are on the way.

Ediacaran Subcommittee

- 2006 – Preliminary proposals for Cryogenian GSSP and Ediacaran subdivision.
- 2007 – Voting on base of Cryogenian System GSSP.
- 2008 – Intra-Ediacaran subdivision GSSP decisions.

Precambrian Subcommittee

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 Neoarchean).
- 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.

International Stratigraphic Classification Subcommittee

- ISSC differs from other Subcommittees because it is concerned with concepts and principles, and with their application on the various continents. Beyond the ongoing work in establishing an international language for sequence stratigraphy and cyclostratigraphy concepts and units, the ISSC will monitor recent critiques by the scientific community to the Golden Spike concept, and its application and will consider recent proposals to introduce new categories of stratigraphic units (i.e. impact-related units).
- The FINAL GOAL is the publication of a new version of the *International Stratigraphic Guide*, simple, well illustrated, user-friendly, including both standard and new techniques.

INTERNATIONAL COMMISSION ON STRATIGRAPHY (ICS)

DIRECTORY OF OFFICERS 2004-2005

15 Dec 2004

COMMISSION EXECUTIVE

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NORDIC liaison to 33rd IGC (Oslo, 2008): *to be appointed*
[Potentially, Prof. Birger Schmitz, Gotenborg.]

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International Commission on Stratigraphy Subcommission on Quaternary Stratigraphy

ANNUAL REPORT 2004

1. TITLE OF CONSTITUENT BODY

Subcommission on Quaternary Stratigraphy (SQS)

Submitted by:

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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.

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

Support of the Chairman's University (University of Cambridge), and 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 2003

Three GSSP Working Group are established and all have fully functioning formal working groups.

a. Lower-Middle Pleistocene Sub-series Boundary

The *Working Group on Lower-Middle Pleistocene boundary* 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 IGC 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.

b. **Middle-Late Pleistocene Sub-series Boundary**

The first meeting of the *Working group on the 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) summarized 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 MI Substage 5e for correlation in the North Atlantic region and adjacent areas.

Wighart von Koenigswald (Bonn) summarized 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.

c. Pleistocene-Holocene Series 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.

d. Other activities

In addition to the Working Group activities noted above, the Subcommittee website continues to be expanded at: <http://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.

In July, a substantial correlation chart for the chronostratigraphy of the last 2.7 million years was published (*cf.* Science Plan task 9c, below). In co-operation with the Royal Dutch Shell BV company, 200 copies of the poster at A3 size and 50 copies at A2 size were produced and distributed free of charge. The posters were also distributed at meetings over the last 6 months, including the IGC in Florence and a series of Quaternary conferences. The poster will be published in the international journal *Boreas* in the first issue of 2005, for which we thank, the editor Professor Jan Piotrowski (Århus) for his support.

e. Open Meeting of Quaternary Subcommittee (Aug, 2004)

At the International Geological Congress in Florence, an open meeting of the Subcommittee was held. This very productive meeting was attended by over 30 people. Apart from the normal work of the Subcommittee, two major topics were discussed:

1. Proposal for new Working Group
2. The status of the term 'Quaternary'.

The former concerned the establishment of a working group to compile regional sequences. During the compilation of the correlation chart it had become clear that there were many regional

stage division systems for the Quaternary and that it would be desirable to assemble and catalogue these schemes. Dr Wim Westerhoff (The Netherlands) has been invited to establish a working group for this enterprise.

The second concerned the need to formulate a Subcommission response to the matter of the attempted suppression of the term Quaternary, as a formal System-status unit, by the ICS Executive. Much has been said about the status of the Quaternary in the past two years. The publication of a new geological time scale, in which the Neogene extended to the present day, had increased the intensity of this debate, particularly since it was apparently made by members of the ICS without consultation with Quaternary workers.

It was repeatedly noted through the year that the decision to eliminate the Quaternary was unacceptable for the vast majority of the Quaternary workers. Arguments mentioned included:

- It is a well-established chronostratigraphical term that has been in use for over 150 years.
- The term has been adopted not only for the time period but also for the identification of a substantial community of workers (geologists, geomorphologists, archaeologists, biologists, oceanographers, climatologists etc.)
- Although relatively short it is nevertheless highly distinct in that it is characterized by short term climatic oscillations that have given rise to continental scale glaciations, sea-level changes and accompanying plant and animal migrations on a scale not seen in the previous periods.
- The evolution and extinction of mammals (including hominins) is very distinct.
- The term Quaternary is strongly established not only in academic circles but in general, popular scientific literature. Lumping the last 17 million years will confuse the general public.

During this discussions the participants voted on two proposals:

1. *That the Quaternary be maintained as a formal chronostratigraphic unit?*
2. *That the Quaternary be kept at system rank or subsystem rank?*

The first question was carried by 25 in favor and 1 against. The second proposal was carried by 22 in favor, 1 against and 3 abstentions. The results of these discussions were communicated to the ICS Executive by the SQS board.

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

Following the deliberations and pressure from the community, the ICS Executive established a working group ('task force') on the definition of the Quaternary in November 2004. This group are due to report to the meeting to be held in Leuven, Belgium in September 2005. It was originally agreed that the group should comprise 6 representatives, three proposed by INQUA and three proposed by SQS, together with Jim Ogg as Secretary and a neutral chairman agreed by the two organizations. However, subsequently the ICS Executive changed their opinion and appointed Phil Gibbard, Nick Shackleton and John van Couvering themselves without consultation with the SQS officers. At the time of writing this working group is yet to begin its work.

All three working groups will continue to function in 2005. It is likely that the Working Group on the *Pleistocene-Holocene Boundary* will be in a position to submit its proposal before the end of the year. Other groups will also continue their deliberations.

As noted last year we are currently considering the possibility of establishing 1-2 additional working groups, possibly jointly with the INQUA Commission on Stratigraphy and Geochronology.

The first will be concerned with dating significant boundaries (including the GSSP and potential parastratotypes), particularly in the Early to early Middle Pleistocene. This group would be chaired by Professor Valerie Hall. A second working group to consider the formal chronostratigraphical/geochronological status of very short-time divisions (durations of 1-5 kyr) currently being recognized in the late Quaternary, e.g. events, phases, oscillations etc. (sometimes referred to as 'sub-Milankovitch scale oscillations') may also be proposed. As yet these groups have not been established because workers have too heavy a workload to begin their investigations.

8. BUDGET FROM ICS IN 2004 AND REQUESTED FOR 2005

Currency in British Pounds (£), based on an exchange rate of £1 GBP = 1.9 US\$

Actual costs 2004

Amount carried over from 2003	£1045
Amount received from ICS	£529
General office expenses	£100
Contribution towards cost of web-site	£10
Travel costs	£500
Current bank balance	£1073

Proposed costs for 2005

General office expenses	£100
Contribution towards cost of website	£10
Contributions to Working Groups	£400
Support for meetings	£400
Total 2005 budget	£900 (\$1746)
AMOUNT REQUESTED from ICS	£500 (\$970)

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.

9. OBJECTIVES AND WORK PLAN FOR NEXT 5 YEARS (2003-2007)

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

- Formalization 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.
- Formalization of a GSSA for the base of the Holocene Series/Epoch.
- 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 formalized. *This has now been completed and will be published in early 2005, as noted above.*

- 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 summarized 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, 6.12.03)

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

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Working group leaders and corresponding members

Working Group on the Pleistocene/Holocene Boundary

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

members:

Chairman, and INQUA Palaeoclimate Commission: John Lowe (UK)

INTIMATE Convenor: Wim Hoek (The Netherlands)

Ice core community:

NorthGRIP: Sigfus Johnsen (Denmark)
 Jørgen-Peder Steffensen (Denmark)

Antarctica: Jakob Schwander (Switzerland)

Oceanographical community: Konrad Hughen (USA)
 John Andrews (USA)

Dendrochronological community: Bernd Kromer (Germany)

Terrestrial community:

Europe: Thomas Litt (Germany)
 North America: Les Cwynar (Canada)
 Asia: Takeshi Nakagawa (Japan)
 Australasia: Peter Kershaw (Australia)
 Rewi Newnham (New Zealand)

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

Dr. 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: Dr Brad Pillans (Canberra)

members:

Dr 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 2004

1. TITLE OF CONSTITUENT BODY

Subcommission on Neogene Stratigraphy (SNS)

Submitted by:

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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.

In 2004, the executive bureau of the SNS changed composition with Willem Jan Zachariasse (chair) and Davide Castradori (vice-chair) leaving. Frits Hilgen (Netherlands) became the new chair whereas two new vice-chairs (Javier Sierro, Spain and David Hodell, USA) and a new secretary (Elena Turco, Italy) were appointed. 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). (*see Appendix for full list of officers and voting members*).

The SNS has presently 3 working groups:

- 1) WG on Miocene Time Scale chaired by Nick Shackleton,
 - 2) WG for defining GSSP sections for the Serravallian chaired by Frits Hilgen, and
 - 3) WG for defining GSSP sections for the Langhian and Burdigalian chaired by Isabella Raffi.
- The SNS web site (www.geo.uu.nl/SNS) is used for news release.

Officers for 2004-2008:

Chair: Frits Hilgen (Netherlands)
2 Vice-Chairs: Javier Sierro (Spain) and David Hodell (USA)
Secretary: Elena Turco (Italy)

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

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

5. 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 bioevents, and in a better understanding of climate and ocean history during this time span.

6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2004

Progress has been made in the integrated stratigraphy and astronomical tuning of the Ras il Pellegrin section on Malta set to become the prime GSSP candidate for the **Langhian-Serravallian boundary**. This progress followed significant publications by Italian research groups in the "*Rivista Italiana di Paleontologia e Stratigrafia*" in 2002 (vol. 108). Uncertainties in the tuning of the upper Blue Clay part of the section have been reduced to ± 1 precession cycle due to optimizing the cyclicity using chemical element analysis and by calibrating the Maltese section to the partly time-equivalent and well-tuned Italian sections of Monte dei Corvi and Tremiti. Tuning of the lower Upper Globigerina Limestone part of the section is complicated and not yet achieved but highly desirable. The Ras il Pellegrin section in addition yielded some well-delineated and identified magnetic reversals, and the excellent preservation of the calcareous microfossils will allow the retrieval of first rate stable isotope data. High-quality carbonate and (bulk) stable isotope records have already been published by John and others (*Geol. Soc. Am. Bull.*, v. 115, 2003) for parallel sections located on the nearby island of Gozo. These records allow the straightforward identification of the main mid-Miocene oxygen isotope shift towards heavier values across the formation boundary, which culminates in the Mi-3 event. The new tuning indicates that the event corresponds to the marked coincidence of minimum amplitude variations in obliquity related to the 1.2 myr cycle and minimum eccentricity related to the 400-kyr cycle (Abels et al., submitted), i.e. similar to orbital configurations found for other glacial isotope events during the Oligocene-Miocene time interval. This Mi-3 event is proposed to serve as the prime criterion to delineate the boundary.

Members of the SNS actively contributed to the completion of a revised standard geological time scale for the Neogene underlain by the astronomical dating method (Lourens et al., 2004 in Gradstein et al., 2004. *Geologic Time Scale 2004*. Cambridge University Press, ~500 pages). The publication of this Neogene time scale is considered a major achievement since it is the first time that the time scale of an entire system is based on astronomical tuning.

The fieldtrip guide of post-IGC excursion P56 "Milankovitch cycles as a geochronometric tool to construct geological time scales" was published even though the fieldtrip itself was cancelled. It can be downloaded from the web and will also be made available on the SNS website at:

[http://www.apat.gov.it/site/it-IT/APAT/FieldtripGuidebooks/PostCongress_Field_Trips_\(from_P40_to_PW06\)/](http://www.apat.gov.it/site/it-IT/APAT/FieldtripGuidebooks/PostCongress_Field_Trips_(from_P40_to_PW06)/).

7. CHIEF PROBLEMS ENCOUNTERED IN 2004

The Neogene was extended up to the Recent in the Geologic Time Scale 2004 (Gradstein et al., 2004) with the Quaternary being eliminated as formal chronostratigraphic unit. A task force was set up that will make a recommendation to ICS on the definition of the Quaternary 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 in case we prefer to have the boundaries defined in astronomically tuned deep marine sections that underlie the geologic time scale. The option to have these boundaries defined in ODP cores is presently under study.

Finally, the planned post-IGC field trip to Sicily was cancelled due to lack of participation.

8. SUMMARY OF EXPENDITURES IN 2004 (ANTICIPATED THROUGH MARCH 2005):

Credit on July 2004 = Euro 3430	
Contribution 2004 ICS to SNS= Euro 1500 (\$ 1900)	
Expenditures	
Contribution 2004 SNS to RCNPS	Euro 300
Contribution 2004 SNS to RCMNS	Euro 300
Finalizing measuring and sampling of candidate section base-Serravallian on Malta (early 2005)	Euro 2500

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

It is still our intention to organize a WG meeting on Malta in 2005 during which the candidate section for the **base-Serravallian** will be visited and the pros and cons as well as the guiding criteria will be discussed. Nevertheless it is considered likely that a formal proposal to define the Serravallian GSSP at the formation boundary between the Globigerina Limestone and the Blue Clay in the Ras il Pellegrin section on Malta will be submitted to SNS voting members before the end of 2005.

The SNS bureau is considering organizing the cancelled post-IGC field trip to Sicily in 2005 linked to the ICS meeting to be held in Leuven September 2005. The trip focuses attention on the astronomical dating method that underlies the age calibration of the new Neogene Time Scale (Lourens et al., 2004). During this trip the by now classical sections will be visited which constitute the backbone of the Pliocene Astronomical (Polarity) Time Scale and in which all Pliocene stage boundaries are defined.

10. BUDGET AND ICS COMPONENT FOR 2004

Organization field meeting on Malta (base-Serravallian)	Euro 2400
Contribution 2004 to RCPNS and RCMNS	Euro 600

11. REVIEW CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (1999-2003)

See Accomplishments in 2003 (above) for additional details.

1999

Acceptance of proposals for Zanclean and Messinian GSSP sections by ICS
 Proposal for lowering the position of the Pliocene/Pleistocene boundary rejected
 Setting up of a WG on Miocene chronology chaired by Nick Shackleton

2000

Ratification by IUGS of Zanclean and Messinian GSSPs
 Publication in *Episodes* 23
 Reorganization of SNS completed

2001

Establishment of WG for base Tortonian and Serravallian (chaired by F.J.Hilgen)
 Establishment of WG for base Langhian and Burdigalian (chaired by I. Raffi)
 Launching of the SNS web-site

2003

Ratification of the base-**Tortonian** GSSP by the IUGS. Ongoing magnetostratigraphic studies of the boundary interval in the Monte dei Corvi section have confirmed the close association of the Tortonian GSSP with Subchron C5r.2n (unpubl. data).

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).

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

Submission of a proposal for the **Serravallian** GSSP - early 2005.

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

Appendix

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International Commission on Stratigraphy Subcommission on Paleogene Stratigraphy

ANNUAL REPORT 2004

1. TITLE OF CONSTITUENT BODY

International Subcommission on Paleogene Stratigraphy (ISPS)

Submitted by:

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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 boundary stratotypes 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

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.

3. ORGANIZATION

ISPS is a Subcommission of the International Commission on Stratigraphy.

Officers: Chairman: Eustoquio Molina, Spain,

Vice-Chairman: Jan Hardenbol, U.S.A.

Secretary: Noël Vandenberghe, Belgium.

20 Voting Members (Akhmetiev, Aubry, Cosovic, Fluegeman, Gingerich, Gladenkov, Hardenbol, Hooker, Hottinger, Malumian, Miller, Molina, Monechi, Premoli Silva, Schmitz, Strong, Strougo, Thomas, and Vandenberghe) and 84 Corresponding Members.

Voting and Corresponding Members are 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 Subcommission, we have set up the following Working Groups and Regional Committees:

- 1) Cretaceous/Paleogene Boundary Working Group. Chairman: Etienne Steurbaut, Belgium.
- 2) Paleocene Working Group. Chairman: B.Schmitz, Sweden.
- 3) Ypresian/Lutetian Boundary Stratotype Working Group. Chairman: E.Molina, Spain. Secretary: C.Gonzalvo, Spain.
- 4) Lutetian/Bartonian Boundary Stratotype Working Group. Chairman: R.Fluegeman, U.S.A.
- 5) Bartonian/Priabonian Boundary Stratotype Working Group. Chairwoman: I.Premoli Silva, Italy.
- 6) Rupelian/Chattian Boundary Stratotype Working Group. Chairwoman: I.Premoli Silva, Italy
- 7) Regional Committee in North-European Paleogene Stratigraphy. Chairman: E.Steurbaut, Belgium. Secretary: J.W.Verbeek, Netherlands.
- 8) South-American Regional Committee on Paleogene Stratigraphy. Chairman: N.Malumian, Argentina. Secretary: C.Nañez, Argentina.
- 9) Middle East Regional Committee on Paleogene Stratigraphy. Chairman: A.Strougo, Egypt.
- 10) Regional Committee on Pacific Paleogene Stratigraphy. Chairman: E.Fordyce, New Zealand.
- 11) Russian Paleogene Commission. Chairman: M.A.Akhmetiev, Russia.
- 12) Working Group on Paleogene Stratigraphy of the North Pacific. Chairman: Y.B.Gladenkov, Russia.
- 13) Paleogene Planktonic Foraminifera Working Group. Chairman: P.Pearson, U.K.
- 14) Paleogene Benthos Working Group. Chairman: L.Hottinger, Switzerland .

The new 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*) and News/Events (*next Meeting on Climate and Biota of the Early Paleogene in Bilbao, Spain, June 2006*).

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

The ISPS does not receive financial support from outside the IUGS/ICS. National and regional support is derived from the participating members funded by national or European research agencies, *via* Working Groups and Regional Committees, global support for research undertaken *via* world wide projects such as the Ocean Drilling Program (ODP) or the International Geological

Correlation Projects (IGCP). However, most funding agencies attribute very low priority to research in stratigraphic problems.

5. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

IGCP No.393 – Neritic events at the Middle-Upper Eocene Boundary: Transtethys-Caribbean correlations and the genesis of faunal provinces, Esmeralda Caus, Spain (start 1996). Ocean Drilling Program, International Subcommissions on Cretaceous and Neogene Stratigraphy; some of our members participate also in the work of these Subcommissions.

6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2004

The main event in 2004 has been the “Session: *Paleogene correlations and chronostratigraphic standards*” in the International Geological Congress, held in Florence (Italy) on August 20-28, 2004 organized by Hanspeter Luterbacher and Isabella Premoly Silva. During the afternoon of August 22, seven speakers reviewed the main fields of Paleogene stratigraphy, whereas the other contributions have been presented as posters.

The web site of ISPS has been periodically updated and replaces the Newsletter. In September 2003, it was transferred to Zaragoza, where Eustoquio Molina, the new Chairman of ISPS, is taking care of it. In this ISPS web site (<http://wzar.unizar.es/isps/index.htm>) can be found the annual reports of the Working Groups and Regional Committees and some other accomplishments and information.

7. CHIEF PROBLEMS ENCOUNTERED IN 2004

The problems encountered this year are essentially the same as those discussed in the previous annual reports by the former chairman Hanspeter Luterbacher. 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.

8. SUMMARY OF EXPENDITURES IN 2003 (ANTICIPATED THROUGH MARCH 2004):

INCOME

Carried forward from 2003	Euro 0
ICS Allocation	<u>Euro 2681</u>
TOTAL	Euro 2681

EXPENDITURE FROM 2004 BUDGET

General office expenses	Euro 250
Professional help with the website	Euro 400
Contribution to former Chairman's travel expenses	Euro 250
Contribution to Officers travel expenses	Euro 600
Support for Working Groups and Regional Committees	<u>Euro 1650</u>
TOTAL	Euro 3150
 To be carried forward to 2005	 Euro -469

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

Organize a meeting and field trip of the ICS officials in Leuven by Noël Vandenberghe (September, 2-5, 2005).

Complete the work on the GSSPs of the base of the Priabonian and Chattian.

Publish selected papers presented at the IGC in Florence, Italy.

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.

10. BUDGET AND ICS COMPONENT FOR 2005

Projected Budget for 2005:

Carry over from 2004	Euro 469
General office expenses	Euro 550
Professional help with the website	Euro 600
Contributions to Officers travel costs	Euro 800
Support for Working Groups and Regional Committees	Euro 2500

TOTAL BUDGET PROJECTED	Euro 4919

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 in regions like Africa and the Indian Subcontinent.

11. REVIEW CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (1999-2004)

At present, the GSSPs for the bases of:

the Aquitanian (= Paleogene/Neogene Boundary)

the Rupelian (= Eocene/Oligocene Boundary)

the Ypresian (= Paleocene/Eocene Boundary)

the Danian (= Cretaceous/Paleogene Boundary)

have been established and ratified by the International Union of Geological Sciences.

In 2004, good progress has been made in the search for the remaining GSSPs. We hope to present proposals for most of the remaining GSSPs in a near future.

12. OBJECTIVES AND WORK PLAN FOR NEXT 5 YEARS (2005-2009)

Complete and publish the GSSPs of the Paleogene.

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 Early Paleogene (CBEP2006), which will be held in Bilbao, N Spain, in June 2006 (probably from the 18th to the 25th), as decided by the participants in the closing session of the previous CBEP Meeting (Luxor, February 2004). The CBEP2006 will be organized by members of the Basque Country University assisted by researchers from other institutions and will be supported by a prestigious Scientific Committee and the ISPS.

APPENDIX #1 [Names and Addresses of Current Officers and Voting Members, 2004-2008] INTERNATIONAL SUBCOMMISSION ON PALEOGENE STRATIGRAPHY

Subcommission officers

Chair: Eustoquio Molina
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Vice-Chairman: Jan Hardenbol
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Secretary: Noël Vandenberghe
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Voting Members

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

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APPENDIX #2 - Summary Reports of GSSP Working Groups

Rupelian/Chattian Boundary Stratotype Working Group

Report by Isabella Premoli Silva, Chairwoman.

Investigations on the Lower-Upper Oligocene Transition are the subject of a paper, submitted to the Geological Society of American Bulletin, 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, and presently under revision after peer reviews.

Complete and continuous sequences of fossiliferous marine rocks covering the Oligocene Epoch and exposed on land are rare, making it difficult to define cause-and-effect relationships of palaeoenvironmental changes in an accurate and precise chronostratigraphic framework. One exception is represented by the pelagic succession of the Umbria-Marche Apennines (central Italy) where a complete and continuous sequence of marly limestones, calcareous marls, and marls allows a detailed bio-, magneto-, and chemostratigraphic study of this Epoch. In addition, this sequence contains several biotite-rich volcanoclastic beds which provide the means for an accurate and precise radiometric calibration of the Oligocene time scale. The OLIS Working Group, including 24 scientists from several Universities and Institutions (Italy, The Netherlands, USA, Canada, France and Belgium), approached a detailed interdisciplinary stratigraphic study of the Oligocene with particular emphasis on the reconstruction of the events that characterize the Rupelian/Chattian boundary. One of the main results of such integrated stratigraphic analyses of the most representative Oligocene sections of the Umbria-Marche region is the interpolated age of **27.3 Ma** (with a geochronologic uncertainty of 0.3 myr), for the Rupelian/Chattian boundary, located in the **middle of chron C9n.2n at meter level 199** in the Monte Cagnero section, and corresponding to the **P21a/P21b foraminiferal subzonal boundary**. This age is approximately one million years younger than that reported in recent chronostratigraphic time scale compilations.

A formal proposal designating the **Monte Cagnero** (MCA) section, out of the three sections studied, as GSSP for the Rupelian/Chattian boundary is in preparation.

Investigations have been undertaken by researchers of the Universities of Padua, Ferrara, Urbino, Utrecht and Milan, and by the numerous scientists of the OLIS Working Group coordinated by Coccioni (University of Urbino), respectively.

Bartonian/Priabonian Boundary Stratotype Working Group

Report by Isabella Premoli Silva, Chairwoman.

The Veneto region in the Southern Alps (NE Italy) is a classical area for the Paleogene Stratigraphy. In particular, the historical stratotype and the parastratotype of the Priabonian (Munier-Chalmas & De Lapparent, 1893) stage are located close to the Priabona and Possagno villages, respectively. However, in both areas, the transition from the middle to late Eocene is missing (Priabona) or poorly exposed (Possagno; Bolli, 1975).

Because of the excellent outcropping conditions, richness of planktonic fossils, easy access, amenability to radiometric dating, the Alano section might be a potential candidate for defining the middle/upper Eocene boundary. In addition, it is a key section for facing the climatic, biotic and chronologic problems associated with the middle to late

Eocene transition. Investigations have been undertaken by researchers of the Universities of Padua, Ferrara, Urbino, Utrecht and Milan, and by the numerous scientists of the OLIS Working Group coordinated by Cocconi (University of Urbino), respectively. We report here preliminary results on the calcareous plankton biostratigraphy of an undescribed section (Alano Section) from the central-eastern Veneto region that contains an expanded record of the middle to late Eocene transition.

THE ALANO SECTION (*pdf is available at website*)

Location: On the left side of the Piave River Valley, in the Veneto Prealps (Belluno Province), some 8 km from the classical Possagno section, in the same region of the Priabonian historical stratotype.

Geologic setting: The section is exposed in continuity along a river cut within the northern limb of the Alano syncline; it belongs entirely to the "Scaglia Cinerea" Formation. It is easily accessible and shows a total thickness of 120-130 meters.

Lithology: Grey marls and calcareous marls with numerous centimetric to decimetric silty to sandy intercalations some of which do represent useful marker beds in the field. The composition of these beds is variable (glauconitic, bioclastic and volcanoclastic). Noteworthy is the presence of a "black-shale" interval between 17 and 25 m level (upper part of the Bartonian).

Depositional setting: Bathyal.

Fossil content: Macrofossils have not been observed except for two badly preserved bivalves. Calcareous plankton is abundant. Planktonic foraminifera are fairly well preserved even if encrusted in the more calcareous lithologies. Calcareous nannofossils are well preserved. Benthic foraminifera are common, increasing in abundance in the upper part of the section. Dinoflagellate cysts are also present and their detailed study is planned. Preliminary biostratigraphic data on calcareous plankton are reported in the attached Figure.

Sampling: 105 m of the section were sampled at high resolution every 20 cm; sampling of the uppermost 10-15 m is in progress. Some pilot samples for magnetic properties are now under examination.

Ypresian/Lutetian Boundary Stratotype Working Group

Report by Eustoquio Molina, Chairman.

In 2003-2004 the Ypresian/Lutetian Boundary Stratotype Working Group continued the search of a suitable section in which eventually define the GSSP.

The Punta Torcida section in Argentina was visited and sampled, but unfortunately is not a good candidate, since in shallow marine environments, such as the Austral Basin in Tierra del Fuego, there is a widespread hiatus between the Early and Middle Eocene (Olivero and Malumian, 1999).

The Spanish subgroup was looking for a suitable section in the Betic cordillera (Southern Spain). Recently, a new section has been found in the **Agost region** about one kilometre far from the section studied by Molina et al. (2000). This new section is better exposed and could be a suitable candidate. Both sections seem to be continuous and show a good record of the Ypresian/Lutetian event caused by a major sea level drop.

A detailed study of the Fortuna section, also located in the Betic cordillera, was finished, integrating the data of foraminifera by Gonzalvo, Molina, Ortiz and Thomas, calcareous nannofossils by von Salis, stable isotopes by Schmitz and mineralogy by Mancheño. Furthermore, two papers were published regarding the planktic and small benthic foraminifera, which allowed to recognize a hyperthermal event (Ortiz and Molina, 2003; Gonzalvo and Molina, 2003). The result shows that the Agost section is probably better than the Fortuna section, which was considered the leading candidate section previously.

In order to inform and generate a more active participation a web site was created, that can be visited at the following address: <http://wzar.unizar.es/perso/emolina/ypresian.html>. This web site is up-dated frequently to explain the aims, how and where to define the boundary stratotype, which are the best potential sections, who are participating in the working group and what is the more recent bibliography on the Ypresian/Lutetian boundary.

Danian (Cretaceous/Paleogene boundary), Selandian and Thanetian Working Group:

Chairman: B. Schmitz, Sweden

The GSSP for the base of the Danian has been defined in the El Kef Section (Tunisia) and ratified by the IUGS. However, this GSSP has some disadvantages because it is poorly preserved and its location is not unequivocally identified. During a meeting in 1999 in Tunisia, it has been proposed to take measures to preserve it and complementary sections which may serve as auxiliary stratotypes have been visited.

Since the Selandian and Thanetian stages are intimately linked, a Working Group coordinated by B.Schmitz

(Göteborg University) is actively investigating criteria and suitable sections for the definition of the boundaries of these two stages. Until now, work has concentrated on the type areas in northern Europe and on continuous sections in Spain and the Near East. Both proposed GSSPs will be placed in the **Zumaya section** (northern Spain). The GSSP of the base of the **Selandian** will be close to the **P2/P3a or P3a/P3b** boundaries; the GSSP for the **Thanetian** will be at the base of magnetochron **C26n**.

[Reports of **North-European Paleogene Stratigraphy** working group, **North-Pacific Stratigraphy** working group, **South American regional committee**, **Russian Paleogene Commission** and the **Paleogene Planctonic Foraminifer** working group are found on the webpage of the International Subcommittee on Paleogene Stratigraphy: wzar.unizar.es/isps/index.htm]



International Commission on Stratigraphy Subcommission on Cretaceous Stratigraphy

ANNUAL REPORT 2004

1. TITLE OF CONSTITUENT BODY

International Subcommission on Cretaceous Stratigraphy (SCS)

Submitted by:

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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.*

The Subcommission’s objectives reflect the IUGS’ aims of developing international correlation in understanding the evolution of the Earth, and in particular in developing an internationally agreed relative timescale based on rigorously defined GSSPs.

3. ORGANIZATION

SCS is a Subcommission of the International Commission on Stratigraphy.

There are an additional **15 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 Subcommission. Effectively, anyone with interest and expertise that can contribute to our objectives is welcome to do so. *The great bulk of the Subcommission's work is carried out by these Working Groups.*

Officers for 2004-2008:

Chair: Professor Isabella Premoli Silva (Milan, Italy)

Vice-Chair: Dr. Irek Walaszczyk (Warsaw, Poland)

Secretary: Dr Silvia Gardin (Paris, France)

4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

The Subcommittee has liaised with successive meetings of the *International Cretaceous Symposium*, which until now 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. The seventh Congress will take place in Neuchâtel, Switzerland, 5-9 September 2005, and will include a session for SCS activities.

The Subcommittee hosted a session at the 32nd International Congress in Florence, Italy, the 22 August 2004.

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.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2004

The Subcommittee hosted a session on *Cretaceous Stage Correlations and Boundaries* (S 60-G22.08) at the 32nd International Geological Congress, held in Florence, 20-28 August 2004. The session began with reviews on the progress made since the Subcommittee Brussels Meeting in 1995 (see Rawson *et al.* (eds) 1996, *Bulletin de l'Institut Royal des Sciences Naturelles de Belgique, Sciences de la Terre*, 66 – Supplement). Peter Rawson reviewed progress on the Lower Cretaceous stages since then, while Annie Dhondt reviewed progress on the Upper Cretaceous stages, except the Cenomanian, Turonian and Maastrichtian, the GSSPs of which have already been agreed and ratified by ICS.

Although no formal proposals have yet been made for Lower Cretaceous GSSPs, the provisional proposals made at the Brussels Meeting generated a lot of further research, much of which has now been published. Hence two formal proposals (Hauterivian and Barremian) are in preparation and some others should follow soon. But the Jurassic/Cretaceous boundary remains a major problem which will probably be resolved by using a non-biostratigraphic marker that is common to Tethyan and Boreal realms.

The Berriasian GSSP and the J/K boundary. The 1995 Brussels Meeting recommended placing the base of the Berriasian at either the base of the *jacobi* ammonite Biozone, or the base of the *subalpina* ammonite sub-Biozone (*occitanica* Zone), at a locality in SE Spain or SE France, depending on which marker is chosen.

The Kilian Group and its predecessor (the Lower Cretaceous Ammonite Working Group) follow the former position (Hoedemaeker *et al.* 2003, *Cret. Res.* 24, 89-94).

Many conferences prior to 1980's discussed the problem of the Berriasian stage and the J/K boundary, especially that caused by the marked Tethyan/Boreal biotic differentiation at that time. The arguments were based almost entirely on biostratigraphy, plus sea-level events, and were inconclusive. Even which stage to place the J/K boundary at is debatable – base of Berriasian to most, but base of Valanginian to some.

A new Berriasian Working Group, which will also consider the Jurassic/Cretaceous

boundary, comprising some 15 scientists so far, was set up in 2004. With the increasing focus on so many alternative (non-biostratigraphic) methods of correlation during the last 10 years it is likely that the marker for the base of the Cretaceous (and the Berriasian?) will be a non-biostratigraphic marker that can be traced from one realm to another and therefore overcome the biogeographic problems.

Base Valanginian GSSP. The 1995 Brussels Meeting recommended placing the base of the Valanginian at the base of the *Calpionellites darderi* calpionellid Biozone, possibly at Montbrun-les-Bains (SE France).

Aguado *et al.* 2000 (*Cret. Res.* 21, 1-21) give a detailed synthesis of biostratigraphic and magnetic events in SE Spain. They confirm the value of using the first appearance of *Calpionellites darderi*, which in their sections, as in the SE of France, coincides with the base of the *Thurmanniceras pertransiens* Biozone. They propose that the Cañada Luenga section in the Betic Cordillera should be considered as a possible boundary stratotype, together with Montbrun-les-Bains. Aguado *et al.* note that the Spanish sections are the only ones in the world where a direct correlation has been made between magnetic chrons and ammonite zones at this level. A final proposal by the Valanginian Working Group is expected.

Base Hauterivian GSSP. The 1995 Brussels Meeting recommended placing the base of the Hauterivian at the first occurrence of the genus *Acanthodiscus*, at **La Charce** in SE France.

Reboulet (1995) supported this (rather than using the first occurrence of the species *A. radiatus*), noting that while *Acanthodiscus* is not common in the basal facies, *Breistroferella* is, and they first appear at the same time. Members of the Hauterivian Working Group are currently preparing a **formal proposal** for this recommendation. The local commune is already taking steps to preserve the roadside section.

Base Barremian GSSP. The 1995 Brussels Meeting recommended placing the base of the Barremian at the base of the *Spitidiscus* [now *Taveraidiscus*] *hugii* ammonite Biozone in the Rio Argos section, SE Spain.

Aguado *et al.* 2001 (*Geotemas*, 3(2), 27-30) summarized the biostratigraphy (ammonites, nannofossils, planktonic foraminifera) across the boundary in the **Betic Cordillera**, SE Spain, and Company *et al.* 2003 (*Geobios* 36, 685-694) reviewed the ammonite biostratigraphy of the highest Hauterivian into the base of the Barremian. As a result of this and other recent work by our Spanish colleagues, the Barremian Working Group is now able to prepare a **formal proposal** for the base of the Barremian as currently recommended.

Base Aptian GSSP. The 1995 Brussels Meeting recommended placing the base of the Aptian at the base of magnetic chron M0, in the Gorgo a Cerbara section in central Italy.

There are problems of recognizing the magnetic event in some of the other Mediterranean areas, and of a poor ammonite fauna in the proposed GSSP. Ammonite workers continue to prefer an ammonite index. The decision to use a magnetic event stimulated a lot of work in SE France sections where ammonite faunas were poorly known. Deshayesitaceae are the dominant Lower Aptian ammonites from Europe to Iran. Bogdanova and Mikhailova (2004, *Bull. Inst. R. Sci. Nat. Belgique, Sci. Terre*, 74, 189-243) continues to place the boundary at the base of the *Paradeshayesites tuarkyricus* Zone. The Kilian Group (Hoedemaeker *et al.* 2003, *Cret. Res.* 24, 89-94) prefer to use *P. ogranlensis* as index of the same interval as it is more widely distributed.

The conflicting views still need a final resolution.

Base Albian GSSP. The 1995 Brussels Meeting recommended placing the base of the Albian at either Vohrum (North Germany), in which case the first appearance of *Leymeriella schrammeni* ‘will almost certainly be used as a marker’, or the Col de PréGuittard in SE France, with a marker to be chosen.

Several conflicting views have been proposed since Brussels: Casey (1999, *Cret. Res.*, 20, 609-628) said that because of the limited geographical distribution of early *Leymeriella* and their overlap with *Hypacanthoplites* of the *jacobi* group the *jacobi/schrammeni* boundary is not appropriate. He proposes lowering the base of the Albian to the base of the *H. jacobi* Zone, previously included in the Upper Aptian since Breistroffer’s (1947) time, though not before then. Kennedy *et al.* (2000, *Cret. Res.*, 21, 591-720) proposed the first occurrence of *Leymeriella tardefurcata*, at the base of the Niveau Paquier Black Shale in SE France. Hancock (2001, *Cret. Res.*, 22, 677-683) proposed the base of the *Lyelliceras lyelli* Zone, which is much higher (base of the current Middle Albian). Herrle and Mutterlose (2003, *Cret. Res.*, 24, 1-23) follow Kennedy *et al.* but do not record any significant nannofossil event very close to the base of the *tardefurcata* Zone in SE France.

A decision still has to be made.

Base Coniacian GSSP. The 1995 Brussels Meeting recommended placing the base of the Coniacian at the first occurrence of the inoceramid *Cremnoceramus rotundatus* Troeger non Fiege at the Salzgitter – Salder Quarry, Lower Saxony, Germany.

The correct name for that inoceramid is, according to Walaszczyk’s recent work, *Cremnoceramus deformis erectus* (Meek). Walaszczyk and Wood are preparing the proposal with the precise description of this section for submission to the Subcommittee.

Base Santonian GSSP. The 1995 Brussels Meeting recommended placing the base of the Santonian at the FO of *Cladoceramus undulatopticatus* (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 organized 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. A volume for *Cretaceous Research* on this topic is in preparation.

Base Campanian GSSP. No formal decision was taken at the Brussels Meeting. It was agreed that a good Santonian/Campanian boundary criterion could be the extinction of the crinoid *Marsupites*.

As possible candidates for boundary stratotype the sections at the Waxahachie dam spillway (north-central Texas, USA) and west of Seaford Head (Sussex, England) were considered. Since then the late Jake Hancock and A. Gale have worked on the Waxahachie dam spillway section and Hancock as chairman of the Campanian WG prepared a preliminary report on the section which is now being expanded by Kennedy. Meanwhile, planktonic foraminiferal study (by Petrizzo and Premoli Silva) revealed that the Waxahachie dam spillway section contains a hard-ground with phosphatic pebbles at the Austin Chalk/Taylor Clay boundary, which means it is incomplete toward the top. Moreover, the extinction of the crinoid *Marsupites* in this section falls well within the range of planktonic foraminifer *Dicarinella asymetrica*, thus well predating the current base of the Campanian.

Another unsolved problem concerning the Texas section is who owns the land where it is situated after a long unsuccessful try by Hancock.



- It is anticipated that at least five more GSSP proposals will be completed for voting by the Subcommittee and ICS
- Papers presented at the Santonian WG's Bilbao meeting will be published as a part of *Cretaceous Research*.
- The Subcommittee will plan its contribution to the next International Symposium on the Cretaceous in Neuchâtel, Switzerland, 5-9 September 2005.

9. BUDGET AND ICS COMPONENT FOR 2005

Office expenses (Fax, phone, postage etc)	\$ 100
Duplication of GSSP proposals for circulation to SCS Voting Members	\$ 100
Working Groups: expenses incurred in preparing draft GSSP proposals etc:	\$ 600
Support for SCS meeting in Neuchâtel and meetings	\$ 1500
Total estimated expenditure	\$ 2200

10. CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2000-2004)

See Accomplishments in 2004 (above) for additional details.

Renewed research by WG members (resulting in numerous publications, still ongoing), based on research needs pinpointed by the 1995 Brussels meeting.

Completion of the first 3 Cretaceous GSSP proposals: **Maastrichtian** (ratified 2001), **Cenomanian** (ratified 2002) and **Turonian** (ratified 2003).

The Chair or Vice Chair represented the SCS at:

6th International Cretaceous Symposium: Vienna August 2000.

Colloque sur le Cénomaniien: Rouen, October 2001

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

11. OBJECTIVES AND WORK PLAN FOR NEXT 5 YEARS (2004-2008)

Objectives

- 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 Subcommittee as GSSP proposals are completed.

Work Plan

2005 Finalize proposals for Valanginian, Hauterivian, Barremian, Albian, Santonian and Campanian. Present latest results to 7th *International Cretaceous Symposium*, Neuchâtel, Switzerland.

2006 Finalize proposals for Aptian and Coniacian

2007 Finalize proposal for Berriasian (Jurassic/Cretaceous boundary)

**APPENDIX [Names and Addresses of Current Officers and Voting Members, 2004-2008]
INTERNATIONAL SUBCOMMISSION ON CRETACEOUS STRATIGRAPHY**

Subcommission officers

Chair: Prof. I. Premoli Silva

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Vice Chair: Dr. I. Walaszczyk

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Secretary: Dr Silvia Gardin

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List of Working (Task) Groups and their officers

Maastrichtian WG: GSSP ratified. Giles Odin, France. gilodin@moka.ccr.jussieu.fr

Campanian WG: to be agreed

Santonian WG: Marcos Lamolda, Spain. gpplapam@lg.ehu.es

Coniacian WG: Irek Walaszczyk, Poland. walas@geo.uw.edu.pl

Turonian WG: GSSP ratified. No chairman at present.

Cenomanian WG: GSSP ratified. No chairman at present.

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. lgbulot@yahoo.fr

Berriasian (J/K boundary) WG: to be agreed

Kilian Group [formerly *Lower Cretaceous ammonite WG*]: Philip Hoedemaeker, Netherlands.
Hoedemaeker@naturalis.nnm.nl



International Commission on Stratigraphy Subcommission on Jurassic Stratigraphy

ANNUAL REPORT 2004

1. TITLE OF CONSTITUENT BODY

International Subcommission on Jurassic Stratigraphy

Submitted by:

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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 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 which provide the framework for global correlation. This mission is well advanced at Stage level, and future plans for formal definitions of Substages (but only as Lower/Middle/Upper as appropriate) and perhaps Standard (Ammonite) Zones are being considered.

Goals

These fall into two 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) 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 Subcommission 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 Subcommission's goals.

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 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 twenty other Voting Members. The Voting Members 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.

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.*]

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

Officers for 2004-2008:

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

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 Symposia.

Close liaison is maintained with IGCP Project 458: Triassic - Jurassic Boundary Events, partly through the Convenor (Geoff WARRINGTON, UK) and Secretary (Gert BLOOS, Germany) of the Triassic/Jurassic Boundary Working Group. Two of the Project co-leaders (Stephen HESSELBO, UK and Jozsef PALFY, Hungary) are Voting Members of the Subcommittee and the third (Chris McROBERTS, USA) is a Corresponding Member.

The Subcommittee Geoconservation Working Group (Convenor Voting Member Kevin PAGE, UK) has several links (including himself and Corresponding Members Stefano CRESTA, Italy, and Platon TCHOUMATCHENKO, Bulgaria) with the IUGS Geosites Programme (Convenor Bill WIMBLEDON, who receives the Jurassic Newsletter) and the European and UNESCO Geoparks Programme. A special session on conservation issues was organized by the Group during the 6th International Jurassic Symposium in Mondello, Italy, in September 2002 (see below).

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.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2004

Highlights of the year 2004 include successful conclusion of the Pliensbachian GSSP proposal, publication of the proceedings of the 6th International Symposium on the Jurassic System and successful participation in the 32nd International Geological Congress.

Selection of GSSPs for Jurassic Stages

The **Pliensbachian** GSSP proposal, from an international team led by Christian MEISTER (Switzerland), was unanimously approved by ICS during the summer of 2004 and submitted to IUGS for ratification. This proposal was significantly revised from an earlier version approved by the Jurassic Subcommittee (published in *Eclogae Geologicae Helveticae* vol. 96, pp. 275-297, 2003). Notably, it included new and very encouraging preliminary paleomagnetic data based on limited sampling of the section financed by the Jurassic Subcommittee. Sample analyses were contributed mainly by a commercial company, Core Magnetics (proprietor Ernie HAILWOOD, UK, who receives the Jurassic Newsletter) for which we are grateful.

Publication of Jurassic Symposium papers

Selected papers presented during the 6th International Jurassic Symposium (Mondello, September 2002) were edited by Guido PARISI, Italy, and published in *Rivista Italiana di Paleontologia e Stratigrafia* vol. 110 in April 2004. This issue contains 428 pages and 45 papers on a wide range of topics, including seven papers on Conservation of Geosites.

32nd International Geological Congress, Florence, August 2004

For the 32nd International Geological Congress in Florence, Italy, in August 2004, the Jurassic Subcommittee organized a General Symposium on the topic *The Jurassic World (Outside the Park)*. This Symposium emphasized the multidisciplinary aspect of research activities related to the Subcommittee, and was arranged in seven themes to reflect the Mission Statement of the Subcommittee. It emphasizes the broadening of the goals of the Subcommittee beyond the definition on chronostratigraphic units. See report in box 4a. It is planned to publish this report, together with submitted abstracts, in electronic form circulated to members of the Jurassic Subcommittee.

Report on Symposium at 32nd International Geological Congress, Florence, 2004

1- SESSION: G22.07 – **Jurassic World (Outside the Park)** (177)

2- Chairpersons: Nicol Morton (ISJS, Vogüé, France), Paul L. Smith (University of British Columbia, Vancouver, Canada)

3- Session description: The Symposium was organised as seven topics or themes reflecting aspects of the World during Jurassic times. For most topics one or two oral presentations were invited and other contributions presented as posters.

4- Number of abstracts actually presented: 26 (8 oral, 18 poster)

5- Overview of oral presentations: Oral presentations covered five of the topics. An introduction and review of the chronostratigraphic framework was followed by a summary update of the current Jurassic numerical timescale. Jurassic palaeoclimates were discussed in terms of atmospheric and oceanic circulation models and their expression in the rocks record, followed by analysis of the significance of tropical and bipolar bivalve distribution patterns. Tectonic events were reviewed in the North Atlantic (Greenland and Denmark) and in western Tethys (NW Africa). Evolutionary events were illustrated by reference to ammonoid extinction and diversification from latest Triassic into early Jurassic. Finally, patterns and trends in marine ecosystems were presented and discussed.

6- Overview of poster presentations: Posters related to six of the topics were presented, with half on biostratigraphy and correlation using a wide range of techniques and contributing much new important data. Similarities of tectonic histories in disparate areas emerged from other posters. Particularly striking overall was the diversity of material presented. A small prize for the best poster was awarded by the Jurassic Subcommittee to Bertinelli & Marcucci, (Italy).

7- General comments: The Symposium was arranged to illustrate the wide range of research on Jurassic rocks and fossils in the exploration of what the World was like during Jurassic times. Of course, only a few aspects could be dealt with in the time available but the diversity of the presentations excited high levels of interest so that the session was full or well attended throughout. Some unexpected results relevant to urgent topics such as the GSSP for the base of the Jurassic emerged.

8- Announcements: No formal publication is planned for papers presented at this Symposium but the topics will be followed up at the 7th International Jurassic Congress to be held in Cracow, Poland in September 2006.

A Topical Symposium on Triassic/Jurassic Boundary Events, organized by IGCP Project 458, was also held during the 32nd International Geological Congress. Although the Jurassic Subcommittee was not formally involved in organization of this, there was significant participation by members.

A third highlight of the 32nd IGC was the presentation of the ICS Medal for a major achievement in advancing stratigraphic knowledge to Stephen HESSELBO (UK), a Voting Member of the Jurassic Subcommittee.

Jurassic Newsletter

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. *Newsletter 31* for 2004, edited by Nicol MORTON (France) and Paul BOWN (UK), was published electronically in July 2004 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 32 pages, and includes reports by the Chairman and the Convenors of nine of the Working Groups, eight items of discussion or report by correspondence, two announcements about future meetings and two news items on Voting Members of the Subcommittee for 2004-2008 and on the award of the ICS Prizes.

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

The 7th International Jurassic Congress (Symposium) will be held in Poland in September 2006. Scientific sessions will be held in the Jagiellonian University Conference Centre in Kraków on 11th to 14th September, with a Pre-Congress field trip on 6th to 10th September and four Post-Congress field trips on 15th to 19th September. Planning by the Organizing Committee, under the Chairmanship of Andrzej WIERZBOWSKI, is well under way and the First Circular was distributed in June 2004. A Congress website atwww2.uj.edu.pl/ING/jurassica has been established for information.

Progress with Stage GSSP proposals

A deadline of September 2006, the date of the 7th International Jurassic Congress, has been set by the Jurassic Subcommittee for submission of all remaining Stage GSSP proposals to the Subcommittee.

There is general agreement that none of the four candidate sections for GSSP of the base of the **Hettangian** Stage and Jurassic System fulfills all the requirements, but also that no new sections or significant new data are likely to emerge in the foreseeable future. Therefore, a proposal for a simultaneous combination of one GSSP plus two or three ASPs will be necessary, and must be accepted as such by ICS and IUGS. A general consensus has not yet been achieved but could emerge provided that remaining problems of detailed correlation using a combined range of criteria can be resolved. This requires funding to complete current work or for further focused research on specific topics.

The **Sinemurian** GSSP in Somerset (S.W. England) has been ratified.

The successful achievement of the **Pliensbachian** GSSP at Robin Hood's bay, Yorkshire (N.E. England) is reported above.

The **Toarcian** Working Group has selected its preferred section (Peniche, Portugal) for proposal as GSSP. However, some details remain to be established and a field meeting in Peniche in Spring 2005 has been organised.

The **Aalenian**, and therefore Middle Jurassic, and Bajocian GSSPs at Fuentelsaz (Spain) and Cabo Mondego (Portugal) respectively have been ratified, together with the ASP for the Bajocian at Berreraig, Isle of Skye (N.W. Scotland).

Investigations of possible new candidate sections for the **Bathonian** GSSP, especially in Iberia, as alternatives to the already proposed section near Digne, Hautes-Alpes (S.E. France), are continuing.

The preferred section for the **Callovian** GSSP, in Swabia (S. Germany) was selected some time ago, but preparation of a formal proposal has been delayed by the personal problems of one of the key contributors. These have now been resolved and a meeting to finalise the proposal is planned for 2005.

For the **Oxfordian** GSSP a proposal of a section near Savouren, Provence (S.E. France) has been published. A field meeting on an alternative section at Redcliffe Point, Dorset (S.W. England) was held in 2003 and multidisciplinary analyses of samples collected are now well advanced. A small meeting to resolve problems of ammonite taxonomy and detailed biostratigraphy will be held in 2005. One section will be proposed as GSSP and the other as ASP.

Work on the Flodigarry section, Isle of Skye (N.W. Scotland), proposed as candidate for **Kimmeridgian** GSSP, has been completed and a monograph submitted for publication to the Royal Society of Edinburgh. Some details of correlation of ammonite horizons between the Boreal/Subboreal Realm (Flodigarry) and the Tethyan/Mediterranean Realm candidate section at Mt. Crussol, Ardeche (S.E. France) remain to be finalized. A Working Group meeting, jointly with the Tithonian WG, will be held in Stuttgart (Germany) in Summer 2005.

The **Tithonian** Working Group has at last made progress with publication in 2004 of a proposal of the Fornazzo section, Sicily (S. Italy) as candidate GSSP. Completion of work on candidate sections at Canjuers and Mt. Crussol (S.E. France) has been delayed by personal problems of a key contributor. The Working Group will review candidate sections during a discussion and field meeting (together with the Kimmeridgian WG) in Stuttgart (Germany) in Summer 2005.

6. CHIEF PROBLEMS ENCOUNTERED IN 2004

These remain as they have been in recent years, mostly related 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 members 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 2004 (ANTICIPATED THROUGH MARCH 2005):

INCOME

Carried forward from 2003		€ 150	
ICS Allocation	€2801 less bank charges of €30 =	€2771	
Supplementary ICS grant for IGC participation	€619, less bank charges of €30 =	€ 589	
	TOTAL		€3510

EXPENDITURE FROM 2004 BUDGET

General office expenses	€ 250	
ISJS Newsletter 31 preparation	€ 100	
32 nd International Geological Congress:		
Travel and accommodation etc	€770	
Preparation of Symposium etc.	€165	
Prize for best poster	€ 50	
	TOTAL	€ 985
Support for Liaison WG	€ 200	
Support for Callovian WG	€ 400	
Addit. contrib. To 2 nd Moroccan Jurassic Colloquium	≈ 200	
CARRIED FORWARD TO 2005 FOR DELAYED MEETINGS:		
Support for Toarcian WG meeting, Peniche	€ 750	
Support for Tithonian and Kimmeridgian meeting, Stuttgart	€ 750	
	TOTAL	€3635
Deficit to be carried forward to 2005		- € 125

8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR:**(a) Revised membership of Jurassic Subcommittee:**

The year 2004 brought in a new Voting Membership of the Jurassic Subcommittee, with six new Voting Members from six countries (and four continents). Each has received a proposed list of responsibilities on behalf of the Subcommittee and the details of these will be given in the new Subcommittee Directory. Early next year (2005) the Corresponding Membership will be revised, to ensure improved subject and geographical coverage, and also a few changes to the Convenors of the Working Groups. Details of all of these will be given in the Subcommittee Directory, which will be electronically published and circulated by email attachment in the same way as the *Jurassic Newsletter*.

(b) Design and establish web-site for Subcommittee:

This has been a long-standing plan of the Subcommittee, but geographical isolation of the Chairman and Secretary have made progress more difficult and slower. It is planned to provide a more widely accessible source of information about the Subcommittee, including recent Newsletters, a Directory of the Executive and other Voting Members, with their allocated areas of responsibility, and Corresponding Members, plus information on the objectives of the Working Groups and contact details for the Convenors.

(c) Publication of Jurassic Newsletter 32:

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. This has been shown to work well in some countries, but less well in others. Distribution of the next *Newsletter* (32) should be in Spring or early Summer of 2005.

(d) Report and abstracts of IGC Symposium on the Jurassic World:

There are no plans to publish fuller versions of the oral and poster presentations to the Jurassic World Symposium organized for the International Geological Congress in 2004. Relatively few of the members and associates of the Jurassic Subcommittee were able to participate in the Congress so that most will not see the outcomes. Therefore, it is planned to collate the abstracts together with the Report (given above in box 5a) and publish these electronically in the same way as the Jurassic Newsletter. It has not yet been decided whether this will be a numbered Newsletter (31A or 32A?).

(e) Preparation of GSSP proposals:

The Convenor and Secretary of the **Triassic/Jurassic boundary** (and **Hettangian**) WG hope to conduct a series of ballots to decide, by majority vote if necessary –

- (i) *the stratigraphical level and principle criterion for recognition of the base of the Stage and system,*
- (ii) *the supplementary criteria useful for correlation at or very near this level,*
- (iii) *which sections best illustrate these criteria and should be proposed as GSSP or ASP,*
- (iv) *selection of preferred section as GSSP.*

However, the timetable is uncertain because of likely perceived problems of correlation.

The **Toarcian** WG have organized for 2005 a field meeting on the Peniche section, Portugal, postponed from 2004, This will review the documentation on this section and complete any revisions necessary. A GSSP proposal will follow.

Further research work will be carried out by the **Bathonian** WG on the Digne (S.E. France) and other sections to resolve uncertainties over a possible minor hiatus in Digne.

Members of the **Oxfordian** WG will meet during 2005 to resolve problems and prepare a combined GSSP/ASP proposal, to reflect Boreal/Tethyan provincialism, probably during 2005.

The **Kimmeridgian** and **Tithonian** WGs have organized a scientific and field meeting based in Stuttgart. For the Kimmeridgian WG this should enable resolution of final problems of detail so that a combined GSSP/ASP proposal can be prepared. For the Tithonian WG the priority is to review the possible candidate sections and decide priorities for further work before the deadline of 2006 set by the Jurassic Subcommittee.

(f) Development of Thematic Working Groups:

Looking to the future the Jurassic Subcommittee is broadening the range of activities it sponsors beyond traditional biostratigraphy and chronostratigraphy. Future activities will be in part focussed on improving relative time-resolution, using both traditional methods such as ammonite biostratigraphy and multidisciplinary integration of different methods. This evolution was evident in the organization of the last two Jurassic Symposia and will be continued in the next. To encourage such developments the Subcommittee established several Thematic Working Groups. The success of these so far has varied, but they will continue to be supported and developed.

(g) Public outreach:

Classified for convenience under the same heading of Thematic Working Groups are two other groups. The Geoconservation WG (Convenor Kevin PAGE, UK) lead the way for ICS in liaison with conservation organizations such as Geosites and Geoparks, by developing codes based on comparing experiences in different countries. This will be continued until the Kraków Congress in 2006. The Liaison WG (Convenor Robert CHANDLER, UK) has successfully involved non-professionals such as amateur fossil collectors, in publishing valid scientific work, frequently in

collaboration with established professional stratigraphers. The Group are planning to broaden involvement by organizing a meeting for presentation of data combined with a field trip.

(h) Possible IGCP Project: Marine/Non-marine Correlations

An application for a new IGCP Project on marine/non-marine correlations in Jurassic the was submitted in 2004 by Jingeng SHA (China) with advice from and collaboration with the Executive of the Jurassic Subcommittee. The Project, though pursued at many stratigraphical levels, would be especially relevant to the Triassic/Jurassic and Jurassic/Cretaceous boundary intervals. There are numerous examples where calibration of the sequences of continental floras and faunas against marine faunal changes would provide valuable insights into the geological and biological evolution of Earth during the Jurassic Period. The application was, apparently, sympathetically received but was referred back for clearer indications of international involvement and commitment. This is being organized.

9. BUDGET AND ICS COMPONENT FOR 2005

For the year 2005 the main activities of the Jurassic Subcommittee will be focused on series of scientific and field meetings planned by some of the Stage Working Groups, the annual Newsletter, and planning for the 7th Jurassic Symposium in Poland in 2006. These priorities are reflected in the budget projections.

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 2005:

General office expenses	€ 250
Preparation and production of <i>Newsletter</i> 32	€ 100
Contributions to Officers travel costs	€ 400
Professional help with establishment of website	€ 200
Support for Stage Working Groups (meetings etc.)	€1500
Support for work towards 7 th Jurassic Symposium, Poland	€1500

TOTAL BUDGET PROJECTED	€3950

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 Poland (2006) 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 (2000-2004)

Jurassic Newsletter 31 for 2004 included a report by the Chairman of the Subcommittee which reviewed to four-year period 2000-2004. For information this is copied here. Subsequent remarks here essentially amplify some aspects of this report.

Extract from *Jurassic Newsletter* 31, August 2004

CHAIRMAN'S REPORT

Nicol MORTON

This year (2004) brings the end of the four-year period of the "official" mandate of the Jurassic Subcommittee from I.U.G.S. We are appointed at a meeting of I.U.G.S. during an International Geological Congress and serve until the next Congress, which will be the 32nd IGC in Florence, Italy, in August 2004. Of course, arrangements for the Subcommittee membership for the 2004-2008 period have to be made nearly a year in advance and details of the new Subcommittee, to be confirmed in Florence, are given later in this Newsletter. The two Pauls and I are honored to be re-elected to the Executive for a second term.

So this is an appropriate occasion to review the progress made by the Jurassic Subcommittee during 2000-2004 and look forward to the 2004-2008 term.

Membership:

For 2000-2004 twenty Voting Members, including the Executive, were appointed, of which nine continued from the previous term and eleven were new. In mid-term one member died (Bill SARJEANT) and was replaced by bye-election. For 2004-2008 there will be twenty Voting Members *in addition to* the Executive (continuing) so that fourteen continuing members will be joined by six new members. Only three members retire on this occasion.

The Corresponding Members are equally important to the success or otherwise of the Subcommittee, especially in lines of communication. The number of these is not defined by the Constitution and was expanded to forty-seven (subsequently increased slightly) for 2000-2004, with nearly half being new. Arrangements for 2004-2008 have still to be made but further expansion as well as some revision of membership is envisaged. Nominations can be made to the Executive.

Jurassic Symposia:

The Jurassic Symposia, sponsored by the Subcommittee but organized independently, are by far the most important event and activity for most of us. These are now arranged on a four-year cycle and fall in the middle of a Subcommittee's term of office. The 6th Jurassic Symposium was held in Mondello, Sicily, in September 2002 and a report on this was given in the *Jurassic Newsletter* no.30 (2003). The Proceedings of this Symposium have now been published. At Mondello the decision was made that the 7th Jurassic Symposium/Congress will be held in Cracow, Poland in 2006. The First Circular has been distributed and details are given in this Newsletter.

GSSPs of Jurassic Stages:

The primary task of the Jurassic Subcommittee for ICS and IUGS is the definition of the internationally recognised Standard Stages by means of a Global Stratotype Section and Point (GSSP). In terms of ratification of proposals the term 2000-2004 saw limited progress, with only one proposal (Pliensbachian) approved by the Subcommittee to add to the three previously ratified by IUGS. However, a lot of work has been undertaken within the various Working Groups (see Reports in this and previous Newsletters) and progress is being made towards agreed proposals. The deadline of 2008 set by IUGS for completion of this project is looming but should be met.

Many of the remaining problems reflect difficulties of precise correlation between different faunal provinces. The correlations available are already more precise in most cases for the Jurassic Stages than for those of many other Systems, but we all seek the best which can be achieved. ICS list a series of "ideals" for a GSSP but recognise that these will almost never all be met. The "best available" is the usual description of ratified GSSPs.

For Jurassic Stages, unlike those of many other Systems, a hierarchical principle of defining the Stages in terms of the contained Standard Zones (and Subzones if appropriate) has long been accepted. This should be respected but some flexibility in definition may be necessary. The GSSP for the Bajocian Stage is a good illustration. This was (and is) defined with the Discites Zone at the base. The Discites Zone in turn was recognised as based on the first appearance of the ammonite genus *Hyperlioceras* (including *Toxolioceras* etc.). However, as a result of detailed studies it became evident that the best correlations, and therefore definition, could be achieved using the first appearance of *Hyperlioceras mundum* and associated species. Earlier *Hyperlioceras* species (e.g. *incisum*) are Aalenian.

Historical precedent is also an important factor in the establishment of Stage boundaries. Definition of the base of a Stage at a GSSP should respect this as far as possible, but it cannot be an over-riding factor which makes wider correlation impossible. The goal is a succession of chronostratigraphic units which will provide a single global standard as far as possible.

Other Activities:

The activities of the Subcommittee are undertaken by the Working Groups, the Convenors of which are the key personnel. Most of the Working Groups were established in order to prepare agreed proposals for GSSPs. This work continues for most of the groups. For the future, consideration will be given as to whether achieving a GSSP for the Stage means the end of a Working Group. Personally, I do not think it should. I would like to see the Stage Working Groups remain active with the tasks of defining, on the same multidisciplinary basis, Substages (but as Lower/Middle/Upper as appropriate rather than as named Substages) and the Standard Zones and Subzones. IUGS may not be interested in ratifying these for its International Stratigraphical Scale, but why should the Jurassic Subcommittee not take on this task?

Other Working Groups were set up with the aim of broadening the range of activities undertaken within the Jurassic Subcommittee. Generally, the intention was to encourage collaboration with reference to a particular theme. The success of this has been mixed - perhaps for the future more specific targets should be set. By contrast thematic sessions during the Jurassic Symposia, notably in Mondella, have been popular and successful, and will be included in the programme for the next Jurassic Symposium/Congress in Cracow. Similarly, the Symposium being organised by the Jurassic Subcommittee for the 32nd International Geological Congress in Florence has several themes (see this Newsletter).

Two "thematic" Working Groups have been successful. The Geoconservation WG convened by Kevin PAGE organised a special session during the Mondello Jurassic Symposium which brought out interesting international comparisons. The Liaison WG with Bob CHANDLER as Convenor has continued to expand and become more international, encouraging collaboration and integrating the work of non-professionals with professional stratigraphers and palaeontologists. The reports in this and the last Newsletters summarise extensive and ongoing research.

Distribution of the Newsletter:

Publication of the Jurassic Newsletters electronically and circulation by email should ensure that they are widely available. The Newsletters are sent to all listed Voting and Corresponding Members and one of their specified responsibilities is to ensure onward distribution to others who are interested. Onward forwarding of the email attachment(s) should make this much simpler than the previous method of photocopying and collating extra copies. Again the success of the distribution has been variable and we will seek to improve this. Please forward this Newsletter to anyone you know to be interested.

ISJS Directory:

A Directory of Members and Working Groups of the Jurassic Subcommittee was produced and circulated in 2001. A new Directory will be prepared and distributed during the coming year. It is extremely important that all of you keep the Chairman and Secretary informed and up-to-date with your address and any other details.

As previously, I close this report by thanking all the contributors and Paul Bown for putting it all together to produce the final version and for its distribution.

Nicol MORTON, Chairman ISJS,
NICOL.MORTON@wanadoo.fr

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 which are held every three or four years - Erlangen (Germany) 1984, Lisbon (Portugal) 1987, Poitiers (France) 1991, Mendoza (Argentina) 1994, Vancouver (Canada) 1998, Mondello (Sicily) 2002. These are noted for the friendly "family" atmosphere. During the last Symposium the location of the next Symposium was decided by democratic vote of those present. Four invitations were received and Poland was selected as the venue for the 2006 Symposium. The interval of the Symposia has become fixed at four years, timed to be midway between the International Geological Congresses.

For each Symposium, the resultant Field Trip Guidebooks are important reference publications, often with much new previously unpublished information, while the Symposium Proceedings are frequently quoted basic references on Jurassic geology. Within the five-year period 1999-2003, the proceedings of the Vancouver Symposium (1998) were published in 2000 and the proceedings of the Mondello Symposium (2002) in 2004. The Guidebook for the field excursions was published in 2002, as was also a revision of the classical volumes by Gemellaro on Jurassic ammonites. 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 various Working Groups reports on current research projects news and comments submitted by members and "friends". Previously the Newsletters were duplicated and distributed by post, but the last five 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 ten are now established and work on three others is almost completed. The remaining three are well advanced. A deadline has been established within the Subcommittee for the project to be completed by the Jurassic Congress in 2006, well before the IUGS deadline of 2008.

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 5 YEARS (2004-2008)

The objectives and plans proposed for the period up to 2008 are still being refined. The following proposals have been circulated to Voting Members and are currently still under discussion.

Proposed Objectives of Jurassic Subcommittee for 2004-2008

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. Completion of GSSP proposals for all Jurassic Stages (remaining) by the next Jurassic Congress in Cracow, September 2006.
2. 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.
3. 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.
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.
5. Investigate the establishment of databases 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. April 2005 - Field meeting of Toarcian WG, Peniche, Portugal; purpose documentation of section and preparation of GSSP proposal for basal boundary of **Toarcian** Stage. The Working Group will also start working on study of the early Toarcian Anoxic Event as one of their future activities.
1. September 2005 - Joint meeting, including fieldtrip, of the **Kimmeridgian** and **Tithonian** Working Groups (possibly also members of Oxfordian and Callovian Working Groups), Stuttgart, Germany; purpose to finalize base Kimmeridgian GSSP proposal and establish a short list of candidate sections for base Tithonian GSSP which will become focus of future work. Publication of proceedings is probable.
2. 2005/2006, date not yet arranged - Nanjing, China; inaugural meeting and workshop of Working Group, or IGCP Project if application is successful, on Marine/Non-marine Correlation; focusing on methods of correlation and case histories. This will be followed up by Special Session planned for 7th Jurassic Symposium in Kraków, Poland (see below).

3. September 2006 - 7th International Symposium on the Jurassic System, Poland, with field trips to Czeszochowa-Cracow Upland in central Poland, and in Pieniny and Tatra Mountains in southern Poland and northern Slovakia; although planned as a general Symposium, thematic sessions will be a major feature, with related field trips in some cases; Field Guides and Abstracts Volume will be produced for the Symposium and a Symposium Proceedings volume will be published subsequently.

No details of other possible meetings are yet available.

APPENDIX [Names and Addresses of Current Officers and Voting Members, 2004-2008] INTERNATIONAL SUBCOMMISSION ON JURASSIC STRATIGRAPHY

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: 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, Leicester, UK gw47@leicester.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@mhn.ville-ge.ch

Toarcian: Convenor Serge Elmi, Lyon, France Serge.Elmi@univ-lyon1.fr

Aalenian: to be arranged

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

Isotope Stratigraphy: Convenor Stephen Hesselbo, Oxford, UK Stephen.Hesselbo@earth.ox.ac.uk

Liaison: Convenor Robert Chandler, Whyteleafe, UK aalenian@aol.com

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

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Akira YAO, Osaka, Japan yao@sci.osaka-cu.ac.jp



International Commission on Stratigraphy Subcommission on Triassic Stratigraphy

ANNUAL REPORT 2004

1. TITLE OF CONSTITUENT BODY

International Subcommission on Triassic Stratigraphy

Submitted by:

Dr Michael ORCHARD, Chairman
101-605 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 (24), 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.

For election of the new executive (below), titular members were invited to propose candidates for Chair and Vice Chair. The incumbent was proposed as continuing Chair and one candidate as Vice Chair; the Chair invited a new secretary to stand. A postal vote was arranged by the past Secretary amongst the titular members and each candidate received at least 60% approval. A new voting list 2004-2008 was achieved through communications with the Executive and all Voting Members.

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 address for Subcommission site; and indication of contents

<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 Wuhan meeting 2005.

InterRad group: Joint meeting planned for 2006.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2004

Three issues of *Albertiana*, the official newsletter of the Triassic Subcommission, were published in 2004. 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>.

Albertiana **29** (63 pages) was published in April 2004. It includes several papers on the Lower Triassic, including a proposal for a I-O GSSP at Chaohu, China; a summary of conodont biostratigraphy in that area; and an account of Olenekian ammonoids in South Primorye. Also new data on the A-L boundary at Bagolino and a new Triassic bibliography.

Albertiana **30** (55 pages) was published for the Spiti Field Meeting in July/ August, 2004. It contains 8 abstracts from the meeting, and articles representing a field guide to the region, including sequence- and litho-stratigraphic revisions, and details of the biostratigraphy of the I-O, O-A, and

L-C boundary successions in Spiti.

Albertiana **31** (83 pages) was published in November 2004. It contains the abstracts of the Florence workshop, and papers on P-T boundary magnetostratigraphy, I-O boundary ammonoids, O-A biostratigraphy in South Primorye, Late Triassic extinctions, and Triassic fill of a J-K impact crater in the Barent Sea.

A **field workshop** in the Himalaya of **Spiti**, India, was held 26th June-6th July 2004. This was co-sponsored with IGCP 467, the Indian Geological Survey, and the Austrian Academy of Science, and was organized jointly by members of Vienna (L. Krystyn), Milano (M. Balini) and Delhi Universities (D.B. Banerjee), and by O.M. Barghava (Chandigarh) with the official support of state of Himajal Pradesh government. During the Manali meeting, attended by 25 scientists from 10 countries, 12 talks were presented and a business meeting held (June, 26). Major topics were the biostratigraphy of time-diagnostic fossil groups across Triassic stage and substage boundaries (Gangetian-Dienerian, Induan-Olenekian, Olenekian-Anisian, Ladinian-Carnian, Carnian-Norian) and a general introduction into the Triassic stratigraphy of Spiti. This was followed by a 8-day bus/jeep tour to Spiti where the classic Triassic sections of Muth and Kuling were visited. Emphasis was on ammonoid-conodont- (and in part brachiopod-) bearing Induan-Olenekian, Olenekian-Anisian, Anisian-Ladinian and Ladinian-Carnian boundary intervals. A special issue of *Albertiana* (#30) was published in which 8 abstracts and 3 articles were published. The Spiti sections are relatively condensed and rich in fossil fauna and are identified as a potential reference for the I-O boundary, particularly as they contain conodonts indicative of a more pelagic environment than Chaohu.

One further outcome of the meeting was the initiation of a multidisciplinary Indo-western cooperation project, called informally “High-resolution Triassic palynostratigraphic time scale of eastern Gondwana basins and margin”, under the umbrella of the IGCP. Scope of the project is to date and correlate more precisely the large continental and marginal marine Triassic series of eastern Gondwana between India and Australasia.

A conodont workshop took place during the Spiti meeting. Discussions on the taxonomy and stratigraphy of boundary-diagnostic conodont biomarkers, especially the species *Polygnathiformis*.

At the **International Geological Congress** held in Florence, Italy, August 20-28, 2004, the Subcommittee sponsored a symposium G22-06: *Triassic in Tethys Realm*, and a workshop DWO-09: *Upper Triassic boundaries*. STS members were also involved in T-04-02: *Permian-Lower Triassic events* and T-04-03: *Triassic-Jurassic boundary events*. Workshop DWO-09 attracted up to about 50 participants who enjoyed lively presentations and discussions on topics relating to correlation and definition of the base Carnian, Norian, and Rhaetian stages of the Upper Triassic. The abstracts from the fourteen talks/ posters are reproduced in *Albertiana* #31.

An **STS website** was established by the new STS Secretary. This complements the *Albertiana* website by providing information on the Subcommittee and its members, task groups, meetings, and especially as a host to discussion notice boards for each of the current boundary task groups. <http://paleo.cortland.edu/sts/>

Organization of future meetings took place:

Wuhan, China Meeting, May 2005. 2nd Circular published in *Albertiana* 29

Wellington, New Zealand, March 2006. 1st Circular published in *Albertiana* 29.

Svalbard, 2006. An organizing committee was established and a preliminary program formulated.

Progress on Triassic GSSPs:

A proposal for the **Induan-Olenekian** (I/O) boundary GSSP at the Chaohu section in Anhui Province of East China, within the low-latitude Tethyan Realm, was published in *Albertiana* #29. The I/O boundary in Siberia and northern Far East is usually marked by the first appearance datum (FAD) of *Hedenstroemia*, an ammonoid which occurs commonly in these regions, but which is rare in the Canadian Arctic and southern Far, and not known in the South China and other low paleolatitude regions. The I/O boundary in South China is marked by the FAD of flemingitid ammonoids and far more abundant conodonts. In the Chaohu section, the FAD of conodont *Neospathodus waageni* subsp. is the preferred index to define the I/O boundary. This datum 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 $\delta^{13}\text{C}$. Conodont biostratigraphy of Chaohu was summarized in *Albertiana* #29, and the ammonoids described in *Albertiana* #31.

After 2004, field work carried out in Muth, Spiti, evaluation of the Mikin Fm. for establishing an Induan-Olenekian boundary GSSP candidate was begun. The rocks are well exposed, and highly fossiliferous both in conodonts and ammonoids with documentation of top *Gyronites*, complete *Flemingites* and basal *Euflemingites* intervals. Three boundary options based in ammonoids are: (1) the FO of *Flemingites* s.l. = *Rohillites rohilla*, (2) the FO of *Flemingites griesbachi* and (3) the FO of *Euflemingites*. These events can be tied to the FAD of *Neospathodus waageni* subsp. The merits of the Muth section are under consideration.

The field meeting and conodont workshop in St Christina last year generated an informal agreement on using the appearance of the conodont *Chiosella timorensis* at Desli Cairra, in Dobrogea, Romania as the GSSP for the **Olenekian-Anisian** boundary. Since then, further geochemical work was undertaken to fill a perceived gap in the coverage at the principal section. Biostratigraphic work is in progress on the ammonoids and nautiloids, while the conodont succession remains to be described in detail. Further work has been undertaken on correlative sections in South China, Spiti, and South Primorye, Russia.

Following the publication of alternate GSSP proposals, an initial vote within the **Anisian-Ladinian** task group first eliminated one option, but was subsequently inconclusive between the remaining two, with 9 votes in favor of the base of the Curionii Zone at Bagolino, and 5 in favor of the base of the Reitzi Zone s.s. at Falsoors. In order to overcome this historical impasse, the Chairman canvassed the titular members of the STS for their view on whether it was appropriate to accept the majority task group view. Those results became available in May with 68% of respondents supporting this approach. Therefore, the proponents of the Curionii datum were invited to prepare a full and final proposal for the GSSP, and this was sent out to voting members of the Subcommission by the new Secretary in early September. The vote closed on 28 November with a 83% of respondents in favor of the GSSP 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 praeungarica* 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. The completed proposal has been forwarded to the ICS for a vote. Integrated geochronology, biostratigraphy and magnetostratigraphy provide a reference frame for the Anisian/Ladinian boundary interval and a key constraint for interpretation of cyclicity in the Latemar carbonate platform succession.

Three widely separated areas are providing essential data on the **Ladinian-Carnian** boundary – the Dolomites in northern Italy, Spiti sections in India, and South Canyon in Nevada, USA. The section at Stuoures in Italy, the subject of an existing proposal, is now supplemented by new data from other sections in the Dolomites. Studies in Spiti are nearly over, with conodont sampling across the boundary interval having been made a total of four times; no new ammonoid discoveries having come to light during the last two expeditions. The distinction between key ammonoids and prospective index fossils *Daxatina* and *Trachyceras* is difficult in poorly preserved specimens, whereas the FAD of the prospective conodont species *polygnathiformis* is associated with typical Ladinian ammonoid species; the bivalve *Halobia* also appears close to this boundary and affords a further guide fossil. The successions in New Pass, Nevada South Canyon remains to be fully documented to test the suitability of bioevents established in Spiti and the Dolomites.

Following the successful conodont workshop in Vancouver in 2003, new conodont zonation from a potential **Carnian-Norian** GSSP at Black Bear Ridge, Western Canada was presented during the IGC in Florence. New taxa and potential indices are recently recognized in both Europe and North America. The succession of bivalve *Halobia* species in the boundary interval at Black Bear Ridge and elsewhere are well integrated with conodont, and less directly, with the ammonoid chronology.

The integrated bio-, magneto- and chemostratigraphic cross-correlation of key sections in the Tethys (Sicily, Slovakia, Turkey) show a concurrent datum plane somewhat above the current Norian ammonoid base. This level is reported to be marked by the appearance of *Epigondolella* cf. *quadrata*, a palaeomagnetic reversal, the onset of a positive $\delta^{13}\text{C}$ shift, and possibly to the FO of *Halobia styriaca*. A boundary study of promising siliceous deepwater facies in Oman unfortunately failed to provide reliable radiolarian faunas important for a correlation with the Panthalassa realm. Carnian-Norian conodonts from the Boreal realm in Siberia were reported for first time at IGC Florence and will be important in correlating Carnian-Norian boundary beds of low and high latitudes.

The Pizzo Mondello section in Sicily contributes a magnetostratigraphic profile tied to a preliminary conodont zonation for the C-N boundary interval in Tethys. This is crucial for marine-nonmarine correlations for the Late Triassic. Alternate views of this correlation with the cyclostratigraphically calibrated Newark non-marine successions place the base of the Norian at about 214 Ma or 228 Ma. Advocates for both views made their case at the Florence IGC.

New data on the **Norian-Rhaetian** boundary from a 50 m thick boundary interval in the Zlambach Formation in Austria were presented at the Florence IGC. Ammonoids, pelagic bivalves, conodonts, radiolarians, and palynomorphs are known and a magnetostratigraphy is available. Despite unexpected ranges of some ammonoids and conodonts, a distinct dinoflagellate change that occurs midway through the section is widely recognized and could prove invaluable in distinguishing the Norian and Rhaetian in shallow marine and/or high latitude basins. Radiolarians need study but may prove crucial in correlation with western North America where radiolarians of the *Proparvicingula moniliformis* Zone provide the most distinctive faunal change for characterizing the base Rhaetian in the oceanic realm. This level corresponds also to the FAD of the conodont *Epigondolella mosheri*, which approximates the Amoenum Zone in North America. *Misikella posthernsteini* is suggested as a Rhaetian equivalent in Tethys. Strongly contrasting magneto-stratigraphic correlations of the marine defined Norian-Rhaetian boundary with the Newark astrochronologic time scale imply either a relatively short (2-3 My) or much longer Rhaetian Stage (6-7 My). A 30m thick top-Norian to Rhaetian Tethyan pelagic limestone succession has been drilled for magnetostratigraphy to resolve this. Preliminary isotopic data from North America suggests a long Rhaetian. A field workshop to the Gabbs Valley Range of Nevada

will be held in March 2005 to resample the Norian-Rhaetian boundary, which has been found to contain rare Tethyan conodonts.

The **Non-marine Group** continued to develop correlations, especially in North America, by the work of Lucas, Heckert, Lockley and Hunt. Work by Kozur in Europe and North America promises new conchostracan-based correlations. Members made presentations at the CHRONOS Workshop held in conjunction with the regional GSA Meeting in Boise, Idaho in May 2004 and at the IGC in Florence (Lucas, Kozur, Hancox, Olsen). The nonmarine working group is heavily involved in organizing and publishing the results of a theme meeting on the nonmarine Triassic-Jurassic transition, to be held in St. George, Utah in March 2005.

6. CHIEF PROBLEMS ENCOUNTERED IN 2004

The ability of the former STS secretary to function effectively continued through the first half of the year due to his retirement and departure from his institute. The Chair took up the slack, conducting votes etc.

The base-**Ladinian** deliberations within the task group remained contentious but the democratic principle prevailed through several successive votes.

Restructuring and fiscal restraint within the Chair's organization threatens to seriously impair his ability to fulfill his STS duties. General difficulty of financially supporting task group members to attend meetings.

7. SUMMARY OF EXPENDITURES IN 2004 (ANTICIPATED THROUGH MARCH 2005):

ICS FUNDING (*values in \$U.S.*)

Subcommission allocation	3000
IGC supplement	1800
TOTAL	4800

STS EXPENDITURES

<i>Albertiana</i> - STS Newsletter	1500
STS website development	600
Support for Spiti meeting	300
Contribution to Chairman's IGC expenses	350
Contribution to STS members IGC expenses	1600
General office expenses	100
Support for Norian-Rhaetian task group meeting	350

TOTAL	4800
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8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2005):

(1) Olenekian GSSP

International meeting on Chronostratigraphy and Biotic Recovery.

May 23-25 (May 23-June 1), 2005; Wuhan, China; co-sponsored by STS, IGCP 467, CHRONOS, SPS.

Themes: 1. Triassic chronostratigraphy and GSSPs, especially Lower Triassic; 2. End-Permian mass extinction and Triassic recovery as well as related events; 3. Triassic paleontology and paleoecology; 4. Correlation between marine and continental Triassic.

Schedule: 21-22 May 2005 Pre-Symposium Field Excursion from Changxing to Nanjing

23-25 May 2005 Symposium in Chaohu, Anhui Province

24 May 2005 Morning: Mid-Symposium Field Excursion in Chaohu

Evening: CHRONOS Workshop

25 May 2005 Symposium in Chaohu, Anhui Province

26-30 May 2005 Post-Symposium Field Excursion 1 in Central and Western Guizhou

26-29 May 2005 Post-Symposium Field Excursion 2 in Southern Guizhou

26 May-1 June 2005 Post-Symposium Field Excursion 3 in Guizhou

Pre-symposium excursion: Permian-Triassic boundary sequence in Changxing, Zhejiang Province and Lower Triassic sequence in Nanjing, Jiangsu Province. Two-day field excursion to view the famous Meishan Section, where the GSSP of the Permian-Triassic boundary, and base Changhsingian are located; Lower Triassic sequence of different facies in Nanjing, which

was a transitional facies between Meishan and Chaohu.

Mid-symposium excursion: Permian-Triassic boundary and Lower Triassic sequence in Chaohu City, Anhui Province. The proposed GSSP of the Induan-Olenekian boundary at the West Pingdingshan Section.

Post-symposium excursions: 1. Permian-Triassic boundary sequences across marine and continental facies in Central-Western Guizhou Province, including the Zhejue Section, proposed as a candidate of the terrestrial Permian-Triassic boundary stratotype; the field museum of the Guanling Fauna, which is a Ladinian-Carnian fossil assemblage typically composed of well-preserved marine reptiles and crinoids. 2. Permian-Triassic boundary and a Lower-Middle Triassic boundary sequence on the Great Bank of Guizhou in Southern Guizhou Province; end-Permian extinction and pattern of biotic recovery in shallow- and deep-marine facies of an isolated carbonate platform, the Great Bank of Guizhou, in southern Guizhou province; chronostratigraphically constrained Permian through Ladinian section with dated volcanic ash horizons bracketing the Olenekian-Anisian boundary. 3. Combination of 1 and 2.

The Induan-**Olenekian** boundary and substage division of the Lower Triassic will be focus of the Wuhan meeting. This will be a forum for presentation of biostratigraphic results from China, Spiti, and North America. Chemostratigraphic (stable isotopes) sampling is planned in Spiti for 2005. Anticipated presentation of Muth as an alternate GSSP candidate.

(2) Other GSSP projects in 2005

Compilation of the **Anisian** GSSP proposal for Desli Caira.

Further work on ammonoid and conodont material from the **Carnian** boundary sections in Spiti and particularly Nevada.

Synthesis of Carnian-**Norian** boundary data from Black Bear Ridge, BC and description of new conodont and bivalve taxa and zonation will be completed. Revision of relevant Tethyan platform conodonts has still to be completed for key sections in Sicily and Turkey.

Further work on Norian-**Rhaetian** sections in Austria and Nevada. Investigations will attempt to show how a worldwide distinct dinoflagellate change correlates to conodont, ammonoid, and radiolarian bioevents and to paleomagnetic and geochemical (stable isotope) profiles. New magneto-stratigraphic data from a 30m thick top-Norian to Rhaetian Tethyan pelagic limestone succession will be published in 2005.

9. BUDGET AND ICS COMPONENT FOR 2005

(values in \$ U.S.)

<i>Albertiana</i> - STS Newsletter production	1500
STS website enhancement	400
Support for Wuhan/ China meeting	1000
Support for Wellington/ NZ meeting	1000
General office expenses	100
TOTAL	4000

Potential funding sources outside IUGS

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

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

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 (2000-2004)

See Accomplishments in 2004 (above) for additional details.

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 member's research interests was published in *Albertiana* 26. Four new GSSP Task Group chairs were appointed.

Meetings/ workshops

- a. Field meeting in Tulcea, Dobrogea, Romania, 7-10 June, 2000. Prospective O-A boundary.
- b. International Symposium on the Global Stratotype of the Permian-Triassic boundary and the Paleozoic-Mesozoic events. Changxing, South China, August 2001
- c. International Conference in Oman: Permo-Triassic deposits: from shallow water to base of slope.
- d. Field workshop on Middle Triassic boundaries, Veszprum, Hungary, September, 2002.
- e. *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.
- f. *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.
- g. Field workshop in Spiti, India, 26th June-6th July 2004. Conodont workshop on the Ladinian-Carnian boundary.
- h. International Geological Congress, Florence, Italy, August 20-28, 2004. G22-06: *Triassic in Tethys Realm*; DWO-09: *Upper Triassic boundaries.*

Publications

- a. 8 issues of *Albertiana* (#24-31) were published in 2000 thru 2004. Each of these issues were made available for download from the web.
- b. Abstract volumes/ field guides prepared for meetings in Romania, Oman, Stuores, Felsőors, Vancouver, St Cristina, Spiti.

Task groups

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. A section in Chaohu, Anhui Province, China became the focus of intensive study. Ammonoid and conodonts biostratigraphy, magnetostratigraphy, and chemostratigraphy were undertaken. The FAD of the conodont *Neospathodus waageni* was identified as a potential GSSP datum, corresponding to the base of the *Flemingites-Euflemingites* ammonoid zone, and falling within a brief zone of normal magnetic polarity.

A field workshop was held at Desli Cairra, 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. Isotopic dates from about this boundary in the Nanpanjiang Basin in South China fixed this boundary at about 247 Ma.

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.

A field workshop in the Italian Dolomites focused on the section at Prati di Stuores, the subject of a formal **Ladinian-Carnian** boundary GSSP proposal in 1998. Fieldwork was carried out in two further regions of great relevance in Spiti and Nevada. Studies in Spiti have included four expeditions. A dedicated task group was established in 2001.

The task group on the **Carnian-Norian** boundary was established in 2001. Key sections in Canada, Sicily, Slovakia, Turkey, and Oman have been studied. Important magnetostratigraphic data was obtained and correlations to the Newark non-marine standard attempted. Conodont taxonomic issues were addressed in a Vancouver conodont workshop in 2003.

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 North America.

11. OBJECTIVES AND WORK PLAN FOR NEXT 5 YEARS (2004-2008)

Meeting/field workshop schedule with themes and anticipated results.

May 23-25, 2005. *Chronostratigraphy and Biotic Recovery. Wuhan, China.* Joint meeting with IGCP 467. See section 8, Workplan.

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

Theme: Southern high latitudes Triassic correlations and trans-Panthalassan correlation.

Schedule: March 13-19: Pre-conference excursion 1. Northland and Auckland to Wellington via west coast Triassic localities (1A) or via central North Island volcanic and geothermal areas (1B)

March 19: Conference registration and ice-breaker

March 20-21, 23-24: Conference symposia and general sessions

March 22: Mid-conference Excursion 2. Wellington south coast

March 24-29: Post-conference Excursions 3, 4 and 5. Marlborough-Canterbury, Canterbury-Southland, Nelson.

Provisional symposia: The conference will be arranged as a series of symposia, which will begin with plenary talks.

One of these will be on Triassic stratigraphy and biogeography

Pre-conference excursions: 1. Northland, March 13-16 (4 days). Permian-Triassic oceanic association of basalt, limestone, chert, and argillite (Waipapa Terrane), Permian-Triassic boundary succession. 2: Auckland-Taupo-Wellington (North Island), March 19-20 (3 days). Triassic-Jurassic oceanic association of pillow basalt, chert and argillite, Kawakawa Bay; 3. Auckland-Waitomo-Wellington, March 19-20 (3 days). Triassic-Jurassic oceanic association of pillow basalt, chert and argillite, Kawakawa Bay, followed by a western North Island excursion to examined late Triassic-earliest Jurassic volcanoclastic sections in Marakopa and Awakino areas (Murihiku Terrane).

Mid-conference excursions: Wellington south coast, March 22. Late Triassic accretionary wedge and associated oceanic sediments (Torlesse Rakaia Terrane) exposed along the Cook Strait coast. Leader:

Post-conference excursions: 1. Marlborough-south Canterbury (South Island), March 24-28. Ferry; 2 Southland (South Island), March 23-28. Early-Late Triassic neritic sequence in Southland Syncline along Otago coast (Kaka Point to Nugget Point) and inland in the Hokonui, Taringatura and Wairaki Hills (Murihiku Terrane; 3. Nelson (South Island). Poorly fossiliferous Early Triassic Maitai Group exposed in river sections near Nelson city and on D'Urville Island.

Latest August-earliest September 2006. *The Boreal Triassic.* Longyearbyen, Svalbard, Arctic Norway. Joint meeting with IGCP 467.

Theme: Northern high latitudes Triassic correlations and boundary recognition.

Location: The UNIS (University studies on Svalbard) Institute has agreed to host the meeting, and an on-ship excursion is planned.

Publications: Conference abstracts will likely be produced as an *Abstracts and Proceedings of the Geological Society of Norway* series. A proceedings volume in *Polar Research* is possible.

Excursions: ship based one day excursion to the famous Festningen section displaying the entire Triassic succession in sea-shore cliffs for all conference participants. Possibly a two days excursion to view some eastern developments of the succession in two localities, and optional helicopter based, non-coastal areas of Svalbard.

May, 2007. *The Global Triassic.* Albuquerque, New Mexico, USA.

Publication of the symposia proceedings, a volume on the Triassic timescale funded by New Mexico Museum of Natural History.

**APPENDIX [Names and Addresses of Current Officers and Voting Members, 2004-2008]
SUBCOMMISSION ON TRIASSIC STRATIGRAPHY**

Subcommission officers

Chairman: M. J. Orchard, Geological Survey of Canada, 101-605 Robson Street, Vancouver, B.C. V6B 5J3, Canada, e-mail: morchard@nrcan.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.
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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@nrcan.gc.ca

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

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International Commission on Stratigraphy Subcommission on Permian Stratigraphy

ANNUAL REPORT 2004

1. TITLE OF CONSTITUENT BODY

International Subcommission on Permian Stratigraphy (SPS)

Submitted by:

Charles M. Henderson, Chairman SPS

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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 GSSPs, 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 GSSPs 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. These three executive positions are new as of the IGC meeting in Florence in August 2004. 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), and on the base-Lopingian boundary (base-Wuchiapingian Stage) have been disbanded on the successful establishment of their defining GSSP's and ratification by IUGS. The current working groups include the following: 1. Cisuralian stages, 2. base-Changhsingian Stage, 3.

Continental Permian, 4. Transitional biotas as gateways for global correlation, and 5. Neotethys, Palaeotethys, and S. China intraplateform basin correlation. The Subcommittee also supports a special project titled “The Permian: from glaciation to global warming and mass extinction”.

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

SPS website is located at <http://pri.boisestate.edu/Permophiles/>. This site includes numerous back issues of *Permophiles* in downloadable PDF format. A link to *Permophiles* and 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, which is an NSF funded initiative. Bruce Wardlaw (SPS Past-Chairman) is concentrating on the Permian-Triassic Time Slice Project and the development of improved taxonomic dictionaries, database sharing and manipulation associated with this CHRONOS project and PALEOSTRAT.

SPS is active with IGCP Project 359: Correlation of Tethyan Circum-Pacific and marginal Gondwanan Permian-Triassic and the Permian Research Group of SE Asia. SPS is also involved in 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. SPS is also co-sponsoring meetings on *Triassic Chronostratigraphy and Biotic Recovery* in Chaohu, China in May 2005 and on the *Nonmarine Permian* in Albuquerque, New Mexico in October 2005.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2004

GSSP's: The proposal for the base-**Lopingian** (base-Wuchiapingian) was ratified by ICS and IUGS in 2004. The proposal for the base-**Changhsingian** was voted and ratified by SPS in 2004 and will be distributed at the beginning of 2005 to ICS for voting.

Publications: The December 2003 issue of *Permophiles* (#43) was produced at Reston, Virginia in February 2004 and distributed to a mailing list of 280 from the University of Calgary later in the year. The June/December 2004 issue of *Permophiles* (#44) was produced at Pend Oreille, Idaho during October 2004 and was distributed in December 2004 from the University of Calgary.

Meetings: The SPS conducted its annual business meeting at the IGC meeting in Florence, Italy on August 23, 2004 with 23 people in attendance. This business meeting was preceded by a session on “*The Lower Permian Cisuralian Stages*” co-chaired by Boris Chuvashov and Charles Henderson. This was a successful session with six oral presentations and several posters that demonstrated clear progress in the definitions for the Cisuralian stages. Abstracts for these papers appear in *Permophiles* issue #44.

Membership: During the past year the voting membership of SPS has seen considerable renewal. We have a completely new executive (see Section 3 above) and six new voting members. In order to allow this renewal, a few members were asked to retire their voting status. The SPS executive has decided to name a new membership category, Honorary Members, to reflect

the significant past and continuing contributions of these retiring voting members. The first Honorary Members are Professors Brian Glenister, Heinz Kozur, and Claude Spinosa. 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 comments of Honorary Members will be included in subsequent versions of the proposal.

6. CHIEF PROBLEMS ENCOUNTERED IN 2004

There were no major problems in 2004. Only one issue of *Permophiles* was produced in 2004 partly as a result of the turnover of the executive and partly as a cost-reduction measure because expenses have exceeded income on the past few issues. Two issues will be produced in 2005 and reduced costs will be achieved by sending some of these as PDFs; paper issues will continue to be mailed to those individuals and institutions that have so requested.

7. SUMMARY OF EXPENDITURES IN 2004 (ANTICIPATED THROUGH MARCH 2005): INCOME

Donations:	\$ 500
University of Calgary support:	\$3,500
U.S. Geol. Survey support:	\$2,000
ICS:	\$1,000

TOTAL: \$7,000 (quoted in US\$ using .84 as the conversion from Canadian\$)

EXPENDITURES:

Printing and Mailing of <i>Permophiles</i> :	\$1,850
Travel support for <i>Permophiles</i> Production:	\$1,200
Support for travel for SPS sponsored international meetings and fieldwork:	\$4,350

TOTAL: \$7,400 (quoted in US\$ using .84 as the conversion from Canadian\$)

BALANCE: -\$400

8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2005):

1. Ratification by ICS and IUGS on the base-**Changhsingian** GSSP.
2. Votes by Cisuralian Working Group on base-**Sakmarian** and base-**Kungurian** GSSPs.
3. Completion of proposal by Cisuralian Working Group on base-**Artinskian** GSSP.
4. Possible working group excursion to Cisuralian GSSP localities in either 2005 or 2006.
5. SPS vote on base-**Sakmarian** GSSP.
6. Production of two issues of *Permophiles* (#45 and #46 in June and December 2005).
7. Participation in the *Triassic Chronostratigraphy and Biotic Recovery* meeting in Chaohu, China, May 23-25, 2005.
8. Participation and annual business meeting at the *Non-marine Permian* meeting in Albuquerque, New Mexico, Oct. 21-29, 2005.

9. BUDGET AND ICS COMPONENT FOR 2005

Cisuralian Working Group Field Excursion	\$3,000
Cisuralian GSSP production and dispersal	\$ 500
Annual Business Meeting, Albuquerque	\$2,500
SPS Participation at Chaohu, China	\$2,100
<i>Permophiles</i> printing and postage	\$1,900
<i>Permophiles</i> travel (will coincide with 2 meetings above)	\$ 0
TOTAL 2005 BUDGET	\$10,000

Support from University of Calgary (Henderson)	\$3,500
Support from NSF China (Shen)	\$1,500
Anticipated donations from <i>Permophiles</i>	\$ 600
TOTAL BUDGET REQUEST (ICS)	\$1,400

10. REVIEW CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2000-2004)

The SPS has approved the general divisions of the Permian and has now had 5 GSSPs ratified by ICS and IUGS (Asselian, Roadian, Wordian, Capitanian, Wuchiapingian). A 6th GSSP (base-Changhsingian) was voted 94% in favor during the summer of 2004 by SPS voting members and will be distributed to ICS during late 2004. Support for documentation (fieldwork and publications) of the various chronostratigraphic methods for the establishment of the GSSPs has been the most outstanding and differentiating character of this Subcommittee. *Permophiles* has become an internationally respected newsletter and bears an ISSN designation (1684-5927) and is deposited in the National Library of Canada. See Accomplishments in 2004 (above) for additional details.

11. OBJECTIVES AND WORK PLAN FOR NEXT 5 YEARS (2004-2008)

The primary objective is to complete the GSSP process by 2008. We currently anticipate that the last three GSSPs (Sakmarian, Artinskian, and Kungurian) should be ratified by 2006 or early 2007.

1. A vote by SPS on the **Sakmarian** proposal will be conducted during 2005.
2. A vote by SPS on the **Kungurian** should be ready for early 2006.
3. A vote by SPS on the **Artinskian** is anticipated during late 2006.

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

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 [Names and Addresses of Current Officers and Voting Members, 2004-2008]
SUBCOMMISSION ON PERMIAN STRATIGRAPHY**

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Prof. Claude Spinosa
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List of Working Groups and their officers

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



**International Commission on Stratigraphy
Subcommission on Carboniferous Stratigraphy**

ANNUAL REPORT 2004

1. TITLE OF CONSTITUENT BODY

Subcommission on Carboniferous Stratigraphy (SCCS)

Submitted by:

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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 subdivides the Carboniferous into two subsystems, the Mississippian Subsystem below and the Pennsylvanian Subsystem above.

The immediate goal is now to coordinate and further refine biostratigraphic correlation and to select the best stage and series 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 pan-tropical standard succession.

3. ORGANIZATION

Officers for 2004-2008:

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

WEB address for Subcommission: {The SCCS currently 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).

Task Group to establish the Visean-Serpukhovian Boundary [which is also the base of the Upper Mississippian Series], chaired by Barry Richards (Canada).

Task Group to establish the Bashkirian-Moscovian Boundary [which is also the base of the Middle Pennsylvanian Series], chaired by John Groves (USA).

Task Group to establish the Moscovian-Kasimovian Boundary [which is also the base of the Upper Pennsylvanian Series], chaired by Elisa Villa (Spain). This group is also dealing with the *Kasimovian-Gzhelian Boundary* within the Upper Pennsylvanian Series.

Project Group on Upper Palaeozoic boreal biota. Stratigraphy and biogeography, chaired by Marina Durante (Russia).

Project Group on Carboniferous magnetostratigraphy, newly organized and chaired by Mark Hounslow (Britain), who summarized the current status and prospects of magnetostratigraphy in the Carboniferous in this year's *Carboniferous Newsletter* [v. 22, p. 35-41]. It currently has 7 members.

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 be cooperating soon with the new Chronos initiative, which is in the process of being established, with a website at www.chronos.org.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2004

Newsletter on Carboniferous Stratigraphy, Volume 22, published in July 2004. Its 70 pages include commentary by the Chair on various current issues, reports of the task groups for 2003 [all containing much informative detail], and 9 articles on various topics of interest, including: Updated chart of 400-ky cyclothem groupings in midcontinent North America; Stratigraphic distribution of critical ammonoids around a potential level for the Kasimovian-Gzhelian Stage boundary; Report of the 2004 meeting of the German Subcommission on Carboniferous Stratigraphy; Carboniferous biostratigraphy of the Moscow Syncline; Review and future prospects of Carboniferous magnetostratigraphy; Lower Desmoinesian (mid-Moscovian) conodont succession in lower and middle Cherokee Group in southern midcontinent North America; Paleophytogeography and stratigraphy of Mississippian plant-bearing deposits of Angaraland; Stratigraphic potential of stigmairian limestones of the Moscow coal basin; North American regional stage nomenclature across the Carboniferous-Permian boundary. As usual, it provides a significant outlet for timely presentation and discussion of useful information relating to boundary selection.

Summary of Task Group Reports

The **Task Group to establish the Tournaisian-Viséan boundary** voted without dissent to approve the GSSP at Pengchong in south China, and is in the final stages of submitting a GSSP proposal to the SCCS. This formal proposal has been delayed by the request from SCCS chair Heckel to elaborate the short section on global correlation that appeared in the *Episodes* article authored by members of the task group (Devuyst et al., 2003). The elaboration achieved so far is included in the full report of the task group, which appears below in Appendix B. Although there are very few critical species of any fossil group that are present in both North America and Eurasia, the overall appearances of faunas suggest placement of the T-V boundary near the top of the Burlington Limestone in the middle of the regional Osagean Stage in North America. Attempts at utilizing chemostratigraphy have not yet borne fruit. Paleomagnetic sampling at Pengchong showed no preservation of original signal. Stable carbon and oxygen isotope sampling there showed no discernible change at the T-V boundary, but subtle isotopic signals in sections across the well-correlated boundary in Western Europe show potential promise for boundary characterization that may be useful elsewhere.

The **Task Group to establish the Viséan-Serpukhovian boundary** confirmed the disconformable nature of the basal contact of the type Serpukhovian section near Serpukhov in the Moscow Basin, rendering it inappropriate for a GSSP. Further studies of the proposed foraminifer lineages involving "*Millerella*" *tortula* have strongly suggested that the first appearance of "*M.*" *tortula* is not desirable as a global boundary marker. Current consensus in the task group is that the first evolutionary appearance of the conodont *Lochriea zieglerei* in the lineage *Lochriea nodosa* - *Lochriea zieglerei* may present the best potential for boundary definition near the middle of the Brigantian Substage, slightly below the current base of the Serpukhovian. This taxon is currently known at several sections in Europe and has recently been identified in a long section near Luodian in southern China. However, it is not yet known in the Americas. Field work has been started on sections spanning the boundary in Utah and the Canadian Rockies by task group chair Barry Richards and member Alan Titus, in order to document conodont and ammonoid faunas and stable carbon and oxygen isotope signatures that might be useful in identifying the boundary. Full text of the task group report appears in Appendix B.

The **Task Group to establish the Bashkirian-Moscovian boundary** has added 3 new Spanish members who have received government funding to work on this boundary in the Cantabrian Mountains. Following task group chair John Grove's request for formal proposals for boundary-defining datums, member Tamara Nemyrovska coordinated a proposal that identifies three independent conodont events as potential datums: 1) the evolutionary origin of *Declinogathodus donetzianus* from *D. marginodosus*; 2) the evolutionary origin of *Idiognathoides postsulcatus* from *I. sulcatus*; and 3) the transition from early to late forms of *Neognathodus nataliae*. It has become clear that none of the previously discussed four foraminiferal lineages has as much correlation potential as the conodont lineages, because three of them are known only in Eurasia, and the fourth displays demonstrable diachroneity in appearances in Eurasia and North America. Full text of the task group report appears in Appendix B.

The **Task Group to establish the Moscovian-Kasimovian and Kasimovian-Gzhelian boundaries** met in Oviedo, Spain, in August 2004 with 12 members in attendance. Full text of the task group report appears in Appendix B below.

For the **M-K boundary**, attention is focused on two separate levels, both involving conodonts in all regions and fusulines in Eurasia. **One level** is near the current boundary and involves the appearance of the conodonts “*Streptognathodus*” *subexcelsus* and *Swadelina neoshoensis*, along with the appearance of typical species (exhibiting distinct wall porosity) of the fusuline genus *Protriticites*. Problems include the abrupt appearance of the conodonts above a subaerial disconformity, their spotty appearances in the different sections, and the dependence of the defining features within the fusuline lineage on facies and preservation. **The other level** is somewhat above the current boundary and involves the appearance of the conodont *Idiognathodus sagittalis* in all regions in conjunction with the appearance of the fusuline *Montiparus* in most regions. Problems include characterization of the morphological range of *I. sagittalis*, and its apparent first appearance at different levels in some sections because of facies.

For the **K-G boundary**, attention is focused on one level close to the current boundary, which involves both a conodont and fusuline species and is consistent with the traditional ammonoid definition. The conodont *Idiognathodus simulator* [*sensu stricto*] appears in midcontinent North America, the Moscow and Donets Basins, and the southern Urals. It appears in the Moscow Basin with the fusuline *Rauserites rossicus*, which is also known from many localities in Eurasia. In Texas, *I. simulator* appears with the earliest and most primitive representatives the ammonoid genera *Shumardites* [*S. cuyleri*], and *Vidrioceras* [*V. uddeni*], which mark the base of the ammonoid genozone that has traditionally defined the base of the Gzhelian Stage among ammonoid-bearing successions. Its taxonomic characterization and distinction from its ancestor *I. aff. simulator* is currently underway by task group member Jim Barrick.

The SCCS had no formal functions at the IGC in Florence because of the intensive activities at the International Carboniferous Congress held in Utrecht in the previous summer of 2003. SCCS Chair Phil Heckel presented two papers at the IGC in Florence, one on the newly ratified series subdivision of the Carboniferous System reported last year, and the other on attempts to calibrate U.S. Pennsylvanian radiometric dates by means of glacio-eustatic cyclothem groupings, both of them at a symposium organized by ICS Chair Felix Gradstein.

6. CHIEF PROBLEMS ENCOUNTERED IN 2004

No administrative problems were encountered in 2004.

However, at the scientific level, it is becoming increasingly apparent that for the three lower stage boundaries under consideration [T-V, V-S, B-M], endemism of conodont and foram lineages between Eurasia and North America is seriously hampering the potential for global correlation. This in turn, is hampering the choice of the boundary level, and ultimately the submittal of a well-researched GSSP to the SCCS and ICS. This issue has delayed the T-V boundary GSSP, for which the event level has been selected for some time. In the case of the higher two boundary levels [M-K, K-G], there are some conodont species in common between the regions, but the strong glacial-eustatic control over sedimentation that resulted in widespread disconformities across entire shelves at this time is hampering the selection of acceptable GSSPs, even while it is aiding in the correlation of the beds across the potential boundaries based on the different scales of the eustatic inundations.

7. SUMMARY OF EXPENDITURES IN 2004 (ANTICIPATED THROUGH MARCH 2005):

STATEMENT OF OPERATING ACCOUNTS FOR 2003/2004

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

INCOME (Oct. 31, 2003 – Oct. 31, 2004)

IUGS-ICS Grant 2004	\$900.00
Donations from Members	628.72
Interest	<u>4.17</u>
TOTAL INCOME	\$1532.89

EXPENDITURE

Newsletter 22 (printing)	\$665.60
Postage for bulk mailings	683.00
Mailing/Office Supplies	146.04
Bank Charges	<u>148.00</u>
TOTAL EXPENDITURE	\$1642.64

BALANCE SHEET (2003 – 2004)

Funds carried forward from 2002 – 2003	\$1864.49
PLUS Income 2003 – 2004	1532.89
LESS Expenditure 2003 – 2004	<u>-1642.64</u>
CREDIT balance carried forward to 2005	\$1754.74

8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2005):

As a result of activity subsequent to the August 2003 Carboniferous Congress in Utrecht, the following activities are planned in the task groups [distilled from the task group reports in # 5 above, for which the full texts appear in Appendix B]:

Tournaisian-Visean boundary. Additional information that the SCCS Chair requested on global correlation of the proposed Pengchong GSSP beyond that which appeared in the 2003 *Episodes* article was published in the Carboniferous Newsletter and further elaborated in the full task group report in Appendix B below. This task group has now voted approval of the GSSP internally, and plans soon to submit the proposal to the SCCS for a vote, which then will forward it on to the ICS for ratification in 2005.

Visean-Serpukhovian boundary. After further work since the Utrecht meeting eliminated the foram lineage from serious consideration, focus is now on a conodont lineage, which, however is not yet known in the Americas. Field work initiated in Utah and the Canadian Rockies by two members will continue this coming year on conodont and ammonoid faunas and stable isotope samples, with the hope of better characterizing the section spanning this boundary in North America.

Bashkirian-Moscovian boundary. After further work since the Utrecht meeting eliminated the several previously discussed foram lineages from serious consideration, attention is now focused on

three conodont lineages. The task group chair has asked for further discussion and refinement of the three proposals for boundary-defining events and suggestions for GSSPs in 2005.

Moscovian-Kasimovian boundary. As a result of the 2004 Oviedo meeting, attention is now focused on two possible boundary levels, each with appearances of conodont taxa and fusuline taxa that may provide boundary-defining events and supporting evidence, respectively, but both have problems outlined above and in Appendix B. To help resolve these problems, member Heckel is constructing a correlation chart across the boundary interval based on matching scales of the glacial-eustatic cyclothem that are identified in several regions of the world, as well as on biostratigraphic events. Russian members will process the samples they collected across the boundary at Danskaya Luka, a new section in southern Russia, earlier this year. All workers will present detailed measured sections of critical exposures, and conodont specialists will better characterize the critical taxa for a task group meeting planned for St. Petersburg, Russia, in August 2005.

Kasimovian-Gzhelian boundary. There is a strong consensus emerging that the conodont lineage *Idiognathodus* aff. *simulator*—*I. simulator*[*sensu stricto*] provides excellent potential for a boundary-defining event that is consistent with both the working ammonoid definition of this boundary and apparently also with the first appearance of an abundant fusuline species in the Moscow region. Taxonomic work on this conodont lineage and on the succession of fusuline appearances in the Donets Basin are planned for presentation at the St. Petersburg task group meeting in August 2005.

Much of the work that is ongoing in all task groups as a result of the 2003 Utrecht Congress and the 2004 Oviedo meeting [for the two higher boundaries] will be published in the Task Group reports in Volume 23 of the *Newsletter on Carboniferous Stratigraphy* in July 2005.

9. BUDGET AND ICS COMPONENT FOR 2005

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	\$200**
Bank charges for international account	\$200
TOTAL PROJECTED EXPENSES	\$2600

INCOME

Carryover (from CREDIT balance in section # 7 above)*** [\$480***]	\$1755
Estimated donations [pace this year is well behind that of last year]	\$300
TOTAL INCOME	\$2055

BALANCE

Estimated deficit from above***	[((\$1820)***)]	(\$545)
BUDGET REQUEST FROM ICS for 2005		\$1200

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

**This estimate is higher than last year because the system of bulk mailing to certain members overseas [who then distribute the Newsletters to members in their areas] broke down in some areas,

based on reports of non-receipt. Therefore, more copies were mailed individually this year, with much better results.

***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], the deficit would have been \$1820 under ordinary circumstances. Therefore I am requesting more than what might appear necessary in order to accommodate anticipated Newsletter expenses for future years, as the carryover has been diminishing steadily from year to year, since the one-time-only contributions.

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. Although last year's donations were greater than in the previous years, the Secretary reports that the pace of donations since the books closed this year is much less than at the same time last year.

10. REVIEW CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2000-2004)

This summary is updated from the information provided last year, and from the task group reports published in the Newsletter on Carboniferous Stratigraphy, which were updated in early November. *See Accomplishments in 2004 (above) for additional details. [Also see the full texts of the task group reports in Appendix B below]*

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. Implicit in this vote was the acceptance of the stage names used in Russia as the global stage names for the Carboniferous, and so the Carboniferous now has all its global series and stage names in place, and all effort can be focused on selecting events and GSSPs for stage boundaries.

Work on the **Tournaisian-Visean boundary** in the lower part of the Mississippian Subsystem was reported in 1997, 2000, and 2001 as well as in other publications mentioned in the 2002 report of this working group. These efforts 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 has been published in the 2004 *Carboniferous Newsletter* [v. 22, p. 8-11], and is further updated and summarized in the full text of this task group report in Appendix B below. The task group voted unanimously to approve the Pengchong GSSP in southern China in 2004.

The status of current work was uncertain on the next higher boundary in the Mississippian, for which project groups were approved in 1995 and 1999. Since an informative article in the 1997 *Carboniferous Newsletter* [v.15, p. 19-22], official reports in the 1999 and 2000 *Carboniferous Newsletters* [v. 17, p. 6; v. 18, p. 7] were brief, and I received no report from the project groups' Chair in either late 2000 or 2001. As a result, in 2002, we established a new Task Group on a Boundary close to the existing **Visean-Serpukhovian Boundary** under the leadership of a new Chair [Barry Richards], for which membership was selected and work 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 has focused most attention on one conodont lineage for further work, particularly in regions where the succession is poorly known.

Work on characterization and subdivision of the type **Bashkirian** [the lower stage of the Pennsylvanian Subsystem] in the southern Urals was reported from 1997 through 2001 by a Project Group. Russian workers made illustrated verbal presentations on their most recent progress at the September 2001 SCCS meeting in St. Louis, and some of this work was published as separate articles in the 2001 Newsletter. In 2002, we established a Task Group on a Boundary close to the existing **Bashkirian-Moscovian Boundary** under the leadership of a new Chair [John Groves], for which membership was selected and work 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 suggests that only two conodont lineages are viable, and work is now being concentrated on them. Three new Spanish members who have received funding for work on this boundary in the Cantabrian Mountains have now been added to this task group.

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, and Spain again in 2004. Fusuline workers have recognized that problems of provincialism in much of the Kasimovian part of the succession in Eurasia probably 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**. A conodont lineage is now being worked up to define the **Kasimovian-Gzhelian boundary**, which appears to have met with general consensus. Correlation charts based on the scale of glacio-eustatic inundations as well as biostratigraphic events are being constructed for the successions across both boundaries in order to clarify which events are more globally correlatable.

Radiometric dating throughout the Carboniferous, most of it published in detail elsewhere, has been 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 has 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. Radiometric dating is now in progress on ash beds from conodont-bearing intervals in the Pennsylvanian-Permian succession in the south Urals, but no new information has been received since 2003. Most recently, a volunteered project group [with 7 members so far] was formed in 2004 to research the potential for identifying correlatable magnetostratigraphic events in the Carboniferous.

11. OBJECTIVES AND WORK PLAN FOR NEXT 5 YEARS (2004-2008)

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 GSSP 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 within the next year, now that the faunal definition has been approved, and the proposal for the GSSP that was published in the June 2003 issue of *Episodes* has been supplemented by more information on correlating the boundary into areas where the defining taxa are not present.

The Visean-Serpukhovian Boundary Task Group utilized the 2003 Utrecht Congress meeting to narrow attention to only a few conodont and foram lineages, and further discussion has focused study onto the most promising conodont lineage, which, like all the others, is not yet known in North America. New field work being initiated in the western U.S. and Canada across this boundary interval in order to identify conodont and ammonoid faunas along with possible stable carbon and oxygen isotope signatures, suggests that 2008 is still a realistic goal.

The new Bashkirian-Moscovian Boundary Task Group utilized the 2003 Utrecht Congress meeting to narrow attention to several conodont and foram lineages for further study. The Chair's 2003 request for formal boundary-defining proposals by April 2004 resulted in three potentially useful conodont lineages for further study, but greater endemism prevented any foram lineages from being proposed. Addition of three new Spanish members who have received funding for work on this boundary succession in Spain will hopefully promote progress toward defining a boundary GSSP by 2008.

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 correlation charts based on scale of glacio-eustatic cyclothems 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] will increase the potential for selecting the events that can be identified in as many of the most complete successions of this age as possible [such as also in the southern Urals and northern Spain, where cyclothems are not yet identified]. Apparent consensus suggests that the event for the K-G boundary may be selected in 2005, but the event for the M-K boundary still needs to achieve consensus. 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.

I am hopeful that ongoing work in chemostratigraphy and more recently, magnetostratigraphy, will identify events that can be used to at least supplement the boundaries that will be defined by means of faunal events, and eventually provide the basis for correlating these boundaries

into the northern-hemisphere Angara region and the southern-hemisphere Gondwana region, where the pan-tropical biotas are replaced by cold-climate endemic communities.

I am hopeful that new, more coordinated radiometric dating on biostratigraphically well constrained marine successions will narrow the age disparities that currently exist within much of the Carboniferous.

Meeting/field workshop schedule with themes and anticipated results.

The Moscovian-Kasimovian and Kasimovian-Gzhelian boundary task group will meet in St. Petersburg, Russia, in August 2005. I will encourage the other task groups to have field meetings as soon as good exposures containing the fossil lineages that are now being considered have been identified. Belgian colleagues have volunteered to host the 2005 Field Meeting in late May, in the Dinantian type region of the Tournaisian and Visean Stages.

The next International Carboniferous Congress is now scheduled for 2007 in Nanjing, China, at which I expect meetings of all task groups to take place. This congress will hopefully have field trips to good successions across as many of the as yet unselected stage boundaries as possible in China. This should enhance the global correlation of potential boundary-level events, and will 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 Addresses of Current Officers and Voting Members, 2004-2008*] SUBCOMMISSION ON CARBONIFEROUS STRATIGRAPHY

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APPENDIX B. [Full text of Task Group Reports of Carboniferous subcommission]

The **Task Group to establish the Tournaisian-Visean boundary**, chaired by George Sevastopulo, is now in the final stage of submitting an official proposal to the SCCS. The biostratigraphic criterion proposed by the group has been formally approved by the voting members of the SCCS in 2002 (Work, 2002). A summary publication has been published in Episodes in June 2003 for the International Congress on the Carboniferous and Permian in Utrecht (the Netherlands) where the group presented its results and conclusions (Sevastopulo et al., 2003; Hance & Devuyst, 2003; Devuyst & Hance, 2003). The Chairman of the SCCS, P. H. Heckel, requested additional information on the correlation of the GSSP with regions where the guide *E. simplex* was absent, essentially North America. Although this is a long-standing problem that cannot be solved without extensive research we are preparing a summary of the available data and research focusing on alternative methods of correlation. In the following report we present new results and research directions.

Macrofauna

The Pengchong section contains an exceptionally rich and diversified fauna of foraminifers and notably of *Eoparastaffella* and a relatively good fauna of conodonts but very few macrofossils (a few brachiopods and corals, see Devuyst et al., 2003). The situation is different in the Yajiao river section, which was located in another narrow basin nearby, in a probably more distal setting, or at least further away from an active platform sediments source than Pengchong (contrary to what was proposed in Hance et al., 1997). Indeed the Yajiao section is characterized by a higher ratio of background/allochthonous deposits and the reworked sediments were deposited in generally thinner beds with sedimentary structures typical of normal turbidity currents (Hance et al., 1997). The section contains a rich and very well preserved basinal conodont fauna and a good succession of archaetidiscids consistent with the conodonts and other foraminiferal guides. Conversely, the foraminifers and notably the *Eoparastaffella* fauna is poorer than in Pengchong for the Uppermost Tournaisian to Lowermost Visean (pre-Arundian) interval. However the section contains trilobite- and ammonoid-rich levels around the Tn-V boundary in an interval dominated by organic-rich shales, argillaceous dolomites and siliceous mudstones (Fig.1). Specimens have been collected in one of these levels (bed 71, Fig. 2) and sent to specialists for identification. In view of the first results a more detailed bed-by-bed sampling should be undertaken.

Relatively compressed negative casts of **ammonoids** are very abundant around bed 71 in the Yajiao section. Four specimens collected in January 2002 have been sent to D. M. Work who provided us with the following information: the four specimens belong to *Merocanites* sp. Incomplete preservation of the sutures (diagnostic V-shaped ventral lobe not visible on any of the specimens) and flattening prevent more detailed identification (the whorl cross section shape is a critical species-level character in *Merocanites*).

The same level (Yajiao, bed 71) yields relatively abundant fragments of **trilobites**. Four samples collected at the same time as the ammonoids have been sent to G. Hahn for study. The samples contain negative casts of 2 cranidia and of 3 pygidia belonging to *Liobole* (*Sulcubole*) n. sp. and *Liobole* (*Liobole*) n. sp (Hahn, G., in preparation). The species are not known in Europe and it is the first time that these genera have been recorded from China. *Liobole* is the index for the Erdbachian (*Pericyclus* Stage) and is typical of the Kulm facies of Central Europe and SW England.

Paleomagnetism

About 100 samples have been collected in the Pengchong section (with higher sampling density around the Tn-V boundary) for paleomagnetism but, unfortunately, no original signal is preserved.

Taxonomy and phylogeny of *Eoparastaffella*

On the basis of the literature (which concerns mainly the former SSSR) and of abundant material collected in various parts of Eurasia during the search for a new Tn-V boundary GSSP F.X. Devuyst and J. Kalvoda are currently reviewing the taxonomy of the genus *Eoparastaffella*. There is also still important work to be done outside the former SSSR where most of the research on *Eoparastaffella* was concentrated (in the 1950s to 1970s). Species that were originally described in the former SSSR and previously known only in their type-area have now been found in distant locations (eg. *Eoparastaffella fundata*, *interiecta*, *restricta*, *florigena*, *fabacea*, etc.). Unfortunately the biostratigraphic resolution of data from the former

SSSR is commonly poor, *Eoparastaffella* spp. being reported from broad horizons and assemblage zones. At present the regions investigated include Southern China, Northern Iran, the Czech Republic, Belgium and Ireland. Conodonts are being used as an independent control on correlation. Especially rich and diversified fauna of *Eoparastaffella*, which allow phylogenetic studies, have been recovered from the following sections: Pengchong (Guangxi, S. China), Daizhaimen (Yunnan, S. China), Mokra (Czech Republic), Rush-Lane (Eastern Ireland) and Oughterard (Western Ireland). One of the main conclusions of the ongoing study is that the genus is extremely diversified and that there is a great potential to use it for very fine biostratigraphy in the Tournaisian-Visean boundary interval. The abundant material collected from the above mentioned localities shows a considerable variability of the genus with progressive morphological transitions between species (e.g. *E. ovalis sensu* Vdovenko, 1964 – *E. simplex*, *E. rotunda* – *E. interiecta*, *E. interiecta* – *E. tummida*, etc.). A species which appears to be of particular biostratigraphic interest and which was poorly known until recently is *E. interiecta*. It has now been found to be well represented in the Czech Republic and Ireland (East and West coasts) and present in Northern Iran and Southern China. It appears in the latest Tournaisian (upper *anchoralis* zone) among the first *Eoparastaffella* and is therefore an useful marker (Kalvoda & Devuyst, in preparation). The taxonomy of the stratigraphically important species *ovalis* is also under revision.

Biometry

A new biometric coefficient to characterize the shape of an *Eoparastaffella* specimen in axial section and therefore the morphological evolution of the genus at the Tn-V transition has been developed (for the reasons explained in Devuyst et al., 2003) and has been tested extensively and gives good results (Devuyst & Hance, 2003). It is based on a few simple measurements that can be taken on published plates. It combines a measure of the angularity of the last whorl (diagnostic criterion in *Eoparastaffella*), of the sphericity of the test, and of the depth of the umbilicus. It is useful not only to locate the entry of Visean sub-angular forms in a progressive morphological evolutionary lineage (Hance & Muchez, 1995; Hance, 1997; Devuyst et al., 2003) but also in taxonomic studies.

Foraminifer biozonation

The Lower Carboniferous foraminifer zonation of the type-Dinantian (Lower Carboniferous of the Franco-Belgian Basin) is being reviewed and updated by L. Hance and F.X. Devuyst. In the two main published zonations (Mamet, 1974; Conil et al., 1991), the Visean pattern is more satisfactory than the Tournaisian one, due to the worldwide development of shelf settings during the Lower Visean, which creates conditions more suitable for foraminifers over wide regions. Main problems in correlating the Belgian Tournaisian zones reflect discontinuous foraminiferal records, due to unfavourable environmental conditions in the lower ramp and basin (Dinant Sedimentation area) and to pervasive dolomitisation of the inner ramp (Condroz and Namur Sedimentation areas). Recent progresses in understanding the Belgian Dinantian sequence-stratigraphy (Hance et al., 2001, 2002) and the new data from Southern China modify former interpretations with strong implications on biostratigraphy. Improvements concern mainly the Upper Tournaisian and the Lower Visean. The new scheme allows better correlations between the classical Eurasian areas. It was presented at the ICCP in Utrecht (Hance & Devuyst, 2003) and will be published in the coming months.

Correlation with Laurentia

Correlating precisely the base of the Visean between Eurasia and the type-Mississippian region and indeed most of North-America has always proved extremely difficult because of endemism in most fossil groups. *Eoparastaffella* seems to be virtually absent from North America. *Eoparastaffella ovalis* and *E. simplex* have been reported from the Canadian Cordillera (Mamet, 1976; Mamet et al., 1986) but after examination of the original material we could not confirm the attribution even to the genus. These specimens most likely belong to *Eoendothyranopsis* which is a very abundant and widespread genus in North-America and much rarer in most of Eurasia. *Gnathodus homopunctatus*, which is a very useful conodont guide for the base of the Visean in Eurasia is virtually unknown from North-America. Other useful uppermost Tournaisian guides in Eurasia such as *Mestognathus praebeckmanni* and *M. beckmanni* are very rare. Conversely *Gnathodus texanus* which is the index species of the biozone of the same name is rarely recorded in Eurasia and poses problems of identification. According to most authors the Tn-V boundary occurs in the upper part of the Burlington Fm. of the Mississippi Valley (Austin et al., 1973; Lane & Ziegler,

1983; Brenckle, 1991; Work et al., 2000) based on conodonts. However this results in positioning the Tn-V boundary within the range of *Scaliognathus anchoralis* and of other taxa that are known only in the Tournaisian in Eurasia such as *Polygnathus communis communis* and *Eotaphrus burlingtonensis*. Indeed the conodont fauna typical of the upper part of the Burlington Fm. looks very similar to the well known upper Tournaisian assemblage of Eurasia.

Chemical and sequence stratigraphy

To try to resolve the problems of correlation between Eurasia and Laurentia, a research project has been set up (funded by the Irish Research Council for Science, Engineering and Technology) at Trinity College, Dublin to investigate the C stable isotope and sequence stratigraphic record of the Mississippian (Lower Carboniferous). Sections being investigated include the suspected position of the Tn-V boundary in North America and sections in Western Europe and Southern China where the historical and proposed new GSSP are located. To date, samples from close to the base of the carbonate section up to a horizon well above the proposed T/V boundary level at Pengchong have been analyzed for stable isotopes of carbon and oxygen (see below). The $\delta^{13}\text{C}$ curve is quite noisy but there is no discernible change at the Tn-V boundary and so it appears that carbon isotopes are unlikely to prove a useful tool in identifying this boundary elsewhere. The proposed boundary section at Pengchong was deposited in water probably too deep to show a sea level change signal. However shallower water sequences in western Europe do show subtle signals of change of sea water depth close to the Tn-V boundary. These are being studied to establish whether they represent global or local effects. It is hoped that sequence stratigraphy allied with biostratigraphy will lead to increased resolution of the correlation.

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The **Task Group to establish the Viséan-Serpukhovian boundary**, chaired by Barry Richards, held its first official meeting at the Carboniferous Workshop during the Utrecht Congress. Several short-term research goals were established, and initial progress was made on some of them. Attention was first focused on the Serpukhovian type section in the Zaborie quarry in the Moscow Basin, particularly the major depositional and biostratigraphic events recorded in the lower part. In this region the Serpukhovian disconformably overlies the uppermost Viséan (Venevian regional horizon) limestone interval containing paleosols and karstified limestone (Skompski et al., 1995). Since the Utrecht meeting, task group member Kabanov (2004) carefully restudied the type section, confirming the unconformable nature of the lower contact.

The task group concluded that the first evolutionary appearance of the conodont *Lochriea ziegleri* in the lineage *Lochriea nodosa* - *Lochriea ziegleri* currently presents the best potential for boundary definition. *L. ziegleri* appears near the middle of the Brigantian Substage, which is slightly below the current base of the Serpukhovian. The lineage, best documented from relatively deep-water sections, has been identified in several European sections (Nemirovskaya et al., 1994; Skompski et al., 1995). In addition, one of the task group, Qi Yu-ping, 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). In the Zaborie quarry section, *Lochriea ziegleri* appears with *Lochriea senckenbergica* in the basal bed (about 65 cm thick) of the type Serpukhovian (Nikolaeva et al., 2002), but this is not a first evolutionary appearance.

Because the *L. nodosa* - *L. ziegleri* lineage and other biostratigraphically important lineages within the *Lochriea* group have not been observed in the Americas, the conodont experts at the Utrecht meeting suggested that North American conodont collections be re-examined for key taxa within the group. The latter work has not been undertaken, but the recent work of team member Alan Titus on conodont assemblages in several sections of basinal facies in the Chainman Formation of western Utah and eastern Nevada suggests the recognition of the *L. nodosa* - *L. ziegleri* lineage in North America is unlikely. If we use the first evolutionary appearance of *L. ziegleri* for boundary definition, it will be necessary to use either geochemical data or other species (conodont, foraminifer or ammonoid) that appear concomitantly with the Eurasian *L. ziegleri* to achieve a precise correlation with North America. With this in mind, Alan Titus indicated that ammonoids could be used to facilitate a precise correlation between Eurasia and North America. Ammonoid-based geochronology is well developed near the level of the Viséan-Serpukhovian boundary because beds near the boundary contain numerous very distinct ammonoid morphotypes.

At the Utrecht meeting, it was proposed that the first evolutionary appearance of the foraminifer "*Millerella*" *tortula* might be used for either defining a GSSP near the current Viséan-Serpukhovian boundary or for assisting with global correlations near the boundary, if the controversy about the phylogeny of the species is favorably resolved. In the Zaborie section, "*Millerella*" *tortula* appears about 50 cm above the base of the Serpukhovian (Gibshman, 2001; Nikolaeva et al., 2002). Brenckle and Groves (1981) and Brenckle (1990) proposed that "*M.*" *tortula* Zeller evolved from *Endostaffella discoidea* and gave rise to "*M.*" *designata* and "*M.*" *advena/cooperi* later in the Chesterian. Gibshman (2001, 2003), however, proposed the lineage "*Endostaffella*" *asymmetrica* - "*Millerella*" *tortula* - *Millerella pressa*, based largely on specimens from the Zaborie quarry in Russia. Since the Utrecht meeting, task group member Paul Brenckle studied the two groups of specimens and concluded that the Russian "*M.*" *tortula* is not the same species as the one from North America. Even if the Russian and North American "*M.*" *tortula* were the same species,

there is no evidence of the Russian ancestral (pre-tortula) forms occurring in North America. The first appearance of "*M. tortula*" is, therefore, not desirable as a global boundary marker.

In October 2004, team members Titus and Richards examined several sections of the Chainman Formation in western Utah in search of ammonoid- and conodont-bearing sections that might permit an exact correlation with Eurasian sections preserving first appearances of *Lochriea zieglerei*. A well exposed upper Viséan to lower Serpukhovian (Asbian to Pendleian) section at Jensen Wash, Utah was considered to be the best in the region and plans have been made to study and sample that section in detail for ammonoids, conodonts and samples for stable isotope (carbon and oxygen) geochemistry. Carbonate ramp lithofacies of the upper Viséan and Serpukhovian Etherington Formation are being measured at five localities in the Canadian Rocky Mountains and sampled for conodonts, foraminifers and geochemistry. From the study of the Etherington sections, the working group hopes to better understand the carbon stable isotope signature of the Brigantian and Pendleian succession; in addition the work will provide another opportunity to look for the *L. nodosa* - *L. zieglerei* lineage.

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The **Task Group to establish the Bashkirian-Moscovian boundary**, chaired by John Groves, has added three new members, Drs. Luis C. Sanchez de Posada, Maria-Luisa Martinez, Carlos A. Mendez, and Rosa-Maria Rodriguez as collaborators with Elisa Villa. This team of Spanish researchers has received government funding to work on the Bashkirian-Moscovian transition in the Cantabrian Mountains.

The Task Group held its first meeting at the Utrecht Congress in August 2003. Seven members of our group along with SCCS Chairman Philip Heckel and several members of the Moscovian-Kasimovian boundary group attended the meeting. Discussion centered on developing a strategy for selecting a lower Moscovian GSSP by 2008. As an outgrowth of the Utrecht meeting, Task Group members were asked to submit formal proposals for boundary-defining datums by Spring 2004. Tamara Nemyrovska and other conodont specialists within the Task Group jointly prepared a detailed proposal that was submitted in early April. After editing and revision, the proposal was circulated throughout the entire Task Group for internal commentary. Task Group members have been asked to provide their comments no later than 30 October 2004.

Briefly, the document prepared by Nemyrovska et al. identifies three independent conodont events as potential boundary-defining datums: 1) the evolutionary origin of *Declinogathodus donetzianus* from *D. marginodosus*; 2) the evolutionary origin of *Idiognathoides postsulcatus* from *I. sulcatus*; and 3) the transition from early to late forms of *Neognathodus nataliae*. The proposal includes unambiguous taxonomic

characterizations of the potential marker taxa, documentation of their known stratigraphic and geographic occurrences, and co-occurrences of important auxiliary taxa from other biotic groups.

It appears likely that the eventual boundary-defining marker will be a conodont, as no other proposals were submitted. Earlier, in response to a survey that was circulated immediately after the formation of the Task Group, several events within fusulinoidean lineages were identified as occurring near the Bashkirian-Moscovian transition: 1) evolutionary changes within the *Profusulinella* phylogeny; 2) the evolutionary appearance of *Aljutovella* (from *Profusulinella*); 3) the evolutionary appearance of *Neostaffella* (from *Pseudostaffella*); and 4) the evolutionary appearance of *Eofusulina* (from *Verella*). It is clear, however, that none of these events possesses optimal global correlation potential. The genera *Aljutovella*, *Neostaffella* and *Eofusulina* are limited in their geographic distributions to Eurasia, with no known occurrences in subarctic North America or South America. The genus *Profusulinella* is more widespread, but its level of appearance in North and South America is demonstrably much younger than in Eurasia.

The **Task Group to establish the Moscovian-Kasimovian and Kasimovian-Gzhelian boundaries**, chaired by Elisa Villa, has continued studies on potential levels of correlation and fossil lineages within the interval from the upper Moscovian into the lower Gzhelian. In August 2004, this group held a general meeting at the University of Oviedo (Spain) that was attended by members A. Alekseev, V. Davydov, N. Goreva, P. Heckel, M. L. Martínez Chacón, C. Méndez, T. Nemyrovska, L. C. Posada, S. Remizova, R. M. Rodríguez, K. Ueno, and E. Villa. Discussions and workshops during this meeting have led to substantial progress in correlation that is summarized as follows:

Moscovian-Kasimovian boundary

The task group has established several paleontologic and stratigraphic links at different levels through sections in areas that are distributed worldwide. The paleontological links are mainly based on conodonts, but fusulines play an important subsidiary role. These paleontological links allow correlation of specific stratigraphic sequences. Two levels offer greater potential for correlation.

1) A distinct level of correlation is situated close to the present lower Kasimovian boundary in Eurasia and within the late Desmoinesian in North America. This level would be traced by combining the occurrence of two conodont species, "*Streptognathodus*" *subexcelsus* and *Swadelina neoshoensis*. However, the suitability of this level is hampered by the fact that in both the Midcontinent and the Moscow Basin it lies above a significant subaerial unconformity and biostratigraphic gap. Moreover, neither of the two conodont species mentioned appear in all relevant areas. The appearance of typical species of the fusuline genus *Protriticites* (forms exhibiting distinct wall porosity) takes place around this same boundary. These forms have been recorded in western USA and in all Eurasian areas. However, the recognition of the defining feature can greatly depend on facies and preservation.

2) A potential marker at the first appearance of *Idiognathodus sagittalis* (which would raise the base of the Kasimovian to a level somewhat higher than the present one) seems to be most promising, especially when considered in conjunction with the fusuline *Montiparus*. *I. sagittalis* has been identified in a number of areas, such as Donets Basin (limestone O1), Moscow Basin (Mid-Neuverovo Formation), Southern Urals (Dalniy Tyulkas section, beds 34-35), Cantabrian Mountains (Las Llacerias section, bed 9035), and American Midcontinent (Checkerboard-South Mound through Hertha to possibly Swope cyclothem). Problems to be resolved mainly concern the somewhat diachronic appearance of this taxon (due to facies constraints, *I. sagittalis* appears later in the Moscow Basin than in other areas). It is also necessary to clarify the status of specimens tentatively identified in several sections as *I. aff. sagittalis*.

The fusuline *Montiparus* can play a relevant role in reinforcing correlation at levels around the first appearance of *I. sagittalis*, since species belonging to this widely distributed Eurasian genus have been recently discovered also in western USA (Nevada). *Montiparus* is also present in the Arctic province, where fusuline assemblages show transitional features that can provide clues for linking Eurasian and North American provinces.

Kasimovian-Gzhelian boundary

The characterization of the lower Gzhelian boundary is based on the appearance of the conodont *Idiognathodus simulator* [*sensu stricto*] at a number of relevant Pennsylvanian sections in areas representing both the American and Eurasian paleobiogeographic provinces. This level is situated in the Oread cyclothem (Midcontinent), Finis Shale (Texas), Shumway cyclothem (Illinois Basin), Upper Rusavkino Formation (Moscow Basin), Bed 7 of Usolka section (Southern Urals), and O7 limestone (Donets Basin). This correlation is reinforced in Eurasia by the appearance of the fusuline *Rauserites rossicus* at the level of the first appearance of *I. simulator* in the Moscow Basin. This fusuline has also been reported from Samarskaya Luka and Trans-Volga region, Northern Timan, Timan-Pechora, North Greenland, Donets Basin, Urals, Carnic Alps, Northern Fergana, Darvas, and the Cantabrian Mountains. Therefore, *Rauserites rossicus* could become a tool of prime importance for correlation within Eurasia in conjunction with *I. simulator*. In North America, *I. simulator* appears with the earliest and most primitive representatives the ammonoid genera *Shumardites* [*S. cuyleri*], and *Vidrioceras* [*V. uddeni*] in the Finis Shale of Texas, above the appearances of their progenitors *Pseudaktubites stainbrooki* and *Eovidrioceras conlini*, respectively, in the next ammonoid-bearing level below, at the Missourian-Virgilian regional stage boundary (Boardman and Work, 2004). Because the base of the *Shumardites-Vidrioceras* Genozone has traditionally been used to define the base of the Gzhelian among ammonoid-bearing successions, this apparent coincidence of readily identifiable events within the three biostratigraphically useful groups, conodonts, fusulines and ammonoids, provides strong support for selection of a globally correlatable Kasimovian-Gzhelian boundary. Taxonomic characterization of *I. simulator* [*sensu stricto*] and its distinction from its ancestor *I. aff. simulator* is currently underway by task group member Jim Barrick.

Coming steps

During the meeting held in Oviedo, members of the Task Group agreed to further study lineages involved in the proposed markers and to sample in more detail certain critical intervals. Member Heckel is constructing correlation charts across the boundary intervals based on matching scales of the glacial-eustatic cyclothems that are identified in several regions as well as by biostratigraphic events. These efforts should lead to refined correlation and hopefully resolution of the existing problems. To continue discussions and laboratory workshops, the group will meet again during summer 2005 in St. Petersburg (Russia).

Reference

Boardman, D.R., and Work, D.M., 2004, Stratigraphic distribution of the ammonoids *Shumardites* and *Vidrioceras* and implications for the definition and correlation of the global Gzhelian Stage, Upper Pennsylvanian sSeries. Newsletter on Carboniferous Stratigraphy, v. 22, p. 23-27.



International Commission on Stratigraphy Subcommission on Devonian Stratigraphy

ANNUAL REPORT 2004

1. TITLE OF CONSTITUENT BODY

Subcommission on Devonian Stratigraphy (SDS)

Submitted by:

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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 2004

Meetings:

Devonian neritic-pelagic correlation, Meeting organized by the Institut Scientifique (Rabat, Morocco) and SDS, Rabat, March 1-10, 2004; SDS business meeting and field trip in the Dra Valley (Western Anti-Atlas).

32nd IGC Florence, General Symposia G - 22.03: *High-resolution stratigraphy for the subdivision of the Devonian stages* (23.08.04); 7 oral presentations and 8 posters.

32nd IGC Florence, SDS business meeting. During this meeting the discussions concerning the subdivision of the Emsian, Givetian, Frasnian and Famennian were finalized:

Results of IGC meeting in Florence.

Proposals were made for internationally agreed substage boundary levels within the Emsian, Givetian, Frasnian and Famennian. It was agreed that these boundary levels should have been recognized in different, geographically spread reference sections and belonging to different facies. The definition of a boundary level should be based on changes in different fossils groups, reference to Devonian events, reference to T-R cycles or subcycles and if possible, reference to geophysical or geochemical signals. Terminology for the substages is Lower, Middle, Upper and Uppermost.

Emsian: formal vote in favor of a two-fold subdivision based on a boundary level within the Duleje Event; the precise correlation between succession in the different faunal groups (brachiopods, conodonts, goniatites, dacryo-cancerids) is not well established; selection of reference sections needs further study.

Givetian: formal proposal for a three-fold subdivision; most guidelines for definition of the two boundary levels are fulfilled.

Frasnian: formal vote in favor of a three-fold subdivision; guidelines for definition of the two boundary levels are fulfilled.

Famennian: formal vote in favor of a four-fold subdivision; two formal valuable proposals have been made; however, they differ on the boundary level for the base of the Middle, Upper and Uppermost Famennian. The two proposals will be submitted in a ballot, early 2005.

Products

Newsletter n° 20.

Abstracts of oral presentations and posters. International Meeting on Stratigraphy - Devonian Neritic - Pelagic correlation and events (Rabat, March 1-10, 2004), Institut Scientifique, Rabat.

Field trip guidebook Devonian neritic- pelagic correlation and events in the Dra Valley (Western Anti-Atlas). Documents de l'Institut Scientifique, Rabat, 19: 100 pp. (can be downloaded from: www.israbat.ac.ma/Publications/IS/Doc19_04/sommaireWeb.htm.)

S. Gouwy & P. Bultynck (2003). Conodont based graphic correlation of the Middle Devonian of the Ardenne (Belgium) : implications for stratigraphy and construction of a regional composite. *Revista Espanola Micropaleontologica*, 35/3: 315-344.

S. Aboussalam (2004). Das "Taghanic- Event" im hoheren Mittel-Devon von West-Europa und Marokko. *Munstersche Forschungen zur Geologie und Paleontologie*, 97: 332 pp.

6. CHIEF PROBLEMS ENCOUNTERED IN 2004

None

7. SUMMARY OF EXPENDITURES IN 2004 (ANTICIPATED THROUGH MARCH 2005):

Income US\$

Balance 2003-March 2004	505.58
IUGS subvention May 2004-April 2005	1400.00
Special IUGS subvention Florence	<u>900.00</u>
Total	2805.58

Expenses

Financial support for attending Rabat meeting	450.00
Financial support for attending Florence meeting ,3 persons	250.00
	300.00
	430.00
Financial support for attending IGCP 499 meeting Göttingen	500.00
Secretary expenses	250.58
Newsletter 2004, n°20	400.00
Newsletter 2005, n°21 to be published early March 2005,part	206.00
Bank costs	<u>19.00</u>
Total	2805.58
<i>Balance</i>	<i>00.00</i>

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

Ballot on the final proposals concerning the subdivision of the Givetian, Frasnian and Famennian stages (see item 10) early 2005.

Short contribution in *Episodes* recommending the use of the substages approved by the ballot.

Three substantial manuscripts concerning the subdivision of the Givetian, Frasnian and Famennian will be submitted to *Geological Quarterly* (Polish Geological Institute) in September 2005.

The Geological Society agreed to publish the proceedings of the Rabat Meeting (March 2004) in their *Special Publications* Series. The volume will be dedicated to the late M. House (TH. Becker and B. Kirckgasser will be guest editors). The deadline for manuscripts was 01.12.2004.

Summer 2005, SDS business meeting in Novosibirsk and field trip to Salair and Altai Mountains organized by E.A. Yolkin and N. Izokh (Institute of Petroleum Geology, Siberian branch of RAS). SDS meeting in conjunction with IGCP project 499. The field trip is relevant to the correlation between inner and outer shelf deposits.

9. BUDGET AND ICS COMPONENT FOR 2005

<i>Balance from 2004</i>	<i>00.00</i>
Secretary expenses 250.00	
Supplement for Newsletter n° 21 (early March 2005)	190.00
Newsletter n° 22 to be published in December 2005	400.00
Support for attending Novosibirsk meeting	<u>1000.00</u>
Total	1840.00

10. CHIEF ACCOMPLISHMENTS OVER LAST FIVE YEARS (2000-2004)

See Accomplishments in 2004 (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.

11. OBJECTIVES AND WORK PLAN FOR NEXT 5 YEARS (2005-2009)

2005: *see item 8.*

2006: Annual Business Meeting in conjunction with ECOS IX which will take place in England. The secretary J. Marshall will organize a long outstanding field trip to the Devonian of the Old Red Continent which should enhance our understanding of cross facies and terrestrial correlations.

Participation in the 2nd International Palaeontological Congress in Beijing including a topical session " Devonian land sea interaction: evolution of ecosystems and climate"-IGCP 499. There will be also fieldtrips.

2007: North American SDS members will organize a symposium in Seattle, followed by a fieldtrip in the Interior Basin, with focus on Nevada.

2008: still open.

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
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Secretary: J. **Marshall**, School of Ocean and Earth Science, Univ. Southampton, Southampton Oceanography Centre, European Way, Southampton, SO14 3ZH, United Kingdom
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SDS Newsletter editor and **Webmaster**: Rex E. **Crick**, Department of Geology, UTA Box 19049, University of Texas at Arlington, TX USA 76019-0049,
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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. Streef, Belgium. *maurice.streef@ulg.ac.be*

List of Voting Members

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G. Young (Australia) *gyoung@geology.anu.edu.au*

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International Commission on Stratigraphy Subcommission on Silurian Stratigraphy

ANNUAL REPORT 2004

1. TITLE OF CONSTITUENT BODY

Subcommission on Silurian Stratigraphy

Submitted by:

Rong Jiayu, *Chairman, SSS*

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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 restudy of global stratotype sections.
- Correlation of Silurian 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

SSS is a Subcommission of the Commission on Stratigraphy.

Officers (chair, one vice-chair, secretary), voting members (15), and corresponding members (50). (*see Appendix for complete listing*)

Officers for 2004-2008:

Chair: Rong Jiayu, Nanjing, China.
 Vice-Chair: T. N. Koren', St. Petersburg, Russia.
 Secretary: M. J. Melchin, Antigonish, Canada (*ending Dec, 2004*)
 J. Verniers, Gent, Belgium (*beginning, Jan. 2005*)

Subcommission members 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. Current research activities and future plans are communicated through publication of an annual SSS newsletter *Silurian Times* in both hardcopy and as a web release.

The current web site for the Silurian Subcommission is:

<http://iago.stfx.ca/people/mmelchin/SILURIAN.HTML>

It contains a list of the SSS executive and access to recent issues of *Silurian Times* in pdf format.

A new site, which will be: <http://www.silurian.cn/home.asp>, will be available soon.

4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

Jointly with the **Subcommission on Ordovician Stratigraphy**.

- Co-sponsored meeting in Argentina and planning a joint meeting in Nanjing in 2007.
- Joint working group on the restudy of the Ordovician-Silurian Boundary.
- Collaboration on a IGCP Project entitled “*Ordovician Palaeogeography and Palaeoclimate*”.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2004

Election of five new titular members and a new secretary for the SSS (see full list of titular members and executive below).

The twelfth issue of *Silurian Times* - the official newsletter of the Silurian Subcommission (edited by Secretary Mike Melchin) is being circulated in December 2004 to all subcommission members, as well as a broad constituency of Silurian researchers around the world. This is the fourth year that the newsletter was produced as a world-wide web document and it forms the main part of a new WWW Site for the SSS. It is the second year that the documents was posted as an Adobe Acrobat PDF file, making it easier to download and print for SSS members.

A new web site is in the final stages of preparation for the SSS. It is being prepared by Fan Juanxuan and Zhao Hui at the Nanjing Institute of Geology and Palaeontology, under the direction of Rong Jiayu, SSS Chair. The web site will be: <http://www.silurian.cn/home.asp> and its format and design will follow closely those of the new site for the Ordovician Subcommission:

<http://www.ordovician.cn/home.asp>.

Planning is well under way for a Silurian Field Meeting in Gotland, Sweden August 15-22, 2005. Information pertaining to this meeting can be found at:

<http://www.geol.lu.se/events/silconf.htm>.

A final report of the restudy of the GSSP for the **Base of Silurian** is in preparation by Mike Melchin. This report will summarize the recent results of the working group to restudy this GSSP and recommend to the titular members of the SSS that they vote in favor of retaining the current

GSSP for this boundary, at Dob's Linn, Scotland, but that its biostratigraphic definition be revised. Once approved by the SSS membership this recommendation will be forwarded to ICS.

The working group to restudy the **Base of the Wenlock** is currently in the process of studying potential GSSP sections in the Czech Republic and Wales, as possible alternatives to the current GSSP in England. A report of this work will be made at the Silurian Field Meeting in Gotland, in August, 2005.

SSS Chair, Rong Jiayu, attended the ICS in Florence. He presented a report that summarized the activities of the SSS during the period of 2002-2004 (see above and item 10, below), and also a work plan for the period of 2005-2008 (see items 8 and 11 below).

6. CHIEF PROBLEMS ENCOUNTERED IN 2004

Delayed production of *Silurian Times* for 2004 due to other commitments on the part of the secretary. A new secretary is taking over for 2005.

7. SUMMARY OF EXPENDITURES IN 2004 (ANTICIPATED THROUGH MARCH 2005):

SSS Chair partial coverage of travel expenses to ICS in Florence: **\$900**

All costs associated with the production of *Silurian Times* are currently paid by St. Francis Xavier University, the host institution of the SSS secretary.

8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2005):

(1) Report paper on the restudy of the **Ordovician-Silurian boundary** by **January, 05**, by Mike Melchin.

Contents: History and background, move recent developments, more acritachs/chitinozoans information from Dob's Lin and others, chemostratigraphical data, and some others.

A proposal for comment:

Global spike GSSP should stay, but GSSP redefined as base of *ascensus* Zone

Comments from all by **end April 04**, Vote of titular members **before July 05**

(2) Call for comments and proposals on Llandovery/Wenlock boundary by deadline **end August 06**

(3) SSS meeting and Field excursion on Gotland **August 05**.

The theme for the field meeting will be the global dynamics of the Silurian Period. In particular, the meeting and field trips will focus on important events of biotic and paleoenvironmental change as represented in the fossil, sedimentological, and chemostratigraphic record and their interpretation

(4) Discussion of proposals for revision of the GSSP for the **Base of the Wenlock**.

(5) Late 2005 - *Silurian Times*: edited by Jacques Verniers, with a progress report on restudy of the Base of Wenlock.

9. BUDGET AND ICS COMPONENT FOR 2005

Travel for SSS Vice-Chair (Dr. Koren) to SSS Field Meeting in Gotland.

Transportation, accommodation, food, registration **\$1200**

Note that Dr. Koren has no funds for international travel from her institute in Russia.

All travel costs for the SSS Chair, Secretary and other titular members will be paid by their own research funds.

It is anticipated that all costs associated with the production of *Silurian Times* will continue to be paid by St. the host institution of the SSS secretary.

10. REVIEW CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2000-2004)

See Accomplishments in 2004 (above) for additional details.

The Sir Frederick McCoy Symposium (3rd International Symposium on the Silurian System) was held in Orange, Australia, July 2000. This excellent conference, which was held in conjunction with Australian Palaeontological Convention and the 2nd Australasian Conodont Symposium, resulted in the publication of "Palaeontology Down Under 2000, Geological Society of Australia, Abstracts 61", edited by P. Cockle, G. Wilson, G. Brock, M. Englebretsen, A. Simpson, and T. Winchester-Seeto.

Over the period of 2002-2004 the Subcommittee on Silurian Stratigraphy was active in several respects. The field meeting of the SSS, 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. Comunicarte Editorial, Tucumán, Argentina*" edited by G. Ortega and G.F. Aceñolaza.

Two upcoming meetings of the SSS have been planned. The first circular for a Silurian Field Meeting in Gotland, Sweden, August 15-22, 2005, has been recently released at <http://www.geol.lu.se/events/silconf.htm>. An International Symposium on the Silurian System is planned for Nanjing, China, in 2007, to be hosted by the Nanjing Institute of Geology and Palaeontology.

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 paleogeography, 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.

A joint working group of the Ordovician and Silurian subcommittees to restudy of the GSSP for the **Base of the Silurian**, led by Dr. Mike Melchin, has nearly completed its 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 biostratigraphic 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 section. A report outlining the results of this work is currently in preparation for submission to the titular membership of the SSS for a vote to accept this proposal. If successful, this will then go to the ICS for approval.

A working group is also currently working to restudy the **base of the Wenlock**, led by Dr. David Loydell. 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. In the interest of stability, the titular members of the SSS that discussed this issue at the 2003 field

meeting of the SSS unanimously agreed that the GSSP for the Base of the Wenlock should coincide with the base of the *Cyrtograptus centrifugus* Biozone. Search for a possible alternative section for this GSSP is currently under way and sections in Great Britain and the Czech Republic are currently under study.

11. OBJECTIVES AND WORK PLAN FOR NEXT 5 YEARS (2004-2008)

1. Year 1: **September 04-August 05**

- a. *Silurian Times* (edited by Mike Melchin): including report of the Argentina Meeting
- b. Consultation paper on the restudy of the **Ordovician-Silurian boundary** by **December, 04**
Contents: History and background, move recent developments, more acritachs/chitinozoans information from Dob's Lin and others, chemostratigraphical data, and some others.
- c. Vote on O/S boundary
A proposal for comment:
Global spike GSSP should stay, but GSSP redefined as base of *ascensus* Zone
Comments from all by **end April 04**, Vote of titular members **before July 05**
- d. Call for comments and proposals on **Llandovery/Wenlock boundary** by deadline **end August 06**
- e. SSS meeting and Field excursion on Gotland **August 05**

2. Year 2: **September 05--August 06**

- a. *Silurian Times*: (Jacques Verniers)
- b. Discussion on the proposals of the **Llandovery/Wenlock boundary**

3. Year 3: **September 06--August 07**

- a. Discussion on possible re-study of other Silurian GSSPs.
- 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, Telychian)
Discussion on **Llandovery/Wenlock boundary**
Further work on possible on new GSSP re-studies
New members for next four years
- d. *Silurian Times* (edited by Jacques Verniers)

4. Year 4: **September 07--August 08**

- a. *Silurian Times* (edited by Jacques Verniers)
- b. Vote on **Llandovery/Wenlock boundary**
- c. Possible continued further re-study of other GSSPs.
- d. New officers and members

**APPENDIX [Names and Addresses of Current Officers and Voting Members, 2004-2008]
SUBCOMMISSION ON SILURIAN STRATIGRAPHY**

Subcommission officers

Chairman: Rong Jiayu, Nanjing Institute of Geology and Palaeontology, 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 (until Dec. 04): Michael Melchin, Department of Earth Sciences, St. Francis Xavier University, Antigonish, Nova Scotia, Canada, B2G 2W5, e-mail: mmelchin@stfx.ca

Secretary (beginning Jan. 05): Jacques Verniers, Research Unit Palaeontology, Department of Geology and Pedology, Gent University, Krijgslaan 281 S8, B-9000, Gent, Belgium, e-mail: Jacques.Verniers@rug.ac.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

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International Commission on Stratigraphy Subcommission on Ordovician Stratigraphy

ANNUAL REPORT 2004

1. TITLE OF CONSTITUENT BODY

Subcommission on Ordovician Stratigraphy (SOS)

Submitted by:

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Chen Xu *Chairman, SOS*

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2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

The Subcommission promotes international cooperation in 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.

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. ORGANIZATION

Subcommission Executive

Chairman: Chen Xu (P.R.China)

Vice Chairman: Juan Carlos Gutiérrez-Marco

Secretary: G.L. Albanesi (Argentina)

16 other Voting Members, 94 Corresponding Members

Subcommission website: www.ordovician.cn

<http://seis.natsci.csulb.edu/ISOS/International%20Subcommission%20on%20Ordovician%20Stratigraphy.htm> (*remains active for facilitating discussion of GSSP proposals*)

4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

IGCP Project 410: The Great Ordovician Biodiversification Event. Project recently completed with final meeting held in conjunction with the first International Palaeontological Congress, Sydney, Australia in July 2002 and with publication of the book "The Great Ordovician Biodiversification Event" edited by Webby, B.D., Paris, F., Droser, M.L., and Percival, I.G. and published in 2004 by Columbia University Press.

IGCP 503 Project: Impact of changing palaeogeography and palaeoclimate on major biotic changes through the Ordovician. Proposers are voting and corresponding members of Ordovician Subcommission. This is a successor to IGCP 410 and will support substantial research on Ordovician strata and fossils, including travel to meetings at which Subcommission business will be carried out. It will include activities stimulated by the GOES project of the Subcommission. Yearly conferences are at Universität Erlangen, Germany, in September 2004, at the Milwaukee Public Museum (Wisconsin, USA) 2005, at Glasgow University, Scotland, UK, 2006, at Nanjing Institute of Geology and Palaeontology, Academia Sinica, China, 2007, at Université des Sciences et Technologies de Lille, France, 2008.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2004

- a. GSSP proposals were submitted for the three boundaries remaining to be defined: the **base of the Middle Ordovician Series** and its lower stage (the **4th Stage**, yet to be named); the base of the **base of the middle stage of the Upper Ordovician Series** (the **6th Stage**, yet to be named), and the **base of the Hirnantian Stage**, the uppermost stage of the Upper Ordovician Series. Subcommission Chair Stan Finney and long-time Subcommission member Stig Bergstrom visited China in March 2004 to inspect the Huanghuachang and Wangjiawan sections, which were proposed as global stratotype sections, respectively, for the base of the Middle Ordovician Series and the base of the Hirnantian Stage. Two GSSP proposals were submitted for the base of the Middle Ordovician Series: the level of the FAD of the conodont *B. ? triangularis* in the Huanghuachang section in China, and the level of the FAD of the conodont *C. aranda* in the Niquivil section in Argentina. A GSSP proposal was submitted for the Black Knob Ridge section in Oklahoma, USA for the base of the middle stage of the Upper Ordovician Series that is to be defined at the level of the FAD of the graptolite *D. caudatus*. British colleagues indicated that they would submit a proposal with the Hartfell Spa section, Scotland as the global stratotype for this boundary. Finally, a

- single GSSP proposal was submitted for the base of the Hirnantian Stage: the level of the FAD of the graptolite *N. extraordinarius* in the section at Wangjiawan, China.
- b. 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 them.
 - c. In August 2004, the vote on the Wangjiawan GSSP for the **base of the Hirnantian Stage** was completed, and the GSSP was approved unanimously.
 - d. Deadlines were set for the submission of additional proposals for the base of the middle stage of the Upper Ordovician Series and for further work on and revisions to the GSSP proposals submitted for the base of the Middle Ordovician Series, with the goal of completing voting on them by mid 2005.
 - e. The Subcommittee sponsored the symposium session "Global Ordovician Earth System" at the 32nd International Geological Congress in Florence, Italy in August 2005.
 - f. Also at the 32nd IGC, a meeting of Subcommittee voting members was held to focus on progress in selection of GSSPs. The new executive committee took office; the terms of several long-term members of the Subcommittee ended, and several new Subcommittee members began their terms. Both a business meeting (voting members) and an open meeting (all participants) were held in Erlangen. New directions of the Subcommittee and three remaining GSSPs were discussed. The proposals of the second stage of the Upper Ordovician and the base of the Middle Ordovician will be voted within 2005.
 - g. *Ordovician News No. 21* was produced and posted on the Subcommittee web site in May 2004.

6. CHIEF PROBLEMS ENCOUNTERED IN 2004

Most subcommittee members requested that additional study and evaluation be given to the GSSPs for the base of the Middle Ordovician Series before proceeding to a formal ballot

As always, the lack of travel support limits the participation of Voting Members in field meetings to evaluate potential stratotype sections. Although the Subcommittee supports investigations of potential GSSPs, the amount available is so limited that most of these investigations must be supported by other sources.

7. SUMMARY OF EXPENDITURES IN 2004 (ANTICIPATED THROUGH MARCH 2005):

Contribution to Chair's travel expenses:	\$ 200
Chair's expenses to host Digby McLaren at IGC and to Produce certificates for ICS Prizes:	\$ 50
Contribution to Secretary's travel expenses:	\$ 500
Support for website, secretariat, and production of newsletter	\$ 500
Support for additional conodont work to improve Niquivil GSSP Proposal	\$ 300
Anticipated contribution to travel expenses of working group (Finney, Bergstrom, and Goldman) that will finalize issues related to accessibility and preservation of the Black Knob Ridge GSSP in December 2004	\$ 800
Anticipated Carryover	<u>\$ 150</u>
TOTAL	\$2500

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

- a. Development of new website based at Nanjing Institute of Geology and Palaeontology to support new executive of Subcommittee.
- b. Submission of Wangjiawan GSSP proposal for **base of Hirnantian Stage** to ICS for approval.
- c. Discussion and evaluation of Black Knob Ridge GSSP proposal for **base of middle stage of Upper Ordovician Series** and Hartfell Spa GSSP proposal, if it is submitted by December 2004 deadline. Ballot on GSSPs in early 2005 and submission of approved GSSP proposal to ICS.
- d. Revisions of Huanghuachang and Niquivil GSSPs for **base of Middle Ordovician Series**, discussion, and ballot on proposals in mid 2005. Submission of approved GSSP to ICS in second half of 2005.
- e. **Selection of names for 2nd, 3th, 5th and 6th stages** of the Ordovician System.
- f. Production and internet distribution of *Ordovician News No. 22* in May 2005.

9. BUDGET AND ICS COMPONENT FOR 2005

<i>Ordovician News No. 22</i> production costs:	\$ 250
Support for secretarial office	\$ 250
Travel subsidies for executive members to attend GSSP dedication ceremonies	\$1500
Plaques for GSSPs to be dedicated in 2005	\$ 500
Contingency for inspection of Hartfell Spa section, if proposed as global stratotype	\$1000
Carryover from 2004	<u>(-\$150)</u>

TOTAL 2005 BUDGET REQUEST **\$3,350** (through Mar, 2006)

Potential funding sources outside IUGS

Already in its first year, IGCP Project 503, Ordovician Palaeogeography and Palaeoclimate, funded a successful meeting in Erlangen, Germany in early September 2004. This project will provide travel support to a significant number of Ordovician specialists, including voting members of the Subcommittee, 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 supports for the new Subcommittee website. The Subcommittee officers are also supported by their research project for parts of their activities.

10. CHIEF ACCOMPLISHMENTS OVER LAST FIVE YEARS (2000-2004)

- 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 upper stage of the Lower Ordovician Series and the Upper Ordovician Series, respectively.
- c. 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.
- d. 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.
- e. 9th International Symposium on the Ordovician System 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.
- f. Publication of *Ordovician News* nos. 17-21 and their posting on the Subcommittee's web site.
- g. 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*.
- h. 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.
- i. 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."
- j. Sponsorship at the 32nd International Geological congress of the symposium "The global Ordovician Earth system."
- k. 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.
- l. Sponsorship of special symposium on the Ordovician System at the Geological Society of America Annual Meeting in 2000, of WOGOGO 2001 in Copenhagen, and of the meeting and field excursion "The Gondwanan Platform in Ordovician times: Climatic, eustatic and geodynamic evolution", in Morocco in February 2001.

11. OBJECTIVES AND WORK PLAN FOR NEXT 5 YEARS (2005-2009)

Selection of GSSP for **base of Middle Ordovician** Series.

Selection of GSSP for **base of middle stage of Upper Ordovician** Series (6th stage of Ordovician System)

Selection of **names** for 2nd, 3rd, 5th and 6th stages of Ordovician System

Publication of papers presented at "The global Ordovician Earth system" symposium at the 32nd IGC.

With completion of selection of GSSPs for all stages, refocusing of Subcommittee to address the global Ordovician Earth system.

Development of a new website with transfer of subcommittee executive to new chair.

10th International Symposium on the Ordovician System to be held in Nanjing, China in summer 2007.

**APPENDIX [*Names and Addresses of Current Officers and Voting Members, 2004-2008*]
SUBCOMMISSION ON ORDOVICIAN STRATIGRAPHY**

Subcommission Officers

Chairman: Chen Xu, Nanjing Institute of Geology & Palaeontology, Academia Sinica, 39 East Beijing Road, Nanjing, China, e-mail: xu1936@yahoo.com

Vice Chairman: Juan Carlos Gutierrez-Marco, Instituto de Geología Económica, Facultad de Ciencias Geológicas, 28040 Madrid, Spain, e-mail: jcgrapto@geo.ucm.es

Secretary: Guillermo L. Albanesi, Museo de Paleontología, Universidad Nacional de Córdoba, Casilla de Correo 1598, 5000 Cordobal, Argentina, e-mail: galbanesi@arnet.com.ar

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Matthew R. Saltzman, Columbus, USA saltzman.11@osu.edu



International Commission on Stratigraphy Subcommission on Cambrian Stratigraphy

ANNUAL REPORT 2004

1. TITLE OF CONSTITUENT BODY

International Subcommission on Cambrian Stratigraphy

Submitted by:

Prof. Loren E. BABCOCK, Secretary
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and by:

Prof. Shanchi Peng, Chair
 Nanjing Institute of Geology and Palaeontology, The Chinese Academy of Sciences
 39 East Beijing Street, Nanjing 210008, China
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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. Until recently, the Cambrian was without formally agreed international stages. Research in progress on trilobites and other fossils, and especially in combination with other stratigraphic indicators, show promise for long range correlation and definition of stages.
- (2) To complete and publish regional 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 15 other Voting Members. The Voting Members are elected for their expertise and experience, but also represent a diversity of countries and regions.

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

Web address for Cambrian Subcommittee site:

www.uni-wuerzburg.de/palaeontologie/ISCS/index.htm

The website contains detailed information pertaining to Subcommittee business, including recent decisions and opinions regarding intra-Cambrian correlation, recent publications, etc.

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.

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 2004

A proposal for the first intra-Cambrian subdivision (Furongian Series and Paibian Stage GSSP) was passed by the Cambrian Subcommittee, and later ratified by the ICS and IUGS. A paper describing the GSSP has been published in *Lethaia* (vol. 37, p. 365-379; 2004).

The IX Conference of the Cambrian Stage Working Group was held in Taebaek, South Korea, under the chairmanship of Duck Choi. Discussion principally centered about **series-level subdivision of the Cambrian**, and the best choices for stage-level GSSPs in the upper half of the Cambrian.

As an outgrowth of the discussion, two **ballots** have been mailed to Voting Members of the Subcommittee. Both ballots will conclude in mid-December, 2004:

- (1) a proposal for subdivision of the Cambrian into **four series**;
- (2) a proposal to concentrate investigations related to establishment of GSSP horizons in several intervals of the **upper half** of the Cambrian System.

6. CHIEF PROBLEMS ENCOUNTERED IN 2004

The principal difficulties encountered in 2004 were:

- (1) Obtaining funding to support basic research on key stratigraphic intervals (potential GSSP horizons and sections).
- (2) Obtaining funding to support travel to the Field Conference of the Stage Subdivision Working Group. 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. Also, a modest increase in funding would greatly facilitate travel by some Voting Members to the upcoming International Symposium on the Cambrian System. Much critical discussion on Cambrian chronostratigraphy is expected to take place at the symposium, and it would be highly advantageous to have full participation of the Voting Members at the meeting. The funding would be of greatest benefit to Voting Members from Russia, Kazakhstan, and elsewhere who have been almost completely hindered from traveling to recent international meetings of Cambrian specialists for financial reasons.

7. SUMMARY OF EXPENDITURES IN 2004:

INCOME

Carried forward from 2003, 3307.27 Euro	\$ 3859.25
ICS Allocation, 728.79 Euro	\$ 900.00
Bank interest, 21.145 Euro	<u>\$ 28.20</u>
SUBTOTAL 2004 income	\$ 4787.45

EXPENDITURE FROM 2004 BUDGET

General administrative expenses (postage, fax, photocopies, paper, printer supplies, misc.)	\$ 32.70
Contribution to officer's travel expenses, 164.75 Euro	\$ 221.78
Support for preparation of the 4 th International Symposium on the Cambrian System meeting (2005), 1100.00 Euros	<u>\$ 1477.41</u>
SUBTOTAL 2004 expenditures	\$ 1731.89

To be carried forward to early part of 2005	\$ 3055.56
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8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2005):

In 2005, the Subcommittee expects to receive a proposal for a stage-level GSSP to be placed at the horizon of the **FAD of the cosmopolitan agnostoid trilobite *Ptychagnostus atavus***.

This horizon is one of the most recognizable in the Cambrian, and it is well constrained by a variety of stratigraphic correlation tools.

The *Fourth International Symposium on the Cambrian System* will be held in Nanjing, China, in August 2005. The symposium will include topical sessions on various themes, including continuing discussion of refining correlation within the system and development of adequate tools for intercontinental correlation. In addition, the symposium will have associated with it a number of field trips to important Cambrian sections in China and Korea. An abstracts volume will result from the symposium in Nanjing.

The Subcommittee expects to make substantial progress toward development of a proposal for a stage-level **GSSP** at the horizon of the **agnostoid trilobite *Lejopyge laevigata***.

A special volume of *Geological Journal* (edited by Duck K. Choi) containing papers resulting from the IX International Conference of the Cambrian Stage Subdivision Working Group (Korea 2004) is expected to be published in 2005.

A special issue of *Palaeogeography, Palaeoclimatology, Palaeoecology* (edited by Loren E. Babcock) containing papers resulting from a topical session on the Neoproterozoic-Cambrian transition (North American Paleontological Convention, Berkeley, California, 2001) is expected to be published in 2005.

An annual newsletter, highlighting activities of the Subcommittee, is expected to be issued in 2005.

9. BUDGET AND ICS COMPONENT FOR 2005

Beginning in 2005, most financial activities of the Subcommittee will be from within the United States. Projections are therefore expressed in US dollars.

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 stratigraphic intervals by Working Group members and travel by Voting Members to international meetings where much of the decision-making takes place. The Subcommittee hopes to complete the definition of GSSPs for the bases of Cambrian stages and series by the IUGS deadline of 2008, but will need additional financial assistance, particularly support for field research and travel to international meetings, if this goal is to become a reality.

INCOME

Carry-over from 2004	\$ 3055.56
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PLANNED EXPENDITURES FOR 2005

Preparation for the 4 th International Symposium on the Cambrian System (China 2005)	\$ 750.00
Officers' attendance funds for China 2005	\$ 2000.00
Executive and VM travel costs	\$ 2000.00
Support for Stage Working Groups (travel to field sites)	\$ 3000.00
General office expenses	<u>\$ 300.00</u>
TOTAL 2005 PLANNED EXPENSES	\$ 8050.00

ICS 2005 BUDGET REQUEST

Total ICS 2005 budget request	\$ 4994.44
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The Cambrian Subcommittee 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. Some members are supported by research grants, normally awarded competitively within individual nations. Specific activities, such as meetings, are sometimes supported in part by small grants to convenors from various sources, such as host institutions, and national and regional authorities of host countries. It is hoped that a substantial part of the cost of the IV Cambrian Symposium in Nanjing in 2005 will be provided by the Chinese Academy of Sciences and other authorities within China.

10. REVIEW CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2000-2004)

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 (1992) and Cambrian-Ordovician boundary (1997). 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), and South Korea (2004).

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 an 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).

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 several stage-level or series-level GSSPs. The first successful GSSP proposal arising from the Cambrian Subcommittee, which sought approval of the base of the **Paibian Stage** and **Furongian Series** (authored by Shanchi Peng, Loren Babcock, Dick Robison, Peg Rees, and Matt Saltzman), was ratified by the ICS and IUGS in 2004.

11. OBJECTIVES AND WORK PLAN FOR NEXT 5 YEARS (2004-2008)

See Accomplishments in 2004 (above) for additional details.

The principal objective of the Subcommittee over the next five years is the identification of the best horizons for establishing stage-level and series-level **GSSPs** within the Cambrian System. Assuming that the outcomes of both current ballots are positive, we expect that the Cambrian will be subdivided into four series and 10 stages. All of the series will be subequal in time duration, and each of the stages within each series will be subequal in time duration. Once the best horizons for intercontinental correlation have been identified, the best sections for establishing GSSPs will proceed, and formal proposals for GSSPs will be written by Working Group members

and forwarded to (in successive order) the ISCS, the ICS, and the IUGS for voting. Following ratification of each GSSP, a paper will be submitted to a major journal (e.g., *Lethaia*) for public dissemination of the information.

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

The Cambrian Subcommittee is deeply committed to establishing GSSPs that are be constrained using a variety of stratigraphic tools: a primary biostratigraphically based horizon used to mark each GSSP will be supplemented by additional biostratigraphic tools, chemostratigraphic information, sequence-stratigraphic information, chronostratigraphic information, and any other stratigraphic information that may be available. A Working Group on Geochemistry has been established to help provide the Subcommittee with refined carbon and strontium isotopic curves for the Cambrian System over the next five years.

Members of the Subcommittee will take part in the planning of upcoming meeting addressing themes related to Cambrian stratigraphy. Meetings planned at present are:

- (1) *Fourth International Symposium on the Cambrian System* (Nanjing, China, 2005). Planning is well underway, principally under the leadership of Shanchi Peng and Maoyan Zhu.
- (2) *X Field Conference of the Cambrian Stage Working Group* (Albany, New York, USA, 2006 or 2007). Planning is in early phases under the leadership of Ed Landing.

Both meetings will include sessions on Cambrian chronostratigraphy, and will include field trips to sites of significance for chronostratigraphic correlation. Abstracts of papers are expected to be published at the time of each meeting, and special volumes of papers resulting from each meeting are expected to be published afterward.

APPENDIX [*Names and Addresses of Current Officers and Voting Members, 2004-2008*] 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

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** Term as Voting Member ends in 2004.*

Suggested Voting Members who will begin terms in 2004

Matthew R. Saltzman, Columbus, Ohio, USA saltzman.11@osu.edu

Maoyan Zhu, Nanjing, China myzhu@nigpas.ac.cn

Total number of Voting Members for term 2004-2008: 19.



International Commission on Stratigraphy Subcommission on Ediacaran Stratigraphy

ANNUAL REPORT 2004

1. TITLE OF CONSTITUENT BODY

Subcommission on Ediacaran Stratigraphy

Submitted by:

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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

The Subcommittee is organized by an Executive consisting of Chairman, Vice-Chairman and Secretary, who are all Voting Members of the Subcommittee. Officers were nominated and elected by voting members of the now-terminated Terminal Proterozoic Subcommittee during later 2003.

Officers for 2004-2008:

Chair:	Dr. James Gehling, Australia
Vice-Chair:	Dr. Shuhai Xiao, USA
Secretary:	Dr. Graham Shields, Australia

There are currently 37 other Voting Members, making 40 voting members in total (see appendix); there are currently 12 additional corresponding members. The Voting Members have been specifically elected for their international reputations and recognized 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.

No thematic working groups have yet been established but a fully archived mailing list of both voting and corresponding members has been set up and is being used for dissemination of information relevant to the subcommittee. A proposal has been made for a new IGCP project on Neoproterozoic ice ages, which will form a locus for a subcommittee thematic working group on the global stratigraphic equivalence of Neoproterozoic glacial horizons.

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 447 (*Proterozoic molar-tooth carbonates*) Subcommittee secretary **Graham Shields** is the Australian correspondent and geochemistry working group chairman of this project;
- IGCP 478 (*Neoproterozoic-early Paleozoic events in SW Gondwana*) led by voting member **Claudio Gaucher**;
- 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 Subcommittee chairman **James Gehling**;
- IGCP 497 (*The Rheic Ocean: its origin, evolution and correlatives*) led by voting member **Ulf Linnemann**.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2004

In September 2003, a 3rd ballot of the Terminal Proterozoic Subcommittee 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 Subcommittee submitted a proposal to the full International Commission on Stratigraphy (ICS) in December 2003.

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). A paper describing the GSSP and its selection process has been submitted for publication to *Lethaia* (the official journal of the ICS), and announcements appeared in *Episodes* (vol. 27, pp. 83-100, 2004), *Science* (vol.305, pp. 621-622) and *Nature* vol. 429, pp.124-125 2004.

6. CHIEF PROBLEMS ENCOUNTERED IN 2004

The establishment of a new period and GSSP during 2004 attracted some resistance internationally and a fair amount of media coverage has concentrated on this disagreement. In particular, a letter dated Aug 12th, 2004, written by Dr Boris Sokolov and others (including Russian voting members on the previous Terminal Proterozoic Subcommittee and the new Ediacaran Subcommittee) made a late stage plea to IUGS at the 32nd IGC to reconsider the Ediacaran Period GSSP and name. They presented the same arguments that had been considered by the Terminal Proterozoic Subcommittee before the three ballots that resulted in a decision in favour of the Ediacaran GSSP. In particular, they called for more research and a stronger reliance on geochronology, and argued for biostratigraphic subdivision of the Ediacaran prior to the definition of the period.

In order that discussion over future GSSPs be seen to be consensus decisions by the wider geological community, we have cast our net wider and attracted 40 research-active voting members from 17 different countries. Because of the necessary changed emphasis away from biostratigraphy in future Precambrian stratigraphic subdivision boundary definitions, this group encompasses expertise from a wide range of relevant fields of geology: chemostratigraphy, glacial sedimentology, carbonate sedimentology, palaeomagnetism and geochronology as well as biostratigraphy.

7. SUMMARY OF EXPENDITURES IN 2004 (ANTICIPATED THROUGH MARCH 2005):
INCOME

Travel grant for participation in 32 nd IGC	US\$1350
TOTAL	US\$1350
EXPENDITURE FROM 2004 BUDGET	
General office expenses	NA
TOTAL	NA
To be carried forward to 2005	NA

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

(a) Design and establish web-site for Subcommittee:

This will provide a more widely accessible source of information about the Subcommittee, including recent Newsletters, a link to discussion group archives (presently stored on the James Cook University server at <https://www.jcu.edu.au/pipermail/iugsediacaransubcommision/>), a Directory of the Executive and other Voting Members, with their allocated areas of responsibility, and Corresponding Members, plus information on the objectives of the Working Groups and contact details for the Convenors. Preliminary work and planning have been carried out and final setting up will be achieved with some professional help.

(b) Publication of Newsletter:

The first circular is currently being prepared to inform voting and corresponding members of:

- the tasks that the Ediacaran Subcommittee has been asked to address.
- workshop held in conjunction with IGCP 493 in Prato, Italy during 2004
- call for abstracts for future meetings
- call for suggestions on further Ediacaran and late Neoproterozoic stratigraphic subdivision

(c) Preparation of GSSP proposals:

We are still at the preliminary stage of setting up working groups.

(d) Development of Thematic Working Groups:

Multidisciplinary working groups are being organized to seek potential GSSP's for a "Cryogenian" period and for subdivision of the Ediacaran.

(e) Public outreach:

The ratification of the Ediacaran GSSP was reported widely in the international press and in news articles in *Nature* and *Science*. Several groups of geologists have given conducted tours of the late Neoproterozoic succession in the Flinders Ranges National Park, including the GSSP site and Ediacara fossil horizons. An **official unveiling of the GSSP by the Premier of South Australia** is being organized for **April 2005**.

(f) Post 32nd International Geological Congress, workshop at the Monash University foreign campus in Prato, Italy, 30-31 August, 2004.

Entitled “*Rise and fall of the Vendian Biota*”, this 2 day workshop attracted 31 presentations drawn from 12 countries. The meeting was chaired by Pat Vickers-Rich, Mikhael Fedonkin and Jim Gehling. It was sponsored jointly by IGCP 493 and the Ediacaran Subcommittee.

(g) Possible IGCP Project: *Neoproterozoic ice ages*

An application for a new IGCP Project on Neoproterozoic ice ages has been submitted by Subcommittee secretary Graham Shields along with over 150 colleagues from 20 different countries. This new project will focus on the number, extent, correlation and environmental consequences of glaciation during the late Neoproterozoic. Future subdivision of the Neoproterozoic will rely greatly on the correlation potential of glaciogenic units worldwide so if successful this project will be important to the goals of the subcommittee. Most of the voting and corresponding members of the Ediacaran Subcommittee are also members of this project and a core body will make up a thematic working group within the subcommittee.

10. BUDGET AND ICS COMPONENT FOR 2005

\$3000 towards organizing a symposium at NAPC (June 2005) and pre-conference excursion to NFLD, and for travel support. (J. Gehling and G. Narbonne)

\$1000 towards organizing the field excursion to SW Scotland and associated thematic working group meeting in Aberystwyth (Correlation of Neoproterozoic glacial horizons) in August 2005 (G. Shields and E. Arnaud)

\$1000 towards production of an up-to-date field guide (to Ediacaran Period GSSP in the Flinders Ranges, Australia), postage and handling. (J. Gehling)

\$500 towards the employment of professional assistance in the setting up of a web page for the subcommittee. (J. Gehling)

TOTAL: \$5500

Potential funding sources outside IUGS

IGCP national committees in Canada (E. Arnaud) and Australia (G. Shields) to help finance the Scotland excursion.

The Ediacaran Subcommittee 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)

N/A. The Ediacaran Subcommittee was established in 2004.

12. OBJECTIVES AND WORK PLAN FOR NEXT 5 YEARS (2005-2009)

The Ediacaran Subcommittee aims to encourage research that will facilitate correlation and subdivision of the late Neoproterozoic (circa 800 – 542 Ma). 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 2005-2008.

2005

- Establishment of subcommission web-page. Call for suggestions for further subdivision of late Neoproterozoic time, including provisional ideas for GSSP's. Establishment of thematic working group on *Neoproterozoic glaciations* and working groups on *Ediacaran subdivision* and the *definition and base of the Cryogenian*. The following meetings will facilitate this discussion:
- Ediacaran Subcommittee will be represented at a Time Scale Workshop to 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. This will follow a field trip across the Capricorn, southern Hamersley Basin, Bangemall Basin, and northern Yilgarn of Western Australia.
- At the NAPC meeting in Halifax, Nova Scotia (June 19-26, 2005), the Ediacaran Subcommittee and IGCP 493 are cosponsoring a symposium entitled: "*Ediacaran paleobiology: paleontological, molecular, embryological, and ecological constraints*". At this meeting subcommission members will hold discussions on preliminary proposals for *Ediacaran Period subdivision*. A 5 day pre-conference excursion (June will be led by Guy Narbonne (Queens, ON) and Doug Boyce (NFLD Survey) to the Ediacaran succession and classic fossil sites of SE Newfoundland.
- First annual meeting of the possible new IGCP project at the "*Conference on Glacial Sedimentary Processes and Products*", University of Wales, Aberystwyth, August 23rd-27th 2005. This International Association of Sedimentologists conference is organised by Professor Michael Hambrey (UK). The subsequent field excursion to Neoproterozoic glaciogenic successions of western Scotland in Islay and the Garvellachs (e.g. *Arnaud, 2004*) will be led by Dr Emmanuelle Arnaud (Canada). At this meeting subcommission members will hold discussions on preliminary proposals for **Cryogenian period GSSPs** and the **thematic working group on Neoproterozoic glaciations** will meet to plan their future work.
- Several members of the subcommission will also attend the national GSA meeting in Salt Lake City (Oct-16-18) with a fieldtrip to the mid-Neoproterozoic rocks of northeastern Utah between Oct 12-15 run by Carol Dehler and will be followed by Paul Link running a trip to see the Pocatello Fm in southeastern Idaho.

2006

- Call for preliminary proposals for Cryogenian GSSP and Ediacaran subdivision
- In conjunction with the 2nd *International Palaeontological Congress* to be held in China in 2006, a special session is being planned on the progress of the subcommission by J. Gehling, S. Xiao and G. Shields. A field workshop to South China in association with the

International Palaeontological Congress in Beijing, Summer 2006 will be organized by Zhu Maoyan.

- Another important meeting will take place at the “*Snowball Earth 2006 appraisal conference*” at the Centro Stefano Franscini, Ascona, Switzerland, Summer 2006. This conference is organised by Professor Philip Allen, Dr James Etienne and Dr Andrea Cozzi (Switzerland). The conference plans to bring together most of the world’s experts in Neoproterozoic Earth System Science and represents a good moment for the thematic working group on Neoproterozoic ice ages to discuss progress.

2007

- During this year we hope to vote on the **base of the “Cryogenian”**.
- 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).
- Possible subcommission field excursions and working group meetings include a planned meeting in Dakar, Senegal organized by P. Affaton, G. Shields and M. Deynoux. Another meeting is being planned in Brazil in conjunction with IGCP 478 and organized by the Brazilian contingent of the proposed project (M. Babinski, A. Misi and others). Two meetings will take place in that year – each focussed on a different time-slice (Cryogenian and Ediacaran)

2008

- Possible proposal and ratification of the new **Cryogenian Period GSSP** at the 33rd *International Geological Congress* on 5–14 August in Oslo, Norway to be combined with possible field-trip in Russia.

APPENDIX [*Names and Addresses of Current Officers and Voting Members, 2004-2008*] SUBCOMMISSION ON EDIACARAN STRATIGRAPHY

Subcommission officers

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International Commission on Stratigraphy Subcommission on Precambrian Stratigraphy

ANNUAL REPORT 2004

1. TITLE OF CONSTITUENT BODY

Subcommission on Subdivision and Calibration of the Precambrian Time Scale

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

A new 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 (not GSSAs) like in the Phanerozoic.

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

Subcommission’s website is under construction and will be up and running early in the next year.

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 Proposal by Drs. Steven Reddy and David Evans 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 2004

- We launched the new Subcommittee and have currently ca. 20 international scientists enlisted as voting members (see below). This is by no means a complete roster, but will form the core. I have tentative agreement from scientists in Brazil to participate. I need to work on extending Chinese, Russian, and Indian representation to the Subcommittee.
- We are currently organizing our first major workshop, to be held in Perth, Australia, 25 September 25, 2005, in conjunction with a major international conference organized by the Tectonics Special Research Center: “*Supercontinents and Earth Evolution*”. A Circular and Call for Abstracts is currently being printed.
- As required for setting up the new Subcommittee, a conceptual proposal was submitted to and published in *Lethaia*:
 - **Bleeker, W.**, 2004a. Towards a “natural” time scale of the Precambrian—a proposal; *Lethaia*, vol. 37, p. 219-222.
- Contributed a chapter on the Precambrian to the new time scale book “GTS2004”. A synopsis of this was included in a paper by Gradstein et al. (2004) in *Episodes*, which was distributed as part of the registration package to all participants of the 32nd IGC in Florence.
 - **Bleeker, W.**, 2004b. Towards a “natural” time scale for 88 percent of Earth history; in *Geological Time Scale 2004*, edited by F. Gradstein, and J. Ogg, Cambridge University Press, in press.
 - Gradstein, F.M., Ogg, J.G., Smith, A.G., **Bleeker, W.**, and Lourens, L., 2004. A new geologic time scale, with special reference to the Precambrian and Neogene; *Episodes*, vol. 27, p. 83-100.
- Activities at the 32nd IGC in Florence, Italy:
 - Invited talk in the Time Scale symposium: “Towards a ‘natural’ time scale for 88% of Earth history”, by Wouter Bleeker
 - Presented an overview of activities at the ICS workshop.
 - Made arrangements with Dr. Sorin Filipescu for launch of subcommittee’s website.
- Presented a talk on the Precambrian time scale, and the rationale for moving to a ‘natural’, rock-record based time scale at the Penrose Conference on “*Secular Change*”, held in St. George, Utah (October 2005). This was part of on-going testing of ideas for ‘naturalizing’ of the Precambrian time scale, complete with GSSPs, on a broad audience. The vast majority of researchers working on Precambrian rocks or the “early Earth” provide positive feedback and indeed would favor such a development.

6. CHIEF PROBLEMS ENCOUNTERED IN 2004

None. Not enough time in a day!

7. SUMMARY OF EXPENDITURES IN 2004 (ANTICIPATED THROUGH MARCH 2005):

Expenses related to attending 32nd IGC in Florence: \$858 (US\$)

(*partial expenses, mainly hotel bill, paid from Subcommittee funding and IGC support*).

8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2005):

- Early 2005: Launch of Subcommittee's website as a point of information on the Subcommittee's goal and activities, and to stimulate discussion and debate as we move forwards.
- Finalizing voting membership for the Subcommittee.
- **First international workshop (Perth, Australia, 25 Sept 2005)** focusing debate, and hopefully first preliminary votes, on some of the major questions: e.g., status of the Hadean; GSSP for base of the Archean at oldest supracrustal rocks in the rock record, etc.
- If a consensus on the Hadean and base of Archean emerges at the Perth workshop, prepare a formal document on these issues and prepare for an official vote.
- Use the Perth workshop also to prepare a detailed plan and time line for how to proceed with 'naturalizing' of the Archean Eon and identify best candidates for GSSP at the Archean-Proterozoic boundary.

9. BUDGET AND ICS COMPONENT FOR 2005

I request support for travel to and from Perth, Australia. Estimated costs: **\$3000** (US\$).

10. REVIEW CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2000-2004)

Not applicable; see item # 5.

11. OBJECTIVES AND WORK PLAN FOR NEXT 5 YEARS (2004-2008)

We are organizing our first major workshop, to be held in Perth, Australia, 25 September 25, 2005, in conjunction with a major international conference organized by the Tectonics Special Research Center: "Supercontinents and Earth Evolution". A Circular and Call for Abstracts is currently being printed.

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 Neoafrican).
- 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 2005, we hope to make the main conceptual progress and reach international consensus, in general, on how to proceed with 'naturalizing' the Precambrian time scale. If indeed we reach such a broad consensus, it would prepare the field for such critical issues as a GSSP-based Archean-Proterozoic boundary. Using the Hamersley Basin stratigraphy of Western Australia as the 'straw man' proposal, we'll invite alternatives (South Africa?, India?, Brazil?). This will

probably lead to and require field excursions to potential sites, to be conducted in 2006, to examine candidate sections.

APPENDIX [Names and Addresses of Current Officers and Voting Members, 2004-2008]

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 (grouped by region):

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International Commission on Stratigraphy Subcommission on Stratigraphic Classification

ANNUAL REPORT 2004

1. TITLE OF CONSTITUENT BODY

Subcommission on Stratigraphic Classification (ISSC)

Submitted by:

Maria Bianca Cita *Chairman, ISSC*

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2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

Mission Statement

The Subcommission represents a core business for the International Commission on Stratigraphy because it represents 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.

Goals

These fall in two categories:

- 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;
- 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.

Fit within IUGS Science Policy

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

Chair: Maria Bianca Cita, Italy

Vice-Chair: Ashton Embry, Canada

Secretary and web-master: Maria Rose Petrizzo, Italy

TASK GROUPS

Sequence stratigraphy

Leader: Ashton Embry (Canada)

Members: Don Owen (USA), Piero Gianolla (Italy), Benoit Beauchamp (Canada), Erik Johannessen (Norway)

Cyclostratigraphy

Leader: Andreas Strasser (Switzerland)

Members: Fritz Hilgen (Holland), Walter Schwazacher (UK)

NATIONAL REPRESENTATIVES (NATIONAL LIAISONS)

Mandate: spread the messages plus instructions given by ISSC in their countries, and report on reactions and acceptance status (via correspondence through ISSC Newsletters)

Provisional list (based on Business Meeting, Florence, August 27, 2004) to be modified and implemented on the basis of later correspondence.

ARGENTINA: A. Riccardi, chairman Stratigraphic Commission of Argentina

AUSTRALIA: Albert T. Brakel national convener, Australian Stratigraphic Names Committee

AUSTRIA: Werner Piller, chairman Stratigraphic Commission of Austria

CANADA: Ashton Embry

GERMANY: Manfred Menning, member of the German Stratigraphic Commission

GREAT BRITAIN: Jan Zalasiewicz, chairman British Stratigraphic Commission

ITALY: Maria Bianca Cita, chairman Italian Stratigraphic Commission

LITHUANIA: A. Grigelis, chairman Stratigraphic Commission of Lithuania

RUSSIA: Yuri Gladenkov, vice-chairman of Stratigraphic Commission of Russia

SPAIN: Hans Peter Luterbacher

SWITZERLAND: Andreas Strasser, chairman Swiss Stratigraphic Commission

USA: Lucy Edwards, past chairman NACSN

STRUCTURAL LIAISONS

Mandate: communicate decisions and orientations of ISSC and report on reactions

Provisional list (based on Business Meeting, Florence, August 27, 2004) to be modified and implemented on the basis of later correspondence.

A. Riccardi	IUGS	H. P. Luterbacher	Paleogene
M. B: Cita	ICS	M. Menning	Permian
P. Heckel	Carboniferous	P. Gianolla	Triassic

4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

ISSC has always been directly or indirectly linked to international projects such as ODP and IGCP.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2004

a. *Communications*

The electronic mail proved to be an invaluable means of communication and allowed a break through in revitalizing the Subcommittee.

Three *Newsletters* were distributed electronically and/or via traditional mail, one in December 2003 (*Newsletter* n. 3 = Circular n. 104), one in March (*Newsletter* n. 4 = Circular n. 105), and one (*Newsletter* n.5) in October 2004, and many comments, proposals, ideas followed.

b. Florence IGC Workshop

A big effort was made through multinational connections, intense correspondence and personal contacts to organize during the 32nd IGC in Florence (Italy) the first ISSC WORKSHOP in the over fifty years long history of this glorious Subcommittee.

The title was self-explanatory:

“POST-HEDBERG DEVELOPMENTS IN STRATIGRAPHIC CLASSIFICATION”

Program

Conveners: Maria Bianca Cita (ISSC chair) and Alberto Riccardi (ISSC past chair)

M. B. CITA - Purpose and significance of the workshop.

A. RICCARDI - Post-Hedberg Stratigraphic Classification: order or chaos?

Key-notes

A. EMBRY - Third generation (3G) Sequence Stratigraphy.

W.B.F. RYAN - Messinian erosional surfaces in the Mediterranean and Noah's flood in the Black Sea: two examples of instantaneous transgression and their sequence boundaries.

A. STRASSER - What is a cycle? Definitions and terminology in cyclostratigraphy.

Reports

L. EDWARDS, B. JORDAN and G. B. VAI - Report on results of Workshop DWO 04 on unconformity/discontinuity bounded units.

P. GIANNOLLA, M. MENNING and A. EMBRY - Report on results on three Stratigraphic Classification tests run within ISSC.

L. DELFRATI, P. FALORNI and F. PETTI – Report on results of the CARG/CIS Project “Catalogo delle Formazioni Geologiche Italiane” (Italian lexicon).

Position papers

Y. ZALASIEWICZ and 14 British Stratigraphers - Simplifying the stratigraphy of time: implications and practical consequences.

C.R. ORNDORFF, L. EDWARDS, R. M. EASTON, B. PRATT and I. FERRUSQUIO-VILAFRANCA (of NACSN) - Regional stratigraphic commissions: testing grounds for new avenues in stratigraphic concepts.

G.S. ODIN, S.GARDIN and G. THIERRY (of French Stratigraphic Commission) - Global stratigraphy, simplified subdivisions, diversity: contribution to the improvement of the nomenclature of the units of the Earth history resulting from modern conventions.

M. MENNING, A. ETZHOLD, H. HAGDORN, K.-C.H KADING, J. LETTER, M. LUTZ and E. NITSCH (of German Stratigraphic Commission) - Dual lithostratigraphy in the Stratigraphic Table of Germany 2002: lithofacies and marker stratigraphy of the classic Zechstein and Germanic Trias.

A. GRIGELIS and Lithuanian Working Group - Lithuanian stratigraphic Guide and Regional Stratigraphic Units;

Y. GLADENKOV and Russian Commission of Stratigraphy - Towards improvements of stratigraphic codes and guides.

Free contributions

E. A. MANCINI AND T. M.PUCKETT - Upper Jurassic and Cretaceous transgressive-regressive (T-R) cycles, northern Gulf of Mexico, U.S.A.

J.VAN COUVERING and M.-P.AUBRY - Rashomon Stratigraphy - Which stage to believe?

Attendance

The workshop was a very successful and interesting, well attended meeting, a real "scientific event" as we hoped it to be. It lasted a full day (August 27, 2004), from 9 a.m. to 7 p.m., with only one interruption for lunch time. Participants were 46 from 21 countries. ISSC “old” and “new” members were 18.

Results

- Sequence stratigraphy is important, alive and promising.

- Cyclostratigraphy is in a very good shape.

- Chronostratigraphy and the twofold subdivision of time is subject to debate on conceptual, philosophical and in part factual grounds.

- A tendency to simplify terminology is shared by several scientists, whereas others require a more diversified categorization.

- The open forum approach proved successful to improve interactions among new and old members, and to strengthen the communications within a largely international community of geologists.

- The open forum approach and follow-up actions are considered an essential prerequisite as a basis for the 4 years program to be accomplished in 2005-2008 (see later).

6. CHIEF PROBLEMS ENCOUNTERED IN 2004

Communications with ICS executive. Lack of response, or inadequate responses to problems deriving from the existing procedures in the approval of proposed GSSP. No time allowed for discussion by the persons (Subcommission chairs) that have the responsibility to approve or not to approve the proposed GSSP. As it is now organized it is just a “rubber stamp” procedure with no possibility to contribute to modifying/improving the product of a long, time consuming and expensive program. A written document will be presented at the planned ICS meeting in Belgium (2006).

7. SUMMARY OF EXPENDITURES IN 2004:

I. INCOME	US DOLLARS
Carry-over from 2003	<i>deficit</i>
2003 ICS subvention	3150.
of which 1350 for ISSC Expenses and 1800 for Florence IGC expenses	
II. EXPENDITURES	US DOLLARS
Exchange charges	10
Mail	52
Office material	97
Secretarial help	500
Meeting in Denver (Nov. 2004)	1000
ISSC Newsletter 3, 4, and 5	250
<i>IGC FLORENCE:</i>	
Travel, subscription, lodging of chair, vice-chair, secretary	2940
Subvention to J. Zalasiewicz	<u>360</u>
Total Expenses	5209
Excess expenditures over income	2059

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

Task Group on Sequence Stratigraphy is new. The energetic Task group leader Ashton Embry, specialist on shallow water clastics, selected the following members:

- Don Owen (USA) specialist on shallow water and non-marine clastic. He is an ISSC member and was also a member of the pre-Dallas Working Group on Sequence Stratigraphy;
- Piero Gianolla (Italy), specialist on carbonates. ISSC member;
- Benoit Beauchamp (Canada), specialist on carbonates. Not an ISSC members.
- Johannessen (Norway), specialist on deep water clastics and seismic. Not an ISSC member

The topic was discussed at the ISSC Workshop in Florence with the presentation of the Keynote “Third generation (3G) Sequence Stratigraphy” by Ashton Embry (see ISSC Newsletter n. 5), and prior to the NACSN in Denver (planning meeting of Embry with Owen).

Task Group on Cyclostratigraphy is a continuation of the previous WG on the same subject, appointed in 1999. Previous steps are represented by:

- a) First report presented by the WG (ISSC Circular n. 97) distributed in 2000.
- b) International workshop “*Multidisciplinary approach to cyclostratigraphy*” Sorrento, Italy, May 2001 (now published)
- c) Second report of the Cyclostratigraphy working Group (ISSC Circular n. 100) distributed in 2002.
- d) Presentation of the Keynote “What is a cycle? Definitions and terminology in cyclostratigraphy” by Andreas Strasser at the Florence workshop, see ISSC Newsletter n. 5.

Working Groups will be appointed – as appropriate- when a realistic plan for the future international guidebook will be prepared within 2005,

- a WG for biostratigraphy,
- a WG for physical stratigraphy,
- a WG for chemical stratigraphy.

No WG is foreseen for chronostratigraphy prior to the settlement of the present intellectualistic debate on time versus time-rock units.

A WG on lithostratigraphy will be appointed only after the sequence stratigraphy is clarified.

Each Task Group and/or Working Group will be lead by an ISSC member and consist of a limited number of scientists with broad international experience. The products of their efforts will be circulated through ISSC newsletter, first among members, then within a larger community through the national liaisons prior to being published in a shared guide.

9. BUDGET AND ICS COMPONENT FOR 2005 (*US Dollars*)

- General office expenses	50
- ISSC Newsletter n. 6, 7 and 8	250
- Contribution towards cost of upgrading the web-site	550
- Contributions to Conveners to help costs of	
- Task Groups	2000
- Support for meetings in Europe (Freibourg, Postdam, Graz)	1000
- Support for meeting in USA	1000
- Secretarial help	500

TOTAL BUDGET REQUEST	5250
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Potential funding sources outside IUGS

The Subcommittee does not receive financial support from outside IUGS-ICS, except for office support from the host institution (University of Milano). Members obtain individual (personal?) research or conference grants for activities related to the Subcommittee.

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) will be maintained and updated by the ISSC Secretary in Milano. This will include assistance with setting up and upgrading the software, for a nominal payment.

The first attempts to obtain external funds were only in part successful, but we will try harder. Next year (2005) is very important for the future of ISSC: it should be a turning point and internal/external funds are wanted.

10. REVIEW CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2000-2004)

Significant results of the International Subcommittee on Stratigraphic Classification activities are listed below.

Creation and world-wide distribution of ISSC Circulars:

- Circular 97 (July 10, 2000), Circular 98 (October 27, 2000)
- Circular 99 (July 26, 2001)
- 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)

Co-organization and co-sponsorship of *Hedberg Conference* (Dallas, Texas, August 26-30, 2001) in “Sequence Stratigraphic and Allostratigraphic Principles and Concepts”. The objective of the conference was “ To provide input into the deliberations of the ISSC and of the North American Commission on Stratigraphic Nomenclature on allostratigraphic and sequence stratigraphic units for possible amendment to the International Stratigraphic Guide and the North American Stratigraphic Code and to debate the merits of utilizing an integrated allostratigraphic and sequence stratigraphic approach to describe and interpret the stratigraphic record”. The flavor of the conference can be summarized using the M. B. Cita words (see her report published in Appendix A, ISSC Circular no. 100): “The Hedberg Conference succeeded to create a good, open discussion on principles and applications, with sedimentologists, micropaleontologists, basin analysts, geophysicists, geochemists, field geologists of at least three generations interacting actively. The lesson I learnt is that those who create the rules of stratigraphic terminology must keep some flexibility and incorporate new developments and methodologies, but should avoid to formalize interpretive definitions. Formalization ensures stability in nomenclature, which is important, but formalization of non observational entities has to be discouraged.”

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.

Organization of the ISSC Business meeting during the 32nd IGC in Florence (Italy).

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”.

11. OBJECTIVES AND WORK PLAN FOR NEXT 5 YEARS (2005-2009)

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 for the next four years is to arrive at the 33th IGC to be held in Oslo with a new *International Guidebook* for stratigraphic classification printed. 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. The new guide will be multi-authored, with task groups directly involved in the preparation of the various chapters. 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 for the Cenozoic and one for the Quaternary.

The large and internationally widespread composition of ISSC, the presence of numerous chairmen of national or multinational commissions on Stratigraphy within the Subcommission, the interactive attitude developed in the last several months guarantee a large degree of acceptance, since all the documents will be widely circulated, commented and revised in an open democratic way.

It is a demanding task but the dice is thrown.

APPENDIX [*Names and Addresses of Current Officers and Voting Members, 2004-2008*]

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