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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 2003**

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

This Consolidated Annual Report of 2003 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** details the plans for 2004 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.
- **Appendix 1** (attached file GSSPs\_Dec2003.XLS) lists the established and potential Global Boundary Stratotype Sections and Points (GSSPs) with approximate ages.

## 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 2003 structure of ICS consists of the Executive Committee, an executive task group (Stratigraphic Information Services), and 15 Subcommissions dealing with the major chronostratigraphic units, and aspects of stratigraphic classification and time scales.

#### **Subcommissions:**

- Quaternary (organized 2002)
- Neogene
- Paleogene
- Cretaceous
- Jurassic
- Triassic
- Permian
- Carboniferous
- Devonian
- Silurian
- Ordovician
- Cambrian
- Terminal Proterozoic Period  
*(completes its mission in 2004,  
then merges with Precambrian)*
- Precambrian (organized 2003)
- Stratigraphic Classification

#### **Executive Task Group:**

- Stratigraphic Information Services

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

The subcommissions of ICS together have about 350 titular members. When the corresponding members of Subcommissions are added, several thousand stratigraphers worldwide participate in the activities of ICS. In addition, many countries have national stratigraphic committees, with which ICS tries to establish or maintain contacts. The members of the Full Commission (i.e. the 5 members of the Executive + webmaster and the officers of the 15 Subcommissions and task group) come from 19 countries: Argentina, Australia, Belgium, Brazil, Canada, China, France, Germany, Ireland, Italy, Netherlands, New Zealand, Norway, Romania, Russia, Spain, Switzerland, United Kingdom, and USA. The voting memberships of the aggregate subcommissions include at least 30 more nations.

## Websites:

ICS main site	<a href="http://www.stratigraphy.org">www.stratigraphy.org</a>
Quaternary	<a href="http://www.quaternary.stratigraphy.org.uk">www.quaternary.stratigraphy.org.uk</a>
Neogene	<a href="http://www.geo.uu.nl/sns">www.geo.uu.nl/sns</a>
Paleogene	<a href="http://134.2.48.3/index.htm">134.2.48.3/index.htm</a>
Lutetian GSSP task group	<a href="http://wzar.unizar.es/perso/emolina/ypresian.html">wzar.unizar.es/perso/emolina/ypresian.html</a>
Triassic (newsletter)	<a href="http://www.uni-muenster.de/GeoPalaeontologie/Palaeo/Palbot/albomsl.htm">www.uni-muenster.de/GeoPalaeontologie/Palaeo/Palbot/albomsl.htm</a>
Permian (newsletter)	<a href="http://pri.boisestate.edu/permophiles">pri.boisestate.edu/permophiles</a>
Devonian	<a href="http://sds.uta.edu/">sds.uta.edu/</a>
Silurian (newsletter)	<a href="http://iago.stfx.ca/people/mmelchin/SILURIAN9.HTM">iago.stfx.ca/people/mmelchin/SILURIAN9.HTM</a>
Ordovician (discussion site)	<a href="http://seis.natsci.csulb.edu/ordstrat2/default.htm">seis.natsci.csulb.edu/ordstrat2/default.htm</a>
Cambrian	<a href="http://www.uni-wuerzburg.de/palaeontologie/ISCS/index.html">www.uni-wuerzburg.de/palaeontologie/ISCS/index.html</a>
Stratigraphic Classification	<a href="http://www.geocities.com/issc_arg">www.geocities.com/issc_arg</a> (commercial site)
Stratigraphic Information Systems	
<b>CHRONOS</b> database network	<a href="http://www.chronos.org">www.chronos.org</a>
(concept posted at:)	<a href="http://www.eas.purdue.edu/chronos">www.eas.purdue.edu/chronos</a>

### 3a. Nominated ICS Executive Officers for 2004-2008:

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; and 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 forwarded to IUGS for ratification.

Chair: **Felix Gradstein** (Oslo, Norway) *will serve a second and last term*  
Vice-Chair: **Stanley Finney** (California, USA) *will serve a second and last term*  
Secretary (*appointed by Chair*): James Ogg (Indiana, USA)

## 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. Informally, every officer and member of ICS donates their own time, office space, institutional facilities, and other components to the activities of the organization.

## 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, 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). 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 2003

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. However, the Executive notes that in order to maintain momentum, and become a truly global organization, ICS funding has to improve (see section below on *Chief Problems encountered in 2003*!)

- Ongoing standardization of the International Chronostratigraphic Scale
  - Approval and ratification of the GSSPs for the Tortonian (Neogene), Eocene/Ypresian (Paleogene), Turonian (Cretaceous), and Furongian/Paibian (Cambrian) stages.
  - Currently voting on approval of GSSPs for Lopingian/Wuchiapingian (Permian) and the Ediacaran Period (late Neoproterozoic).
  - Active engagement with the global Geochronology community via two workshops co-sponsored by ICS – one in Canada and one in the United States – to jointly pursue time scale objectives and to improve error analysis in geochronology.
- 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 has submitted a special request to IUGS for the second planning workshop on “Future Directions in Stratigraphy”, to be chaired by Stan Finney in 2005 in Zaragoza, Spain.
  - Establishment of a Precambrian Subcommission to consider “natural” divisions of 80% of Earth’s history. The Precambrian Subcommission will also incorporate the current Subcommission on Terminal Proterozoic.
  - Consolidation of the Stratigraphic Information Services task group, co-sponsoring its new website at [www.stratigraphy.org](http://www.stratigraphy.org) (hosted on **CHRONOS** server, Iowa State Univ.), and initiated a web-service to display regional stratigraphic schemes tied to the International Chronostratigraphic Scale.
  - Monitoring election of officers for 2004-2008 in the various subcommissions to achieve

- global and specialization diversity within each subcommission.
  - Established formal links with the journal *Lethaia* as the primary outlet for ICS-sponsored scientific studies.
  - Organized two Stratigraphic Prizes to be awarded during the 32<sup>nd</sup> IGC in Florence in 2004 – the Digby McLaren Prize for lifetime stratigraphic accomplishments and the ICS Prize for an outstanding piece of stratigraphic research by a young stratigrapher. The ICS prize committee, ably chaired by Nicol Morton, is currently evaluating nominations.
- Selected Major Products under ICS Executive
  - F.M. Gradstein, J.G. Ogg *et al.* brought the new International Geologic Time Scale to completion (GTS2004, being published by Cambridge University Press). This five-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.
  - Organized publication in 2004 of the new International Stratigraphic Chart (in *Episodes*), and an overview of established GSSPs (in *Lethaia*).

#### Quaternary Subcommittee (jointly with INQUA)

- At the ICS strategic planning meeting in Urbino (June, 2002), it was decided to establish a joint ICS-INQUA subcommittee for formalizing the main divisions of Pleistocene-Holocene stratigraphy. The “Quaternary” is an informal term, which encompasses the major glaciation-dominated climate of the past 2.6 myr (spanning the last portion of the Pliocene, the Pleistocene, and the Holocene epochs) of the Neogene Period. Rather than having “stages”, the Pleistocene will be formally divided into three sub-series (Lower, Middle, Upper) to avoid confusion with the multiple existing “stage” nomenclatures used by Quaternary workers for isotope, anthropology, faunal, and other episodes through this interval.
- Task groups were established for the base-Middle and base-Upper Pleistocene GSSPs (probably near the base of the Brunhes paleomagnetic chron at 0.78 Ma, and beginning of the Late Interglacial (Eemian) at 0.12 Ma, respectively). A third task group is deciding placement of the Holocene/Pleistocene series boundary (probably at approximately 10,000 C-14 years).

#### Neogene Subcommittee

- The GSSP for the base of the **Tortonian** Stage (Miocene) at the level corresponding with the midpoint of the sapropel of cycle 76 in the Monte dei Corvi beach section near Ancona (Italy) was accepted by ICS and ratified by IUGS in 2003.
- The potential GSSP for the base of the Serravallian Stage (Miocene) at the Ras il Pellegrin section on Malta has yielded high-resolution integrated stratigraphy and astronomical tuning. The Mi-3 oxygen-isotope shift may serve as the prime correlation criterion.

#### Paleogene Subcommittee

- Ratification by IUGS of the base of the **Ypresian** (=base of the Eocene) in the Dababiya Section near Luxor, Egypt. This is the first GSSP to use a global excursion in carbon isotopes as the primary correlation horizon, instead of a fossil event. [*Some other GSSPs have utilized other non-biologic events as primary correlation criteria, including oxygen-isotope cycles (e.g., Gelasian), iridium anomaly (base-Cenozoic), or magnetic reversals (e.g., Zanclean).*] All series boundaries of the Paleogene are now fixed by ratified GSSPs. The results of the work on the Eocene GSSP are extensively documented in a special issue of the journal

### *Micropaleontology.*

- An outstanding “**Symposium on the Paleogene**” with the theme “*Preparing for Modern Life and Climate*” was held in Leuven (Belgium) on August 25-30, 2003 and attended by approximately 200 participants.

### **Cretaceous Subcommittee**

- **Turonian**: The GSSP at Pueblo, Colorado, USA was accepted by ICS and ratified by IUGS in 2003.
- **Campanian**: The proposal GSSP at Waxahachie, Texas, USA, has had extensive biostratigraphic investigations, but there is still an uncertainty to be resolved over ownership of the land.
- **Hauterivian**: The local council is conserving the potential GSSP at a roadside cut at La Charce, France,, and an updated GSSP proposal will be submitted in 2004.
- **Santonian** and **Barremian**: Key research was published on potential GSSP candidates.

### **Jurassic Subcommittee**

- Planning for the 7<sup>th</sup> International Jurassic Symposium in Poland is well under way.
- Proposal for **Pliensbachian** GSSP in Yorkshire, England published in *Eclogae geologicae Helveticae*; and the subcommittee financed a magnetostratigraphy study on this section.
- The **Oxfordian** Working Group held two field meetings at potential GSSPs (in Dorset of England, and in Provence of SE France). The two sections will be proposed, one as GSSP and the other as ASP in 2004.
- The **Kimmeridgian** Working Group held field meetings at the potential GSSPs of Staffin (Isle of Skye, north-west Scotland) and Mont Crussol (Ardèche, France). One of the two sections will be proposed as GSSP and the other as ASP.

### **Triassic Subcommittee**

- Co-sponsoring of meeting in Italy on “Triassic geochronology and cyclostratigraphy – a field symposium”. At this meeting, the Task Group for base **Anisian** agreed that the appearance of the conodont *Chiosella timorensis* was the best datum for GSSP definition and corresponds to a significant change in the ammonoid fauna, and the peak of a negative C isotope anomaly. This corresponds to the base of “bed 7” at Desli Caira, in Dobrogea, Romania, and a formal proposal is being prepared. Results from the Nanpanjiang Basin in South China fix this boundary at about 247 Ma.
- **Ladinian**: At this same meeting, this task group reduced the options to two potential GSSP locations.
- **Carnian**: A proposal for Stuooures in Italy as a candidate for a GSSP has been prepared, but a decision awaits completion of paleontological studies in Spiti and Nevada.
- **Norian**: Correlations between potential GSSPs in Canada and in Italy were prepared.
- **Rhaetian**: A multi-disciplinary documentation of this time interval is underway.

### **Permian Subcommittee**

- The proposal for the **Lopingian** GSSP was submitted by the Subcommittee, and is currently undergoing a second voting round by ICS after extensive revision. It should be submitted to IUGS by February, 2004.
- XV International Congress on Carboniferous-Permian Stratigraphy (Utrecht, The Netherlands in August 2003).

### **Carboniferous Subcommittee**

- A very successful International Congress on Carboniferous-Permian Stratigraphy was held in Utrecht in August 2003, at which major advances were made in reaching international

- agreement on subdivision and stratigraphy of the Carboniferous.
- The subcommission now has four functioning Task Groups dealing with all the likely Stage and Series boundaries to be recognized within both subsystems of the Carboniferous.
- The subcommission voted to subdivide **each** of the two **subsystems**, Mississippian and Pennsylvanian, **into three series (Lower, Middle, Upper)**. Because there are current plans for only seven stages in the Carboniferous, each of the lower five series at the current time comprises only one stage.
- The subcommission voted to withdraw official recognition of stage rank from the 15 named and lettered stages previously approved in the upper part of the western European regional classification. The former western European stages can be recognized only as regional substages.
- These decisions clear the way for formal GSSPs to define the boundaries of the global Carboniferous stages of Tournaisian, Viséan, Serpukhovian, Bashkirian, Moscovian, Kasimovian, and Gzhelian (in ascending order).
- Viséan**: Details of the proposed GSSP at Pengchong, Guangxi, China were published in *Episodes*, and this GSSP will soon be submitted to a vote by the subcommission.

### Devonian Subcommission

- A formal vote for the subdivision of the **Famennian** into 3 versus 4 substages resulted in a tie.
- Proposals for defining the bases of middle- and upper **Givetian** substages have been formulated.

### Silurian Subcommission

- Revised biostratigraphy of the Ordovician-Silurian boundary GSSP implies that the primary biostratigraphic correlation criterion for the base of Silurian requires modification, and this is undergoing a formal vote.
- The GSSP for base of Wenlock series has ambiguous biostratigraphy, and a potential replacement in the Czech Republic is undergoing investigation.

### Ordovician Subcommission

- Dedication of the Diabasbrottet and Fagelsang **GSSPs** in Sweden in May 2003 was attended by many Scandinavian and outside-Scandinavia stratigraphers, the national press, the ICS Executive, and the Ordovician Subcommission executive. The Diabasbrottet GSSP defines **base of Second Stage** of Ordovician System (i.e., the upper stage of the Lower Ordovician Series), which will be named after the upper boundary of the stage is defined. The Fagelsang GSSP defines **base of Upper Ordovician Series** and the **Fifth Stage** of the Ordovician System (i.e. lower stage of the Upper Ordovician Series), which will be named after the upper boundary of the stage is defined.
- The **9<sup>th</sup> International Symposium on the Ordovician System** was held in San Juan, Argentina in August 2003 (3 days plus field trips, 130 participants, 124 papers).
- Base of Middle Ordovician Series** (base of Fifth Stage): Two candidate primary correlation levels have been proposed, and candidate sections are in Argentina and China.
- Decision to **subdivide Upper Ordovician Series into three stages**, with boundaries between them placed at biohorizons with known potential for reliable global correlation and for which there exists suitable stratotype sections. A January 10, 2004 deadline has been set for GSSP proposals for all boundaries for all Upper Ordovician stages. The goal is to move towards voting on candidate GSSPs in the Spring 2004.

### Cambrian Subcommission

- Voting had indicated that the *Ptychagnostus/Acidusus atavus*, the *Cordylodus proavus*, the *G. reticulatus*, the *Ptychagnostus punctuosus*, the *Pt. gibbus*, and *Oryctocephalus indicus* levels and horizons are potential GSSPs for major chronostratigraphic levels in the Cambrian.



Working Groups are searching for the *best sections* in which these levels might be found to establish a GSSP.

- Correlation chart on the Cambrian System of the Mediterranean Region and the Gondwanan sector of Central Europe is in progress.
- A working group on Geochemical Correlation has been established. The major task of this WG is the application of non-conventional (i.e. non-paleontologic) correlation techniques and aspects of Cambrian stratigraphy such as isotope profiles based on carbon, oxygen, strontium and sulphur, and magnetostratigraphy, and numeric age determinations and to calibrate them with biostratigraphic data.

### Terminal Proterozoic Period Subcommittee

- The Subcommittee placed the beginning of the terminal Proterozoic period, to be named **Ediacaran Period**, at a **GSSP** located at the base of the Nuccaleena cap carbonate above Marinoan tillites exposed along Enorama Creek in the Flinders Ranges of South Australia. This is the first new Period to be formally added to the Geologic Time Scale in 50 years. The preceding global Marinoan glaciation has an age of 640-630 Ma.
- Several volumes summarize these data, including *Precambrian Research* volume 100(1-3), *The Neoproterozoic of Australia*, edited by Malcolm Walter and the recent book entitled *Life on a Young Planet* by Andrew Knoll (2003, Princeton University Press).

### International Stratigraphic Classification Subcommittee

- A new bottom-up approach to stratigraphic classification to test the degree of acceptance of the present rules (International Stratigraphic Guides edited by Hedberg, 1976 and by Salvador, 1994) has been distributed to old and new ISSC members.

### Stratigraphic Information System

- This task-oriented group was established in late 2001, and has formulated an ambitious work plan that, amongst others, will generate new educational stratigraphic products, focus on specific areas of concern in the modern Geologic Time Scale. Its website under ICS ([www.stratigraphy.org](http://www.stratigraphy.org)) is flourishing.

## 7. CHIEF PROBLEMS ENCOUNTERED IN 2003

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 subcommittee.

### ICS Executive Committee

- Progress on Global Stratotype Section and Point (GSSP) selection did not proceed in the timely manner indicated by several subcommittee projections in 2001. In particular, there are two remaining Systems (Jurassic and Cretaceous) with no GSSPs at their base. However, both the Jurassic and Cretaceous subcommittees report that these GSSPs are expected to be in place by 2006.
- Many subcommittee chairs and other officers in 2004 have a retired status (e.g., the chairs of Paleogene, Cretaceous, Jurassic, Devonian, Cambrian, and Stratigraphic Classification subcommittees). As a result, 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 in the nations of Europe and North America. However, incorporation of more active participation from African, Mideast, 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' with membership contributions, including potential income from journal and other semi-commercial ventures.

#### Quaternary Subcommission (joint with INQUA)

- No serious problems.

#### Neogene Subcommission

- No serious problems.

#### Paleogene Subcommission

- ISPS cannot adequately support its working groups and regional committees. In particular, it would need a substantial increase in budget in order to support and in part to reactivate regional committees in poorer areas (e.g. Africa, Indian Subcontinent, SE Asia).

#### Cretaceous Subcommission

- A GSSP for the **Jurassic/Cretaceous Boundary** remains an elusive goal.
- Definition of **Albian** and **Aptian** stage boundaries remains difficult, either for lack of consensus or for apparent lack of suitable global markers.
- While many scientists are eager to join working groups, it is becoming more difficult to get people to commit time to preparing the documentation for GSSPs.

#### Jurassic Subcommission

- Difficulties in obtaining research grants for stratigraphic topics and travel grants for meetings of Working Groups, which are often given low priority by National grant-awarding agencies.
- The **Triassic/Jurassic Boundary** – endemism has made it impossible so far to establish inter-continental correlations with the requisite precision, so discussions are continuing.
- The **Toarcian** Working Group abandoned as impractical and unsuitable for access and security reasons a favored section in western Algeria as candidate for GSSP. An alternative section at Peniche, western Portugal, has been identified as a strong candidate.

#### Triassic Subcommission

- The current secretary retired from the British Geological Survey and no longer has facilities to fulfill his duties.
- The base **Anisian** GSSP deliberations remained contentious and opinions are strongly polarized around two candidates.
- *Albertiana* production costs increased as did the pressure for additional financial subsidy.

#### Permian Subcommission

- No serious problems.

#### Carboniferous Subcommission

- No serious problems.

#### Devonian Subcommission

- The SDS field trip and annual meeting scheduled for 2003 in Iran was cancelled because of the critical situation in that area.

### Silurian Subcommittee

- No serious problems.

### Ordovician Subcommittee

- The Subcommittee was forced to devise a new strategies for global subdivision of the Middle and Upper Ordovician series.
- The lack of travel support limited the participation of some Voting Members in Subcommittee activities.

### Cambrian Subcommittee

- The cancellation of the two meetings under patronage of the ISCS (in Kazakhstan and South China) in 2003 creates a delay in the Working Group activities, namely for the *Working Group on a Acidusus atavus level GSSP* and the new *Working Group on a Oryctocephalus indicus level GSSP on that of another fossil in a comparable stratigraphic position*.
- The majority of the newly established Working Groups require intensive field studies and substantial financial support to achieve rapid progress in long range correlation and definition of urgently needed global stages. Both the subcommittee Chair and Secretary are momentarily without a permanent position and therefore have limited access to funding of scientific activities.

### Terminal Proterozoic Period Subcommittee

- It is recommended that the subcommittee be expanded into a more comprehensive **Neoproterozoic working group** under the new Precambrian Subcommittee that can build an improved stratigraphic framework for the entire Era. We need fresh problems, fresh ideas, and fresh blood.

### International Stratigraphic Classification Subcommittee

- Slow response from members. Postponement in forming a new WG to analyze Chemostratigraphy as a new category of stratigraphic classification.

### Stratigraphic Information System

- No serious problems.

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

The ICS Executive Bureau established the following budget for April 2003 – March 2004 after consideration for relative needs, planned activities, and funding requests of the subcommittees; and re-allocating based on the \$5600 reduction in the total ICS request by IUGS. The financial reports of individual subcommittees are contained within their attached annual reports. All Subcommittees were limited to a maximum of \$750 for communications and administration costs.

Subcommittee	Requested by ICS 2003	Reduced 2003 Allocation	Comments on distribution
Quaternary	\$2000	\$1750	<i>New Subcommittee</i>
Neogene	2000	1750	
Paleogene	3000	2640	<i>Major Paleogene symposium. Special travel needs included in ICS special fund.</i>

Cretaceous	800	<b>700</b>	
Jurassic	3500	<b>3080</b>	<i>Support for field workshops for potential GSSP evaluation</i>
Triassic	3000	<b>2500</b>	<i>Support for field workshops for potential GSSP evaluation</i>
Permian	1000	<b>900</b>	
Carboniferous	1000	<b>900</b>	
Devonian	1500	<b>1300</b>	
Silurian	1000	<b>900</b>	
Ordovician	2500	<b>2000</b>	<i>Support for field workshops for potential GSSP evaluation</i>
Cambrian	2350	<b>2200</b>	
T. Proterozoic	0	<b>0</b>	<i>Subcommission did not expend funds granted in 2002.</i>
Precambrian	0	<b>500</b>	<i>Subcommission was reborn only in late 2003</i>
Classification	1000	<b>880</b>	
Strat. Info. System	3000	<b>2500</b>	<i>Webmaster, web software, etc..</i>
<b>Subcommission Total</b>	<b>\$27,650</b>	<b>\$24,500</b>	
ICS Executive	3000	<b>2500</b>	<i>Meeting travel, mailings, etc.</i>
<i>Special travel needs (*)</i>	5000	<b>3500</b>	<i>See explanation below (*)</i>
Contingency	5000	<b>4500</b>	<i>Special Subcommission and ICS needs</i>
<b>TOTAL (all funds in USD)</b>	<b>40,650</b>	<b>35,000</b>	<i>\$27000 for continuing operations; \$8000 for 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). After the IUGS reduced the total ICS budget (with no special allocation for this travel fund), then we decided that its importance justified a uniform 10% re-allocation or "tax" on all subcommission and Executive operating budgets. These funds were re-allocated to Paleogene, Triassic, Permian, Silurian and Stratigraphic Classification in approximately \$800 grants by the ICS secretary-treasurer.

The change-over in IUGS Treasurer created a funding problem in 2003, with no IUGS transfers received prior to June. To accelerate partial funding, the IUGS Treasurer made direct Euro bank transfers to select subcommissions (total of 11,500 \$US), but the bulk of the ICS funds (\$23,500) was not received until September 2003. Therefore, rather than operating on a "budget" during most of 2003, the ICS and its subcommissions were partially operating on a "we will reimburse you later" pledge to different ICS officers and subcommissions. The 10% drop in the value of the U.S. dollar during this delay in transferring the majority of the funds (still the same dollar amount) implied an effective further "reduction" in the operating budget of ICS.

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 and for initiating "special opportunity" projects that may arise during the fiscal year. At this point (early December) in the 2003

(considering that the IUGS funds were not received until September), this fund has been used for GSSP graphics and other information that is placed on the ICS website ([www.stratigraphy.org](http://www.stratigraphy.org)), for additional subcommission travel requests (Permian-Carboniferous symposium), and for partial expenses of the ICS Executive meeting held in May 2003 in Denmark.

## **9. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED FOR April 2004-March 2005:**

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.

### **SUMMARY OF IGC (Florence) PLANS**

All subcommissions will be having activities for the 32<sup>nd</sup> International Geological Congress (Florence, 2004):

#### **ICS Executive Committee**

Convening a Special Symposium Sii "*The Geologic Time Scale*"  
Holding the ICS business meeting with a special scientific contribution on the Ediacaran Period by Andrew Knoll, and holding hearings with several subcommission officers on the 2004-2008 Strategic Planning initiative.

#### **Quaternary Subcommission**

Co-sponsoring TWO sessions -- one on Pleistocene mammalian stratigraphy and a second on Pleistocene chronostratigraphy.

#### **Neogene Subcommission**

Running IGC field trip to emphasize the Neogene Astronomical Time Scale.

#### **Paleogene Subcommission**

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

#### **Cretaceous Subcommission**

One session will be hosted by the subcommission.

#### **Jurassic Subcommission**

Organized the 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 involve the Triassic Subcommission and its members.

#### **Permian Subcommission**

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

#### **Carboniferous Subcommission**

Task group meetings will be held.

#### **Devonian Subcommission**

Organized the symposium on "*High-resolution stratigraphy for the subdivision of the Devonian stages*".

The subcommission plans to come to conclusions on the subdivision of the Emsian, Givetian, Frasnian and Famennian stages at the 32nd IGC, Florence, 2004.

#### **Silurian Subcommission**

Involved with 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 will be held.

#### **Terminal Proterozoic Subcommission**

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

#### **Stratigraphic Classification Subcommission**

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

### **SUMMARY OF GENERAL PLANS IN ICS**

#### **ICS Executive Committee**

- Planning meeting in May, 2004, in preparation for the extensive suite of activities at the Florence IGC (as listed above), and setting strategic goals for the next 4 years.
- Publication 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.
- Preparing for the ICS-wide "Strategic Planning" meeting in Zaragoza, Spain in 2005.
- Atlas of the Standard Geologic Time Scale to be hosted on [www.stratigraphy.org](http://www.stratigraphy.org), and linked to other stratigraphic websites such as NORGES and **CHRONOS**.
- A Quantitative Stratigraphy task group may be formed to improve the role of quantitative stratigraphy in geological problem solving. Although interest in application of existing methods and programs is growing, lack of a program to 'make' the data is a serious bottleneck. It is urgent to undertake development of a data input, data management and data transfer interface between the leading quantitative stratigraphic methods and programs RASC, CONOP, UAGRAPH and GRAPHCOR/STRATCOR (under consideration jointly with the **CHRONOS** Project).

#### **Quaternary Subcommission**

- This new subcommission has established 3 task groups to recommend GSSPs for base-Holocene, base-Upper Pleistocene, and base-Middle Pleistocene.

#### **Neogene Subcommission**

- Formal proposal for base-**Serravallian** GSSP is anticipated.
- Publication of a standard geologic time scale for the Neogene.

### Paleogene Subcommittee

- Complete the work on the **GSSPs** of the base of the **Selandian** and **Chattian**.
- Organize a workshop on the future role of the Paleogene Subcommittee. This workshop coincides with the renewal of officers and voting members and will plan future directions and objectives of the subcommittee after the completion of all Paleogene GSSPs.

### Cretaceous Subcommittee

- Three GSSP proposals (**Hauterivian**, **Barremian**, **Santonian**) will be prepared for voting.

### Jurassic Subcommittee

- GSSP proposal for the **Pliensbachian** Stage, approved by the Jurassic Subcommittee in 2003, will be presented to ICS in early 2004.
- The **Toarcian** Working Group will have a field meeting on the Peniche section, Portugal, and a GSSP proposal is likely for 2005.
- The **Oxfordian** Working Group will present a combined GSSP/ASP proposal at the International Geological Congress, Florence, Italy.
- The **Kimmeridgian** Working Group will complete field investigations in France and Poland and review details of Boreal/Tethyan correlation during a joint meeting with the Tithonian WG in Stuttgart, Germany in 2004 to prepare a combined GSSP/ASP proposal.
- A Jurassic Subcommittee website will come on-line.
- A new IGCP Project on correlation between Jurassic rocks formed in marine, marginal and non-marine environments is proposed.

### Triassic Subcommittee

- Formal proposals for base **Olenekian** and base **Anisian** GSSPs are anticipated.
- Possible agreement on the **base** for the **Carnian**, **Norian**, and/or **Rhaetian** stages at IGC in August, 2004.
- Vote on two candidates for the contentious base **Ladinian** GSSP within the task group. In the event of no majority decision, the group will likely be reconstituted under a new Chair.
- Co-sponsorship (with IGCP 467) of field workshop on Triassic Time. Spiti-Himalayas, Himajal Pradesh, India, approx. June 25 to July 10, 2004.

### Permian Subcommittee

- Formal vote on the **Changhsingian** GSSP by the Subcommittee and ICS. This will complete the establishment of all Upper and Middle Permian GSSPs.
- Submittal of formal proposals for candidate GSSPs for Lower Permian stages of **Sakmarian** and **Kungurian**.

### Carboniferous Subcommittee

- **Viséan** – Proposed GSSP to be presented for a vote.
- **Moscovian** – Formal proposals for the boundary-defining event to be submitted by early April, 2004.
- **Kasimovian** and **Gzhelian** – Task group meetings in Oviedo, Spain, prior to IGC in Florence.

### Devonian Subcommittee

- SDS will come to a consensus on the number of substages for the Givetian (2 or 3) and for the Famennian (3 or 4).
- International meeting in Rabat, Morocco, hosted by the subcommittee and the Institut Scientifique de Rabat: "*Devonian neritic-pelagic correlation and events*" March 1-10 2004.

### Silurian Subcommittee

- The **base of the Silurian** the current GSSP is undergoing a vote for a revised biostratigraphic correlation horizon on the global scale, due to new biostratigraphic results from the Scottish GSSP.
- The GSSP for the **base of the Wenlock** Series yields ambiguous biostratigraphy, therefore a replacement candidate will be proposed.

#### Ordovician Subcommittee

- The goal for 2004 is to select GSSPs for **base of Middle Ordovician** Series and for the **three stages of the Upper Ordovician** Series, and then to formally name all un-named stages. A major subcommittee vote on boundary levels is scheduled for April, 2004.

#### Cambrian Subcommittee

- The main goal of the Cambrian Subdivisions Working Group is to achieve a decision on formal Cambrian global stages and to choose GSSPs.
- The Cambrian Correlation volume for the Mediterranean Region and Central Europe could be close to completion toward the end of 2004.
- Numerous field meetings are planned, and the subcommittee will help organize the *Fourth International Symposium on the Cambrian System* in China in 2005

#### Terminal Proterozoic Period Subcommittee

- The Ediacaran GSSP will be forwarded in early 2004 for ICS vote and IUGS approval. This completes the main task of the subcommittee.
- New leaders are keen to press on with the formal stratigraphic subdivision of the Ediacaran Period.

#### International Stratigraphic Classification Subcommittee

- Task groups on Sequence Stratigraphy and on Cyclostratigraphy are the major new initiatives.

#### Stratigraphic Information System

- Establishing a wide range of on-line information, such as stratigraphic procedures and standards.

#### Communications: Websites, Newsletters and Special Publications by ICS Subcommittees

In addition to a hub website "[www.stratigraphy.org](http://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 2004 (USD \$)

The following budget request is for operations and special initiatives through March 2005 (funds are generally transferred from IUGS to ICS in April; which implies ICS subcommittees must operate on an April-to-March fiscal year). It is important to note that the 2003 allocations of all subcommittees and other programs were reduced by almost 15% in 2003 (ICS had requested a total of \$40,600; and IUGS granted a total of \$35,000, but after a severe drop in the value of the



\$US dollar during a delay in fund transfer – see re-allocation table and other remarks in Item #8 above). The column of "Initial Subcomm Request 2004" is taken from each Subcommittee annual report of 2003 (already adjusted for projected residual balances through March 2004). We (ICS Executive) have added an additional column of "ICS recommended allocation" based on past budgets and performance of the subcommittees.

**Exchange rates:** We have converted all budgets to \$US, using the assumption that one Euro is equivalent to 1.20 \$US and 1 British Pound is 0.6 \$US (Nov 2003 exchange rates).

**Special Budget Categories:**

We have grouped some aspects of the subcommittee requests into aggregate categories of "Special travel needs", "Contingency" and "Florence IGC Participation" categories. The funds will be redistributed by the ICS secretary-treasurer according to the final budget received from IUGS and needs of the subcommittees as their activities occur during 2004 and early 2005. The ICS Contingency Fund is designed to support additional special needs of subcommittee as these arise in the later part of 2004-2005. The Special Travel Needs fund is explained in Section #8 (see above), and is solely for subcommittee use (not for ICS executive officers).

**Florence International Geological Congress activities** – Every ICS subcommittee will be sponsoring IGC symposia, field trips, and other activities during the IGC of August 2004 (see above). In addition to preparing posters to be distributed to IGC participants, the ICS Executive has several other activities, a special booth, and other publications to be distributed (see Work Plan of Section #9). Each subcommittee will be holding business meetings, and the ICS will have a general open meeting to emphasize its progress during the past 4 years, and future plans. However, this extensive participation at the IGC will be very expensive (registration, travel, hotel, booth costs, publication printing, etc.). Therefore, the ICS is requesting a special IUGS allocation to partially cover registration costs of subcommittee officers and the ICS executive (\$500 x 20 people), the special printing costs (\$1000), and a fund for partially reimbursing the travel costs of some ICS participants who are on pension status or require support to be able to attend (\$4000). **This Florence IGC request (\$15,000) is a one-time special request from IUGS, and is not a continuing budget item for future years.**

**Budget Summary:**

The initial total of all Subcommittee and ICS Executive budget requests is \$56,340. These amounts have already been adjusted for external funding sources.

The ICS Chair and Secretary-General have adjusted these requests based on past year's expenditures and comparative rates, but with consideration of special programs in 2003 (as indicated in the above comments). We have also tried to make the request for 2003 similar to the funding in 2003; but with the additional desire to adequately participate in the International Geological Congress in Florence during August 2004.

We therefore request a total allocation of **\$38,200** (routine subcommittee & ICS) + **\$15,000** (for IGC activities) from IUGS for the 2004 fiscal year = **\$53,200** total (USD).

Subcommittee	Reduced 2003 Allocation (Item#8 above)	Initial Subcomm Requests 2004	ICS recommended allocation	Comments on "ICS recommended allocation" to initial subcommittee requests
Quaternary	\$1750	2000	1000	New subcommittee. Funding request for meetings moved to ICS contingency
Neogene	1750	3500	2000	Funding requests for travel moved to "Special travel needs".
Paleogene	2640	6200	3500	Funding requests for travel moved to "Special travel needs".

Cretaceous	<b>700</b>	1650	<b>800</b>	Funding request for meetings moved to ICS contingency. IGC support moved to the composite special request ( <i>below</i> ).
Jurassic	<b>3080</b>	4900	<b>3500</b>	Support for field workshops for GSSP evaluation. Travel subsidies moved to "Special travel needs"
Triassic	<b>2500</b>	4600	<b>3000</b>	<i>Albertiana</i> newsletter subsidy was reduced. IGC support moved to the composite special request ( <i>below</i> ).
Permian	<b>900</b>	1000	<b>1000</b>	
Carboniferous	<b>900</b>	1000	<b>1000</b>	
Devonian	<b>1300</b>	2150	<b>1500</b>	IGC support moved to the composite special request ( <i>below</i> ).
Silurian	<b>900</b>	2000	<b>1000</b>	IGC support moved to the composite special request ( <i>below</i> ).
Ordovician	<b>2000</b>	3500	<b>2500</b>	Field workshops for GSSP evaluation. IGC support moved to the composite special request ( <i>below</i> ).
Cambrian	<b>2200</b>	900	<b>900</b>	
T. Proterozoic	<b>0</b>	0	<b>0</b>	Subcommission did not expend funds granted in 2002.
Precambrian	<b>500</b>	500	<b>500</b>	[NOT YET RECEIVED – same budget as last year]
Classification	<b>880</b>	8700	<b>2000</b>	Requests for funding meetings and task groups re-assigned to ICS contingency, until such activities are organized.
Strat. Info. System	<b>2500</b>	3000	<b>2500</b>	[NOT YET RECEIVED – same budget as last year]
<b>Subcommission Total</b>	<b>27,000</b>	<b>45,600</b>	<b>26,700</b>	
ICS Executive	<b>2500</b>	3000	<b>3000</b>	
<i>Special travel needs</i>	<b>3500</b>	3500	<b>3500</b>	<i>See explanation above</i>
<i>Contingency</i>	<b>4500</b>	5000	<b>5000</b>	<i>See explanation above</i>
<i>Florence IGC Participation</i>		15000	<b>15000</b>	<i>See explanation above – Special 2004 request only</i>
<b>TOTAL (in USD)</b>	<b>35,000</b>	<b>72,100</b>	<b>53,200</b>	

## 11. REVIEW CHIEF ACCOMPLISHMENTS OVER LAST FIVE YEARS (1998-2003)

A combined 4-year review was compiled as part of the ICS report for 2000, and the accomplishments for 2003 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 1998 (listed in stratigraphic order)

#### Neogene

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

- base of the **Gelasian** Stage at Gela, Italy (1998)
- base of the **Piacenzian** Stage at Punta Piccola, Italy (1998)
- base of the **Zanclean** Stage and of the **Pliocene** Series at Eraclea Minoa, Italy (2000)
- base of the **Messinian** Stage at Oued Akrech, Morocco (2000)
- base of the **Tortonian** Stage at the Monte dei Corvi beach section near Ancona, Italy (2003).
- base of the **Neogene** System and of the **Aquitainian** Stage, Lemme-Carrosio section, Italy (1997)

### 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 **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 **Triassic** System at Meisan, China (2001).

### Permian

- base of the **Lopingian** Series (Wuchiapingian stage) anticipated in earliest 2004.
- base of the **Guadalupian** Series (Middle Permian) and component **Roadian**, **Wordian** and **Capitanian** Stages in Guadalupian mountains, USA (2001).
- base of the **Permian** System and of the **Asselian** Stage, in the Aidaralash Creek, Kazakhstan (1998).

### 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*

### 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 (undergoing ICS vote in earliest 2004).

## B. The International Stratigraphic Chart

This new type of International Stratigraphic Chart (divisions of geologic time), highlighting all those units which are formally defined by a GSSP, and leaving in unnamed those time intervals for which no internationally recommendable divisions was available. Such a chart gives an objective picture of the present state of the art in chronostratigraphy. Two color schemes are available: the International Geological Map of the World or 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](http://www.stratigraphy.org).

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

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 2004-2005.

### 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.
- ICS and several of the Subcommissions will hold focused symposia and field trips during the International Geological Congress 2004 in Florence (Italy).

### Quaternary Subcommission

- The immediate objective of the Quaternary Subcommission is to formalize the divisions of the Pleistocene Series and the Holocene/Pleistocene boundary; plus compile 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.
- 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.

### **Paleogene Subcommittee**

- 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:
  - 2004 -- Hauterivian, Barremian and Santonian.
  - 2005 -- Valanginian, Albian and Campanian
    - 2005 will be the 7<sup>th</sup> *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, 3 GSSPs have been ratified, 1 is ready for submission to ICS, 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.
- 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.
- 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 – Anisian and Olenekian
  - 2005 – Ladinian, Carnian, Norian and Rhaetian
  - 2006 -- Summary volume of all Triassic GSSPs. Emphasis switches to choice of non-marine auxiliary sections.

### **Permian Subcommittee**

- Complete Late Permian stage GSSP ratification (Changhsingian, Wuchiapingian) during 2004
- Complete Early Permian GSSP selection during 2005

### **Carboniferous Subcommittee**

- Base Viséan GSSP should be selected within the next year.
- The other stage boundaries should be set by GSSPs within the next four years.
- Radiometric dating will be the emphasis of some subcommittee members for the next five years. 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.

### **Devonian Subcommittee**

- The subcommittee plans to come to conclusions on the subdivision of the Emsian, Givetian, Frasnian and Famennian stages.

### **Silurian Subcommittee**

- The subcommittee is concerned with the relative scarcity of reliable geochronological dates that are biostratigraphically well constrained within the Silurian System. To improve the situation, the subcommittee executive will encourage its members to collaborate in projects that provide new calibrations for Silurian time.

### **Ordovician Subcommittee**

- Approval and ratification of three GSSPs remaining to complete subdivision of Ordovician System with goal of completion by 2005.
- Redirection of Subcommittee's focus to interdisciplinary investigation of the global Ordovician Earth system.

### **Cambrian Subcommittee**

- Completion of global subdivision of Cambrian. Decisions on several GSSPs will be made at the *Fourth International Symposium on the Cambrian System*, Nanjing, China, 2005.
- Four regional correlation chart volumes are on the way.

### **Terminal Proterozoic Period Subcommittee**

- The next phase of subcommittee work will focus on (1) the formal stratigraphic subdivision of the Ediacaran Period and (2) the establishment of a GSSP for a geochronologically defined Sturtian Period that preceded the Ediacaran Period.

### **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 *Stratigraphic Guide*, simple, well illustrated, user-friendly, including both standard and new techniques.

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2000-2004**

1 Jan 2004

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## Subcommission on Quaternary Stratigraphy ANNUAL REPORT 2003

### 1. TITLE OF CONSTITUENT BODY

#### Subcommission on Quaternary Stratigraphy (SQS)

*Submitted by:*

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*Chair, SQS*

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9 December 2003

### 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 Commission on Stratigraphy.

Officers (Chair, two vice-chairmen, secretary), voting members (~~XX~~). (*see Appendix for complete listing*). There are currently three Working Groups established the remit of which is the 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.

This Subcommission was established in 2003, therefore the initial set of officers have requested to serve for 2004-2008.

### 3a. Nominated Officers for 2004-2008:

Chair: Dr. Philip Gibbard Vice-Chair: Dr. Jerry McManus 2nd Vice-Chair: Dr. John van Couvering Secretary: Dr. Thijs van Kolfschoten
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## 4. EXTENT OF NATIONAL/REGIONAL/GLOBAL SUPPORT FROM SOURCES OTHER THAN IUGS

Support of the Chair'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).

## 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 SQS Working Group on Lower-Middle Pleistocene boundary was established in November 2002, comprising some 10 members, chaired by Davide Castradori. At that time members included Thijs Van Kolfschoten (The Netherlands), Andrei Dodonov (Russia), Anastasia Markova (Russia), Jiaqi Lui (China), Charles Turner (UK), Richard Preece, Luc Lourens (The Netherlands), Martin Head (UK), Rainer Gersonde, Cesare Ravazzi (Italy), Lawrence Guy Straus (USA). Additional members Brad Pillans (Australia), Craig Feibel (USA) and Tom Meijer (The Netherlands) were subsequently added.

Davide Castradori asked members to compile a Powerpoint presentation showing stratigraphic datums in the range 1.1 to 0.6 Ma, encompassing the time range of potential interest in defining the boundary, linked to the marine isotope record. This task was completed in February 2003 and circulated to members for comment in early March. Unfortunately at about this time Davide had to step down as chair of the group, owing to pressure of other work commitments. He was replaced by Brad Pillans.

Martin Head and Phil Gibbard convened a one-day symposium on Early-Middle Pleistocene transitions, held at University of Cambridge in mid-April 2003. A number of working group members attended and made presentations (the full report is available on the SQS website: <http://www.quaternary.stratigraphy.org.uk/reports/em.html>).

Some WG members attended the INQUA Congress in Reno in July/August, where a poster session on major subdivision of the Quaternary was convened by Jiaqi Lui and Phil Gibbard. Brad Pillans contributed a poster summarizing the evidence from Australasia in favor of defining the boundary at the Matuyama/Brunhes paleomagnetic boundary (0.78 Ma) – see also the following publication: Pillans, B., 2003, Subdividing the Pleistocene using the Matuyama-Brunhes boundary (MBB): an Australasian perspective. *Quaternary Science Reviews*, 22: 1569-1577.

In November, Brad Pillans circulated a proposal to members, for discussion, that the boundary be defined at or near the MBB. That discussion is continuing, and it is expected that potential GSSPs will be considered in the months before the IGC meeting in Florence in 2004.



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

The Working Group on the **Middle/Late Pleistocene Boundary**, chaired by Professor Thomas Litt (Bonn, Germany), has already begun selecting sites for a potential boundary stratotype. The Middle/Late Pleistocene Boundary is at present not formally defined, but has up till now been placed at the beginning of the Last Interglacial (Eemian) or Marine Isotope Stage 5e (see proposal from the former INQUA Commission on Stratigraphy: Richmond 1996: The INQUA-approved provisional Lower-Middle Pleistocene boundary. In: Turner, C. [ed.]: *The early Middle Pleistocene in Europe*, 319-326; Rotterdam (Balkema). The task of the working group will be therefore the preparation of a formalization of a Global Stratotype Section and Point (GSSP) for the Middle/Upper Subseries of the Pleistocene Series. Very recently, P. L. Gibbard (2003: Definition of the Middle-Upper Pleistocene boundary. *Global and Planetary Change*, 36: 201-208; Amsterdam) proposed that the Saalian-Eemian stage boundary, and thus the Middle-Upper Pleistocene Sub-series boundary-stratotype be defined from a terrestrial locality (Amsterdam-Terminal borehole, The Netherlands). To find an agreement and to formulate an official proposal for the voting members of the SQS, we established a group with a good geographical coverage and with experience from different stratigraphic fields (see below). The next step is to organize a workshop of the working group in Bonn at beginning of 2004.

#### **c. Pleistocene-Holocene Series Boundary**

The Working Group on the **Pleistocene-Holocene Boundary** is chaired by Professor Mike Walker (University of Wales, Lampeter). This Working Group is to be organized through INTIMATE (Integration of Ice Core, Marine and Terrestrial Records), which is a core programme of the INQUA (International Quaternary Union) Palaeoclimate Commission. At the recent INQUA Congress in Reno, Nevada, USA (23-30 July 2003), the Chair of SQS, Dr Phil Gibbard, gave a short paper to the INTIMATE Workshop outlining the background to the proposals by the International Stratigraphy Commission for the establishment of working groups to determine the four key boundaries of the Pleistocene. The Workshop endorsed the proposal that INTIMATE should take on the task of defining the Pleistocene-Holocene GSSP boundary, and that the most suitable site would be the Greenland Ice sheet, using the ice-core record.

#### **d. Other activities**

In addition to the activities noted above, a Subcommittee website has been established at: <http://www.quaternary.stratigraphy.org.uk>. This site is used as the main line of communication for the Subcommittee. As well as showing information on the structure, composition and work programme of the Subcommittee, it includes an information section. Pages are also included on Quaternary stratigraphical nomenclature, history, and new developments. The pages are maintained by Phil Gibbard.

At the INQUA Congress in Reno, Phil Gibbard stepped down as Secretary of the INQUA Commission on Stratigraphy (a post he had held for 4 years). A new Commission structure was established with stratigraphy being included in the Commission on Stratigraphy and Geochronology. The President of this new commission is Brad Pillans, the Vice-President is Thijs van Kolfschoten, and the Secretary is Valerie Hall (Queen's University, Belfast). Phil Gibbard will remain on the Commission as an *ex-officio* member. These officers serve for 4 years in the first instance. The fact that there is considerable overlap in membership between the INQUA and ICS groups will ensure that there is a constant and efficient exchange of information between the two organizations.

### **7. CHIEF PROBLEMS ENCOUNTERED IN 2003**

No major problems.

## 8. SUMMARY OF EXPENDITURE IN 2003:

Establishment of website (address) 2 years initially:	<u>£10.00</u>
TOTAL	£10.00

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

The next INTIMATE Workshop will be held in Germany in September 2004, where the Working Group will be established, and the first round of discussions on the Pleistocene-Holocene boundary will take place. SQS will be co-sponsoring this workshop with INQUA.

The **IGC meeting at Florence** will include four Quaternary sessions including two that will be co-sponsored by SQS, one on Pleistocene mammalian stratigraphy and a second on Pleistocene chronostratigraphy. Members and the full list of Quaternary workers on the INQUA Stratigraphy Commission have been circulated and invited to offer lectures or posters for inclusion in these sessions.

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.

## 10. BUDGET FROM ICS IN 2003 AND REQUESTED FOR 2004

*Currency in British Pounds (£), based on an exchange rate of £1.00 = US\$1.732 (8.12.03)*

### **Actual costs 2003**

Amount received from ICS	£1045
General office expenses	£100
Contribution towards cost of web-site	<u>£20</u>
Current bank balance	£925

### **Proposed costs for 2004**

General office expenses	£100
Contribution towards cost of web-site	£20
Contributions to GSSP Working Groups	£1000
Support for meetings	<u>£1000</u>

**Total 2004 budget** £2120 (\$3672)

**AMOUNT REQUESTED** £1195 (\$2070)

### **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.

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

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

- a. 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.
- b. Formalization of a GSSA for the base of the Holocene Series/Epoch.
- c. An international correlation chart for the most commonly used regional stratigraphic units and isotope stages. No international stage-level subdivisions for the Pleistocene or Holocene will be formalized.
- 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". It is planned to communicate the names of the majority of these individuals by the end of the year; at the time of writing 19 people have agreed to act as voting members.

## APPENDICES [Names and Full Addresses of Current Officers and Voting Members]

### **Chair: Dr. Philip Gibbard**

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Downing Street, Cambridge CB2 3EN, England  
E-mail: plg1@cus.cam.ac.uk

### **Vice-Chair: Dr. Jerry McManus**

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### **2nd Vice-Chair: Dr. John van Couvering**

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### **Secretary: Dr. Thijs van Kolfschoten**

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

### ***Working group leaders and corresponding members***

#### **Working Group on the Pleistocene/Holocene Boundary**

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

#### Members:

INTIMATE group members

#### **Working Group on the Middle/Late Pleistocene Boundary**

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

#### Members:

Dr. Art Bettis (Iowa, USA) art-bettis@uiowa.edu

Dr. Aleid Bosch (Zwolle, The Netherlands) A.Bosch@nitg.tno.nl

Dr. Andrey Dodonov (Moscow, Russia) dodonov@geo.tv-sign.ru

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 (Woodruff's Hole, USA) jmcmanus@whoi.edu

Prof. Tim Partridge (Johannesburg (South Africa)

Dr. Charles Turner (Milton Keynes, UK) c.turner@open.ac.ukconvenor:

#### **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),

### ***List of Quaternary Subcommission Voting Members***

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## SUBCOMMISSION ON NEOGENE STRATIGRAPHY ANNUAL REPORT 2003

### 1. TITLE OF CONSTITUENT BODY

#### Subcommission on Neogene Stratigraphy (SNS)

*Submitted by:*

**Willem Jan Zachariasse,**  
*Chairman SNS*

Faculty of Geosciences, Utrecht University

P.O. Box 80021, 3508 TA Utrecht, Netherlands. E-mail: jwzach@geo.uu.nl.

*Dec, 2003*

### 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. The present SNS consists of an executive bureau (Willem Jan Zachariasse, chair; Davide Castradori, vice-chair and Frits Hilgen, secretary), voting members (20) and corresponding members (38). (*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 Tortonian and 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](http://www.geo.uu.nl/SNS)) is used for news release.

#### 3a. Nominated 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 2003

The proposal for the base-**Tortonian** was approved by the voting members of the SNS and the ICS and was recently ratified 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).

Progress has further 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  $\pm 1$  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 (John *et al.*, *Geol. Soc. Am. Bull.*, v. 115, 2003) for parallel sections located on the nearby island of Gozo. These records allow the straight-forward identification of the main mid-Miocene oxygen isotope shift towards heavier values across the formation boundary, which culminates in the Mi-3 event. This event may 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 (GTS2004) for the Neogene underlain by the astronomical dating method.

## 7. CHIEF PROBLEMS ENCOUNTERED IN 2003

No specific problems were encountered in 2003.

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

Credit on July 2003	Euro 1976
Contribution 2003 ICS to SNS	Euro 1470
<b>Expenditures</b>	
Contribution 2003 SNS to RCNPS	Euro 300
Contribution 2003 SNS to RCMNS	Euro 300
Finalizing measuring and sampling of candidate section base-Serravallian on Malta (early 2004)	Euro 2500

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

Finalizing measuring/sampling the prime candidate section for the **base-Serravallian** (Ras il Pellegrin section on Malta). After having worked out the integrated stratigraphy of the lower part (Upper Globigerina Limestone) we may set a decisive step towards tuning this part of the section. It is our intention to organize a WG meeting on Malta by the end of 2004 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. If a majority opinion is reached then a draft proposal will be written.

The SNS bureau further launched the idea to call attention to the astronomical dating method that underlies the construction of the Neogene Astronomical Time Scale by organizing a post-IGC field trip to Sicily. 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.

Finally, the publication of a revised standard geological **time scale for the Neogene**, which is based on the astronomical dating method, is foreseen (Lourens et al., 2004. The Neogene Period. In: Gradstein, Ogg et al., *A Geological Time Scale 2004*, Cambridge Univ. Press, UK).

## 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

### 2002

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

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

Submission of a proposal for the **Serravallian** GSSP - late 2004 to early 2005.

Organization of workshop(s) 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

### *Subcommission officers*

**Chairman: Willem Jan Zachariasse,**

Faculty of Geosciences, Utrecht University, P.O.Box 80021, 3508 TA Utrecht, The Netherlands, e-mail: jwzach@geo.uu.nl

**Vice Chairman: Davide Castradori,**

AGIP, Laboratoria Bolgiano, Via Maritano 26, I-20097 S.Donato Milanese (MI), Italy, e-mail: davide.castradori@agip.it

**Secretary: Frits J. Hilgen,**

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

### *List of Voting Members*

Aubry, M.P., USA, aubry@rci.rutgers.edu  
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## SUBCOMMISSION ON PALEOGENE STRATIGRAPHY ANNUAL REPORT 2003

### 1. TITLE OF CONSTITUENT BODY

#### Subcommission on Paleogene Stratigraphy (ISPS)

*Submitted by:*

**Hanspeter Luterbacher**

*Chair, ISPS*

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24 October 2003

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

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

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.

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

In 2002 and 2003, good progress has been made in the search for the remaining GSSPs. We hope to present proposals for most of the remaining GSSPs in the near future.

### 3. ORGANIZATION

ISPS is a Subcommission of the International Commission on Stratigraphy.

Officers:

Chair	H.P. Luterbacher, Spain
Vice-Chair	J.Hardenbol, U.S.A.
Secretary	Noël Vandenberghe, Belgium

20 Voting Members (see Appendix) and 82 Corresponding Members

Voting and Corresponding Members are selected regionally to provide representative expertise in the Paleogene stratigraphy of each major area and according to their specialty in order

to cover the main fields of stratigraphic tools used in the Paleogene.

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

- a) Paleocene Working Group  
Chair: B. Schmitz, Sweden
- b) Ypresian/Lutetian Boundary Stratotype Working Group  
Chair: E. Molina, Spain  
Secretary: C. Gonzalvo, Spain
- c) Lutetian/Bartonian Stratotype Working Group  
Chair: R. Fluegeman, U.S.A.
- d) Bartonian/Priabonian und Rupelian/Chattian Boundary Stratotypes Working Group  
Chairwoman: Isabella Premoli Silva, Italy
- e) Regional Committee on North-European Paleogene Stratigraphy  
Chair: E. Steurbaut, Belgium  
Secretary: J.W. Verbeek, Netherlands
- f) South American Regional Committee on Paleogene Stratigraphy  
Chair: N. Malumian, Argentina  
Secretary: C. Nañez, Argentina
- g) Middle East Regional Committee on Paleogene Stratigraphy  
Chair: A. Strougo, Egypt
- h) Regional Committee on Pacific Paleogene Stratigraphy  
Chair: E. Fordyce, New Zealand
- i) Russian Paleogene Commission  
Chair: M.A. Akhmetiev
- j) Working Group on Paleogene Stratigraphy of the North Pacific  
Chair: Yu.B. Gladenkov, Russia
- k) Paleogene Planktonic Foraminifera Working Group  
Chair: Paul Pearson, UK
- l) Paleogene Benthos Working Group  
Chair: L. Hottinger, Switzerland

### 3a. Nominated Officers for 2004-2008:

Chair: E. Molina (Spain) Vice-Chair: . Secretary: <i>to be selected by Chair</i>
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## 4. EXTENT OF NATIONAL/REGIONAL/GLOBAL SUPPORT FROM SOURCES OTHER THAN IUGS

In 2003, ISPS received Euros 3.000,00 as support from IUGS/ICS of which Euros 600,00 have been earmarked as travel assistance to participants of the Paleogene Symposium in Leuven.

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, E.Caus, Spain (start 1996)

Ocean Drilling Program, and some of our members participate also in the work of the “adjacent” ICS subcommissions on Cretaceous and on Neogene Stratigraphy.

## 6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2003

The main event in 2003 has been the “**Symposium on the Paleogene**” held in Leuven (Belgium) on August 25-30, 2003 organized by Noël Vandenberghe and his team. It was attended by approximately 200 participants. During two days, invited speakers reviewed the main fields of Paleogene stratigraphy, whereas the other contributions have been presented as posters. During two days, field trips led to the type areas of the Rupelian and Ypresian stages. The expenses of the Symposium have been largely supported by Flemish agencies and to a very minor part by ISPS.

IUGS has ratified the GSSP of the base of the **Ypresian** (=base of the Eocene) in the Dababiya Section in Upper Egypt. All series boundaries of the Paleogene are now fixed by ratified GSSPs. The results of the work on this GSSP are extensively documented in a special issue of the journal *Micropaleontology*.

E. Steurbaut and Ch. Dupuis have been asked to look into the problems (accessibility and preservation) with the GSSP of the base of the **Danian** (=Cretaceous/Paleogene boundary) at El Kef (Tunisia) and, if necessary, the choice of an alternative to it.

The **website** of ISPS has been periodically updated and replaces the *Newsletter*. In September 2003, the website was transferred to Zaragoza with E. Molina, the future Chair of ISPS.

## 7. CHIEF PROBLEMS ENCOUNTERED IN 2003

The problems encountered this year are essentially the same as those discussed in the previous annual reports.

ISPS can support only very insufficiently its working groups and regional committees. In particular, we would need a substantial increase in our budget in order to support and in part to reactivate regional committees in poorer areas (e.g. Africa, Indian Subcontinent, SE Asia).

Most of the secretarial and other expenses have been covered by the institutions of the officers and other members of ISPS. Since money becomes tighter everywhere, these sources may dry up.

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

**I. Income (IUGS Subvention 2003):** **Euro 3,000.00**  
(of which Euro 600,00 as travel assistance for participants to Leuven Symposium)

### II. Expenditures:

Carry-over deficit 2002	Euro	365.00
Support Symposium Leuven		1,200.00
Travel assistance Leuven		600.00
Support Working Groups and Regional Committees		900.00
Secretarial and postage		378.00

Maintenance ISPS Website 500.00

**Total expenditures for 2003 Euro 3,943.00**

**Deficit for 2003 Euro 943.00**

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

- Organize a symposium on "Paleogene correlations and stratigraphic standards" at the 32<sup>nd</sup> **International Geological Congress in Florence** (August 20-28, 2004).
- Complete the work on the **GSSPs** of the base of the **Selandian** and **Chattian**.
- Publish selected papers presented at the "Symposium on the Paleogene" in Leuven.
- Rejuvenate the list of the Voting Members in compliance with the statutes of ICS.
- 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.
- Organize a workshop on the future role of ISPS. This workshop coincides with the renewal of the list of voting members and of the bureau and is aimed to discuss future directions and objectives of ISPS after the completion of all Paleogene GSSPs.

## **10. BUDGET AND ICS COMPONENT FOR 2004**

Maintenance ISPS Website	Euro	800.00
Secretarial and postage		700.00
Travel Assistance Workshop "Future Directions of ISPS" *)		1,200.00
Support to Working Groups and Regional Committees **)		1,500.00
Carry-over deficit 2003		<u>943.00</u>
<b>Total request for 2004</b>	<b>Euro</b>	<b>5,143.00</b>

\*) The requested sum is intended to support the travel expenses of invited participants who will not be able to attend this workshop otherwise.

\*\*\*) As discussed above, 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.

### **Potential funding sources outside IUGS**

A large part of the administrative and other costs of ISPS is paid for by the parent institutions of the officers and members of the bureau, the working groups and the regional committees.

## **11. REVIEW CHIEF ACCOMPLISHMENTS OVER LAST FIVE YEARS (1999-2003)**

*See sections on Objectives, and on Accomplishments in 2003 (above) for details.*

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

- 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.

### APPENDIX [Current Officers and Voting Members]

#### Chair

Hanspeter Luterbacher  
Valencia 133, 2<sup>o</sup>-1<sup>a</sup>, E-08011 Barcelona, SPAIN  
E-mails: hpluter@yahoo.de, HPLUTER@telefonica.net,  
hanspeter.luterbacher@uni-tuebingen.de

#### Vice-Chair

Jan Hardenbol  
Global Sequence Chronostratigraphy Inc.  
826, Plainwood Drive  
Houston, Texas 77079-4227 USA  
Tel: 1-281-497-8516, Fax: 1-218-597-9065  
Jhardenbol@aol.com

#### Secretary

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

#### Voting Members (full list)

M.-P. Aubry (USA)	H.P. Luterbacher (Spain)
W.A. Berggren (USA)	N. Malumián (Argentinien)
G. Bignot (France)	K.G. Miller (USA)
C. Cavelier (France)	E. Molina (Spain)
G.C. Chapronière (Australia)	I. Premoli Silva (Italy)
K. Drobne (Slovenia)	B. Schmitz (Sweden)
J. Hardenbol (USA)	C.P. Strong (New Zealand)
J. Hooker (UK)	A. Strougo (Egypt)
L. Hottinger (Switzerland)	N. Vandenberghe (Belgium)
V.A. Krashennikov (Russia)	Pinxian Wang (China)



# SUBCOMMISSION ON CRETACEOUS STRATIGRAPHY ANNUAL REPORT 2003

## 1. TITLE OF CONSTITUENT BODY

### Subcommission on Cretaceous Stratigraphy (SCS)

Submitted by:

**Prof. Peter F. Rawson**  
*Chair*

Dept of Earth Sciences, University College London, Gower Street, London WC1E 6BT, UK  
Tel. 20 7679 7326; Fax 20 7388 7614, Email: p.rawson@ucl.ac.uk

10 December, 2003

## 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.

**Officers:**      Chair:            Professor Peter F Rawson, UK  
                         Vice Chair:      Dr Annie V. Dhondt, Belgium  
                         Secretary:        Dr Silvia Gardin, France

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 Task 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 Task Groups.***

### 3a. Nominated Officers for 2004-2008:

Chair:	Prof. Isabella Premoli Silva (Milan, Italy) <i>[one of 2 candidates; all Voting Members voted]</i>
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Vice-Chair:	Prof. Ireneusz (Irek) Walaszczyk (Warsaw, Poland) [one of 3 candidates; all Voting Members voted]
Secretary:	to be appointed by the new Chair

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

SCS receives no formal support other than that from IUGS/ICS.

Working Group members are drawn from every continent. Individual members depend on formal or informal support from their host institutions or grant-giving bodies, both for necessary research and for travel to appropriate meetings. Unfortunately, few institutions provide any direct financial support.

#### 5. 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, in 2005, and will include a session for SCS activities.

The Subcommittee will be hosting a session at the International Congress in Florence, Italy, in 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.

#### 6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2003

The preliminary recommendations/progress reports presented at the *Second International Symposium on Cretaceous Stage Boundaries* (Brussels, September 1995) continue to form the basis for finalizing GSSP proposals.

**Before 2003**, the **Maastrichtian** and **Cenomanian** GSSPs had been proposed and ratified by IUGS:

**2003** saw the following main developments:

**Campanian:** The WG Chair (Professor J M Hancock) has now received reports on the lithostratigraphy, and ammonite, inoceramid, crinoid, nannofossil and planktonic foraminiferal successions of the proposed GSSP at Waxahachie, Texas. But there is still an uncertainty to be resolved over ownership of the land.

**Santonian:** The WG met in Bilbao in 2002. Papers from that meeting are now in press in a special issue of *Cretaceous Research*, edited by Annie Dhondt, Marcos Lamolda and Jose M Pons. They include several papers on the Coniacian/Santonian boundary at the Olazagutia Quarry, a candidate for the GSSP for the base of the Santonian.

**Turonian:** A proposal for the GSSP for the base of the Turonian was approved by ICS and **ratified by IUGS**.

**Albian and Aptian:** Definition of both stage boundaries remains difficult, either for lack of knowledge or for apparent lack of suitable markers. Several important papers tackling these problems have been published during the year, on both Mediterranean areas and NW Europe.

**Barremian:** Some key research has now been published on the most likely candidate section (SE Spain).

**Hauterivian:** The proposed section (at La Charce, SE France) is a roadside cutting. It is now being conserved by the local council, who plan to move the existing road away from the section, and build a special parking area with explanatory boards. As a result, the 1995 proposal for a GSSP at this locality is now being updated for submission in 2004.

**The Kilian Group** (*formerly the Lower Cretaceous Ammonite WG*). Following the group's meeting in Lyon in July 2002, a modified 'standard' Lower Cretaceous ammonite zonal scheme has now been published in *Cretaceous Research* (vol. 24, pp. 89-94 and p. 805).

One **electronic newsletter** has been circulated since the last report and another is currently being compiled for circulation in early January. The newsletters go to more than 140 Cretaceous specialists, all of whom are encouraged to further it to anyone who may be interested.

## 7. CHIEF PROBLEMS ENCOUNTERED IN 2003

Although work on the proposed Campanian GSSP at Waxahachie, Texas, is well advanced (see 6 above), there is a problem over ownership of the land and access to it. Professor Hancock is hoping to be able to arrange its purchase.

The preliminary recommendations of the 1995 Brussels meeting have led to considerable further research. Some of the newly published results have raised unforeseen problems that are delaying decisions; this applies especially to the base of the Aptian and the base of the Albian where some very conflicting opinions are emerging.

While many scientists are happy to join our working groups it is becoming more difficult to get people to commit time to preparing the documentation for GSSPs. And there have been very few volunteers to join the recently-revived Berriasian (Jurassic/Cretaceous boundary) WG.

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

### INCOME

Debit carried over from 2002	\$ - 90
ICS subvention for 2003	\$ 700
	-----
Total income	\$ 630

### EXPENDITURE

Chair's office expenses (telephone, photocopying, etc.) [£50]	\$ 84
Secretary's office expenses [60 euros]	\$ 74
Bank charges (conversion of \$700 to £ sterling)	\$ 20
Support for WG activities (actual & anticipated)	\$ 500
	-----
Total expenditure (estimated)	\$ 678

**EXCESS OF EXPENDITURE OVER INCOME** \$ 48

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

- It is anticipated that three more GSSP proposals will be completed for voting upon by the

- Subcommission and ICS.
- Papers presented at the Santonian WG's Bilbao meeting will be published as a part of *Cretaceous Research*.
- The Subcommission will host a session at the International Geological Congress in Florence, August 2004.
- The Subcommission will plan its contribution to the next International Symposium on the Cretaceous in Neuchâtel, Switzerland, in 2005.

## 10. BUDGET AND ICS COMPONENT FOR 2004

### ESTIMATED EXPENDITURE

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 meetings	<u>\$ 800</u>
<b>Total estimated expenditure</b>	<b>\$1600</b>
<i>Add projected debit from 2003</i>	<u>\$ 48</u>

**ALLOTMENT REQUESTED FROM ICS FOR 2004:** **\$1648**

### Potential funding sources outside IUGS

None for the above expenditure. Some additional support is being sought for attendance at Florence.

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

*See Accomplishments in 2003 (above) for additional details.*

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

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

The Chair or Vice Chair represented the SCS at:

*150 years of the Maastrichtian Stage*: Maastricht, November 1999.

*6<sup>th</sup> International Cretaceous Symposium*: Vienna August 2000.

*Colloque sur le Cénomaniien*: Rouen, October 2001

1<sup>st</sup> meeting on the *Cretaceous System of Russia*, Moscow, February 2002.

1<sup>st</sup> meeting on *Future Directions in Stratigraphy*, Urbino, June 2002

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

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

*Meeting/field workshop schedule with themes and anticipated results.*

### Objectives

- To bring recommendations for the remaining 9 GSSPs before ICS as soon as possible, and not later than 2008.

- To present results/current position for every stage at the International Congress in Florence in 2004.
- To communicate the results as widely as possible.
- To develop new directions for the Subcommittee as GSSP proposals are completed.

#### *Work Plan*

- 2004 Finalize proposals for Hauterivian, Barremian and Santonian  
 2005 Finalize proposals for Valanginian, Albian and Campanian  
 2006 Finalize proposals for Aptian and Coniacian  
 2007 Finalize proposal for Berriasian (Jurassic/Cretaceous boundary)
- 2004 SCS session at 32<sup>nd</sup> *International Geological Congress*, Florence  
 2005 Present latest results to 7<sup>th</sup> *International Cretaceous Symposium*, Neuchâtel, Switzerland.

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

### **Subcommittee officers**

**Chair:** Professor Peter F Rawson,  
 Department of Earth Sciences, University College London,  
 Gower Street, London WC1E 6BT, United Kingdom  
*Phone* + 44 20 7679 7326; *Fax* + 44 20 7388 7614; *E-mail* p.rawson@ucl.ac.uk

**Vice-Chair:** Dr. Annie V. Dhondt,  
 Institut Royal des Sciences Naturelles de Belgique,  
 Rue Vautier 29, B-1000 Brussels, Belgium  
*Phone* + 32 2 627 44 92; *Fax* + 32 2 627 41 74; *E-mail* Annie.Dhondt@naturalsciences.be

**Secretary:** Dr. Silvia Gardin,  
 ESA-CNRS 7073, Laboratoire de Micropaléontologie, case 104,  
 Université Pierre et Marie Curie, 4 Place Jussieu, F-75252 Paris 05, France  
*Phone* + 33 1 44 27 49 86; *Fax* + 33 1 44 27 38 31; *E-mail* gardin@ccr.jussieu.fr

### **List of Task Groups and their officers**

**Maastrichtian WG:** GSSP ratified. Giles Odin, France. gilodin@moka.ccr.jussieu.fr  
**Campanian WG:** Jake M. Hancock, UK. J.hancock@ic.ac.uk  
**Santonian WG:** **Marcos Lamolda, Spain.** gpplapam@lg.ehu.es  
**Coniacian WG:** Irek Walaszczyk, Poland. walas@geo.uw.edu.pl  
**Turonian WG:** GSSP ratified. No Chair at present.  
**Cenomanian WG:** GSSP ratified. No Chair at present.  
**Albian WG:** Malcolm Hart, UK.  
**Aptian WG:** Elisabetta Erba, Italy. erba@mailserver.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

### ***List of Voting Members***

Dra Maria Aguirre-Urreta (Argentina) [aguirre@gl.fcen.uba.ar](mailto:aguirre@gl.fcen.uba.ar)  
Prof. Peter Bengtson (Germany) [peter.bengtson@urz.uni-heidelberg.de](mailto:peter.bengtson@urz.uni-heidelberg.de)  
Prof. Jim Channel (USA) [jetc@nersp.nerdc.ufl.edu](mailto:jetc@nersp.nerdc.ufl.edu)  
Dr James Crampton (New Zealand) [J.Crampton@gns.cri.nz](mailto:J.Crampton@gns.cri.nz)  
Dr Elisabetta Erba (Italy) [erba@mailserver.unimi.it](mailto:erba@mailserver.unimi.it)  
Prof. Fernando Etayo-Serna (Colombia) [fetayos@hotmail.com](mailto:fetayos@hotmail.com)  
Prof. Andy Gale (UK) [asg@nhm.ac.uk](mailto:asg@nhm.ac.uk)  
Dr Jim Haggart (Canada) [jhaggart@nrcan.gc.ca](mailto:jhaggart@nrcan.gc.ca)  
Prof. Hiromichi Hirano (Japan) [hhirano@waseda.jp](mailto:hhirano@waseda.jp)  
Prof. Mischa Kakabadze (Georgia) [mkakabd@cretac.acnet.ge](mailto:mkakabd@cretac.acnet.ge)  
Dr Herbie Klinger (South Africa) [hklinger@samuseum.ac.za](mailto:hklinger@samuseum.ac.za)  
Prof. Marcos Lamolda (Spain) [gpplapam@lg.ehu.es](mailto:gpplapam@lg.ehu.es)  
Prof. Jörg Mutterlose (Germany) [Joerg.Mutterlose@rz.ruhr-uni-bochum.de](mailto:Joerg.Mutterlose@rz.ruhr-uni-bochum.de)  
Prof. Isabella Premoli-Silva (Italy) [micro@mailserver.unimi.it](mailto:micro@mailserver.unimi.it)  
Prof. Helmut Weissert (Switzerland) [helmut.weissert@erdw.ethz.ch](mailto:helmut.weissert@erdw.ethz.ch)

## SUBCOMMISSION ON JURASSIC STRATIGRAPHY ANNUAL REPORT 2003

### 1. TITLE OF CONSTITUENT BODY

#### **International Subcommission on Jurassic Stratigraphy (ISJS)**

*Submitted by:*

**Dr Nicol Morton**

*Chair*

Le Chardon, Quartier Brugière, F-07200 Vogüé, France

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

November, 2003

### 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 is the unambiguous definition, by means of agreed GSSPs, of a hierarchy of chronostratigraphic units which provide the framework for global correlation.

#### **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 is developing communication with a wider public through two initiatives (also called Working Groups for simplicity): one concerned with conservation of Jurassic geological sites; the second encouraging liaison with and scientific contributions from non-professionals, mainly fossil collectors.

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

The objectives of the Subcommission relate to three 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 Jurassic period;
- (2) Establishment of frameworks and systems 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 paleontologically important sites such as GSSPs. This relates to, inter alia, the IUGS Geosites Programme. The Subcommission 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 Chair, Vice-Chair and Secretary, who are all Voting Members of the Subcommittee. There are currently seventeen other Voting Members; this will be revised to twenty for 2004/2008. The Voting Members are not elected to represent a country or region, but for their 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 one (occasionally two) Convenors 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 on the Jurassic System every four years. The Chair of the Organizing Committee is normally a Voting Member of the Subcommittee, but the Committee is independent of the Subcommittee.

#### 3a. Nominated Officers for 2004-2008:

Chair:	Dr. Nicol Morton (France)
Vice-Chair:	Prof. Paul Smith (Canada)
Secretary:	Dr. Paul Bown (UK)

All Voting Members were asked to nominate Chair and Vice-Chair. The only nominations received were for the current holders and their re-election was voted unanimously.

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

The Jurassic 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 two 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.

### 5. 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 the Jurassic Symposia. Other member links involving Voting Members include Peter Baumgartner, Switzerland, as President of Interrad, Geoff Warrington, UK, Secretary of the Triassic Subcommittee and Jim Ogg, USA, Secretary of ICS.

**IGCP Project 458:** Triassic - Jurassic Boundary Events has close links to the Subcommittee, and several members in common, especially with the Triassic/Jurassic Boundary Working Group. WG Convenor Geoff Warrington, UK, and Project Co-Leader Jozsef Palfy, Hungary are both Voting Members of the Subcommittee.

The Subcommittee has a Working Group, Convenor Voting Member Kevin Page, UK, on **Geoconservation** and this group has several links (including Kevin Page and Corresponding Members Stefano Cresta, Italy, and Platon Tchoumatchenko, Bulgaria) with the IUGS Geosites Programme (Convenor Bill Wimbledon, who receives the Jurassic Newsletter).



Recently a UNESCO World Heritage Site was established for the East Devon and Dorset Coast, informally known as the **Jurassic Coast World Heritage Site** because the principle significance of the site is the Jurassic geology. 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 Site. The Chair Nicol Morton (France) visited Lyme Regis and Charmouth in March 2003 for discussions with members of the Site Management Group and about the role and relationships with the Jurassic Subcommittee. The report of this meeting has been given restricted circulation. However, a report by the Management Group on plans for the management of the site was published in the 2003 Jurassic Newsletter, no.30.

## 6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2003

The year 2003 has been a relatively quiet year compared with 2002, during which the 6<sup>th</sup> International Jurassic Symposium in Mondello, Sicily was held. The Proceedings of this Symposium have been refereed and edited and will be published in *Rivista Italiana di Paleontologia e Stratigrafia*.

An illustrated report on the 6<sup>th</sup> International Jurassic Symposium by the Secretary of the Symposium Organizing Committee Luca Martire, Italy, was published in *Episodes* vol. 26, no. 1 (but with incorrect caption to one of the photographs).

*Jurassic Newsletter* no. 30 of the International Subcommittee on Jurassic Stratigraphy was published electronically and circulated as email attachments in July 2003. This *Newsletter*, edited by Nicol Morton (France) and Paul Bown (UK), has 43 pages plus five additional figures and contains reports on the 6<sup>th</sup> Jurassic Symposium, the Subcommittee meeting (Mondello, September 2002), and the ICS meeting in Urbino, Italy (June 2002) plus reports of ten Working Groups. Information was given about two meetings in 2004, the 2<sup>nd</sup> Colloquium on Moroccan Jurassic (Marrakesh, April 2004) and the 32<sup>nd</sup> International Geological Congress (Florence, Italy, August 2004). In addition, the Newsletter contains ten articles submitted as Correspondence, and three obituaries.

Planning for the 7<sup>th</sup> International Jurassic Symposium in Poland is well under way and the Organizing Committee, under the Chairship of Andrzej Wierzbowski has been established. ISJS Chair Nicol Morton visited Poland in May 2003 to give advice on organization of the sessions in Warsaw and the program of pre- and post-Symposium fieldtrips, and met with the Director of the Polish Geological Institute and the Dean of the Faculty at University of Warsaw. Provisionally symposium sessions will be held in the University of Cracow; two pre-Symposium general fieldtrips are planned while post-Symposium fieldtrips will be more specialized. Preliminary information will be given in the next *Jurassic Newsletter* and the First Circular distributed in Autumn 2004.

### Task Groups

The **Pliensbachian** Working Group (Convenor Christian Meister, Switzerland) submitted a formal proposal for a Pliensbachian GSSP proposal (at Wine Haven, Robin Hood's Bay, Yorkshire, England) and this was unanimously approved by the Jurassic Subcommittee. This proposal, co-authored by nine authors from three countries, has now been published in *Eclogae geologicae Helveticae*, vol. 96, pp. 275-297, with financial support from the Jurassic Subcommittee. In the light of comments and suggestions received the proposal is currently being revised before submission to the International Commission on Stratigraphy.

The Pliensbachian proposal does not have any information on the paleomagnetism of the rocks in the Wine Haven section. A short programme of sampling for a pilot paleomagnetic stratigraphical study was carried out in April 2003 by Mark Hounslow (UK). This was financed by the Jurassic Subcommittee, with the laboratory analyses (the more expensive part of the study) being contributed by the University of Lancaster and a commercial company Core Magnetics thanks to the proprietor Ernie Hailwood (UK). The laboratory data are still being analyzed.

The **Toarcian** Working Group (Convenor Serge Elmi, France) abandoned as impractical and unsuitable for access and security reasons a favored section in western Algeria as candidate for GSSP for the base of the Toarcian Stage. The Group has been re-formed under the same Convenor and has arranged a field meeting at an alternative section at Peniche, western Portugal, identified as a strong candidate. Co-ordination of this meeting proved difficult and it has now been arranged for April 2004.

Members of the **Oxfordian** Working Group held two field meetings during 2003. The first, in July, led by Kevin Page (UK) and WG Convenor Guillermo Melendez (Spain), was devoted to detailed study of the Ham Cliff section in Dorset, southern England. This section had emerged during the Jurassic Symposium in Mondello (September 2002) as a promising candidate for GSSP of the base of the Oxfordian Stage. Detailed logging and sampling for multidisciplinary (and multinational) analyses were carried out. These are currently under way. A second, smaller, meeting with Guillermo Melendez and Francois Atrops (France) was held at Savournon, Provence, SE France, in August 2003 to follow up earlier fieldwork. A proposal of this section as base Oxfordian GSSP was presented to the meeting of the Sociedad Espanola de Paleontologia in Morella in October 2003. A further meeting, to resolve outstanding problems of ammonite taxonomy and biostratigraphy will be held in Lyon, France, but the date is not yet finalized. The two sections will be proposed, one as GSSP and the other as ASP but which not yet decided, next year (2004).

Polish and British members of the **Kimmeridgian** WG (Convenor Andrzej Wierzbowski, Poland) held a field meeting at Staffin, Isle of Skye, north-west Scotland, in June 2003. The purpose of this was to refine the detailed stratigraphy, especially the ammonite biostratigraphy, across the Oxfordian-Kimmeridgian boundary at Kildorais. This section had already been identified as the best GSSP candidate section within the Boreal/Subboreal Realm. The fieldwork produced new data which further refines the very precise ammonite stratigraphy around the Oxfordian/Kimmeridgian boundary. Micropaleontological, geochemical and geophysical analyses are also being carried out. A second meeting involving Andrzej Wierzbowski (Poland), Francois Atrops (France) and Nicol Morton (France) was held in the field in southern Ardeche and in Lyon in September 2003. This established what further data were required for the Mont Crussol section, the best Submediterranean candidate GSSP section, in order to complete precise ammonite stratigraphy correlations between the different Realms. Sections in Poland will also be investigated at the Oxfordian/Kimmeridgian boundary interval. Subsequently one of the two sections will be proposed as GSSP and the other as ASP.

## 7. CHIEF PROBLEMS ENCOUNTERED IN 2003

These remain as they have been in recent years, mostly related to difficulties in obtaining research grants for stratigraphical topics and travel grants for meetings of Working Groups, which are often given low priority by National grant-awarding agencies.

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

### INCOME

Carried forward from 2002	\$ 550
ICS Allocation	\$2800
<b>TOTAL</b>	<b>\$3350</b>

### EXPENDITURE FROM 2003 BUDGET

General office expenses	\$ 300
ISJS Newsletter	\$ 100
Prov.for devel. of web-site	\$ 250
Contribution to Chair's travel expenses	\$ 300

Contribution to publication costs, Pliensbachian GSSP proposal	\$ 400
Prov. for prod. & distrib. Pliensbachian GSSP proposal	\$ 150
Support for Toarcian WG meeting, Peniche	\$ 750
Support for Tithonian and Kimmeridgian meeting, Stuttgart	\$ 750
Addit. contrib. To 2 <sup>nd</sup> Moroccan Jurassic Colloquium	\$ 200
<b>TOTAL</b>	<b>\$3200</b>
To be carried forward to 2004	\$ 150

## 9. 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 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 *Jurassic Newsletter* 31:

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* (31) should be in Spring 2004.

### (c) Preparation of GSSP proposals:

The Convenor of the **Triassic/Jurassic boundary** (and Hettangian) WG has published tables of comparison between the four candidate sections showing their relative merits in terms of fulfilling the ICS guidelines for a GSSP. No suitable biostratigraphic datum has yet been agreed because of provincialism of the ammonite faunas; this, and alternative criteria are being investigated.

The GSSP proposal for the **Pliensbachian** Stage, approved by the Jurassic Subcommittee in 2003 will be presented to ICS in early 2004.

The **Toarcian** WG have organized a field meeting on the Peniche section, Portugal, in April next year to review the documentation on this section and complete any revisions necessary. A GSSP proposal is likely in 2005.

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.

The **Oxfordian** WG expect to complete their work and preparation of a combined GSSP/ASP proposal, to reflect Boreal/Tethyan provincialism, in time for presentation during 2004 at the International Geological Congress, Florence, Italy.

The **Kimmeridgian** WG will complete the remaining field investigations in France and Poland this year or early 2004 in time to review details of Boreal/Tethyan correlation during a joint meeting with the Tithonian WG in Stuttgart, Germany in 2004. This will enable presentation of a generally acceptable combined GSSP and ASP proposal.

The **Tithonian** WG has a number of candidate sections under investigation and review. Several proposals of possible sections have been published. These will be reviewed during the joint meeting with the Kimmeridgian WG in Stuttgart in 2004.

**(d) 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 focused on improving relative time-resolution, using both traditional methods such as ammonite biostratigraphy and multidisciplinary integration of different methods.

However, an increasingly evident feature of the four-yearly Jurassic Symposia has been the diversification of the subject matter, so that there is more attention to the application of diverse disciplines, from micropaleontology to tectonics, from sedimentology to geophysics to understanding the evolution of the Earth during this particular time-period. Most of the papers at the most recent Jurassic Symposium (Mondello, September 2002) were presented during six special thematic sessions. 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.

**(e) Public outreach:**

Classified for convenience under the same heading of Thematic Working Groups are two which involve interaction with and outreach to a wider public, many of whom have an interest in Jurassic geology. Both are very active - the Geoconservation WG (Convenor Kevin Page, UK) organized one of the Special Sessions in Mondello and this demonstrated the usefulness of bringing together information about different national systems of conservation. The Liaison WG (Convenor Robert Chandler, UK) has the role of encouraging the involvement of non-professionals, especially fossil collectors, in valid scientific work. The report of this Working Group in the last Jurassic Newsletter included contributions by three such individuals.

**(f) International Geological Congress, Symposium G-22.07 The Jurassic World**

The Jurassic Subcommittee is organizing a symposium during the International Geological Congress in Florence, Italy in August 2004. The Convenors are Nicol Morton (France, Chair), Giulio Pavia (Italy, Past-Chair) and Paul Smith (Canada, Vice-Chair). Six themes have been identified which will give broad scope for presentations but still maintain a focus. For each theme one or more individuals have been invited to give an oral presentation; other contributions will be in the form of poster presentations. In addition, a General Topic will enable poster presentations which are relevant to the Symposium but do not readily fit into the identified themes.

The success of this Symposium will depend on a sufficient number of the potential participants being financially able to participate in the Congress. The possibility of publication of the papers presented, augmented by other relevant papers which could not be presented, is being considered.

**(g) Possible IGCP Project: Marine/Non-marine Correlation**

An application for a new IGCP Project on correlation between Jurassic rocks formed in marine, marginal and non-marine environments is being prepared by Jingeng Sha (China) with advice from and collaboration with the Executive of the Jurassic Subcommittee. The purpose is to investigate the application by multidisciplinary means of all methods of correlation of (marine) Standard Chronostratigraphic Subdivisions of the Jurassic at various levels with successions which lack the main biostratigraphically useful fossil groups, notably ammonites.

This Project would be pursued at all stratigraphical levels in the Jurassic; for example it would be especially relevant to the Triassic/Jurassic and Jurassic/Cretaceous boundary intervals. There are numerous examples of intermediate ages where calibration of the sequences of continental floras and faunas against marine would provide valuable insights into the geological and biological evolution of Earth during the Jurassic Period.

## 10. BUDGET AND ICS COMPONENT FOR 2004

For the year 2004 the main activities of the Jurassic Subcommittee will be focused on the annual *Newsletter*, the symposium at the International Geological Congress in Florence, Italy, on the meetings and other activities of Stage Working Groups and on preparation and planning for the 7<sup>th</sup> 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 2004:

General office expenses	\$ 250
Preparation and production of <i>Newsletter</i> 31	\$ 100
Contributions to Officers travel costs	\$ 300
Professional help with establishment of website	\$ 250
Additional support for 2 <sup>nd</sup> Morocco Jurassic Colloquium	\$ 200
Support for Stage Working Groups (meetings etc.)	\$1500
Support for work towards 7 <sup>th</sup> Jurassic Symposium, Poland	\$1500
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TOTAL BUDGET PROJECTED	\$4100
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Please note that no provision has been included towards preparation for and participation in the Symposium during the International Geological Congress. The Subcommittee has a heavy commitment to this, including three members as Convenors, invited speakers who may need small contributions although the invitation specified that no financial help could be provided. We would also like to award a prize for the best poster presentation.

### 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 meetings in Morocco (2004) and in Poland (2006) will receive financial support from the respective national Ministries, but this cannot be predicted at this stage.

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

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) are expected to be published in 2003. 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 Chair 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 four 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. The project will be completed 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.

## **12. OBJECTIVES AND WORK PLAN FOR NEXT 5 YEARS (2004-2008)**

The prime objective of the Subcommittee remains completion of the program of establishing **GSSPs** for the Jurassic Stages. Of the ten Standard Stages in the Jurassic, three GSSPs have been ratified by IUGS and a fourth approved by the Subcommittee but not yet submitted to ICS. Four others are advanced in their preparation, with the sections to be proposed as GSSP and ASP selected and only details to be finalized. Only two have several possible candidate sections with selection of preferred candidate(s) still to be made. All are expected to be finalized by 2006.

Within the Subcommittee consideration is being given to extending definition of boundary stratotypes to Substages (where appropriate, but without formal names other than Lower/Middle/Upper) and possibly also to the Standard Chronozones. Historically in Jurassic stratigraphy these have long been considered as part of the chronostratigraphical hierarchy of units.

The thematic Working Groups have mostly concentrated on participation in the Jurassic Symposia (and currently in the International Geological Congress), but focused meetings, topical workshops and field symposia are also being considered during the next five-year period.

The schedule of meetings already planned includes the following:

1. April 2004 -- 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.
2. April 2004 -- **2<sup>nd</sup> Colloquium of Moroccan Jurassic (CJM2)**, Marrakesh, Morocco, with field trips in Atlas; focused on the general Jurassic geology of Tethyan margins and their surroundings with the proceedings to be published in a special issue.
3. August 2004 -- **32<sup>nd</sup> International Geological Congress, Florence**, Italy; Symposium G-22.07 The Jurassic World, Outside the Park; oral and poster presentations on various themes exploring the planet Earth during the Jurassic Period. The abstracts will be published by the IGC and a Special Publication based on the papers presented, plus others, is being proposed.

4. September 2004 -- Joint meeting, including fieldtrip, of the **Kimmeridgian** and **Tithonian** 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.
  5. 2005, date not yet arranged -- Nanjing, China; inaugural meeting and workshop of **Working Group on Marine/Non-marine Correlation**; focusing on methods of correlation and case histories. This will be followed up by Special Session planned for 7<sup>th</sup> Jurassic Symposium in Warsaw 2006 (see below).
  6. 2005, date and place not yet arranged - possibly Lyon or Paris, France; inaugural meeting and workshop of **Palaeobiogeography Working Group**; focusing on principles of paleobiogeographic reconstruction and detailed case histories.
  7. August/September 2006 -- **7<sup>th</sup> International Symposium on the Jurassic System**, Poland, with field trips to Czeszochova-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

### INTERNATIONAL SUBCOMMISSION ON JURASSIC STRATIGRAPHY Voting Members 2000-2004

#### *Subcommission officers*

- Chair:** **Nicol Morton**,  
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Tel. \*\* 33 4 75 37 03 80, email NICOL.MORTON@wanadoo.fr  
(formerly Birkbeck, University of London, UK)
- Vice-Chair:** **Paul L. Smith**,  
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- Secretary:** **Paul R. Bown**,  
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#### *Voting Members*

- Peter O. Baumgartner**, Lausanne, Switzerland Peter.Baumgartner@igp.unil.ch  
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**Akira Yao**, Osaka, Japan [yao@sci.osaka-cu.ac.jp](mailto:yao@sci.osaka-cu.ac.jp)



## SUBCOMMISSION ON TRIASSIC STRATIGRAPHY ANNUAL REPORT 2003

### 1. TITLE OF CONSTITUENT BODY

#### Subcommission on Triassic Stratigraphy (STS)

*Submitted by:*

**Michael J. Orchard**  
*Chair, STS*

Geological Survey of Canada, 101-605 Robson Street, Vancouver, BC V6B 5J3, Canada  
Tel: 604 666 0409; Fax: 604 666 1124, E-mail: morchard@nrcan.gc.ca

26 November 2003

### 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 (Chair, two vice-chairmen, past Chair, secretary), web-master/ editor of newsletter, voting members (21), and corresponding members (103). (*see Appendix for complete listing*)

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 a bi-annual STS newsletter *Albertiana* in both hardcopy and as a 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 present Secretary amongst the titular members and each candidate received at least 60% approval.

### 3a. Nominated Officers for 2004-2008:

Chair: M.J. Orchard, Vancouver, Canada. Vice-Chair: M. Balini, Milan, Italy. Vice Chair: Y. Hongfu, Wuhan, China. Secretary: C.R. McRoberts, Cortland, USA
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## 4. EXTENT OF NATIONAL/REGIONAL/GLOBAL SUPPORT FROM SOURCES OTHER THAN IUGS

Collaboration and meeting co-sponsorship through IGCP 467.  
Grant from the Canadian National IGCP committee towards travel expenses to attend Vancouver meeting.  
A Japanese Fellowship for Research (JSPS) grant to Chair.  
In kind support of the Chair's Institute (GSC Vancouver), and of the Earth Science Sector of Natural Resources Canada.

## 5. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

**IGCP Project 467:** Triassic time and trans-Panthalassan correlations. Co-sponsored meetings in Vancouver and the Dolomites.

**IGCP Project 458:** Triassic/ Jurassic Boundary Events. Joint meeting held May 2003 at the Geological Association of Canada annual meeting in Vancouver, BC, Canada.

**Nanpanjiang Basin project:** A China-USA-Canada collaboration on an integrated biostratigraphy and chronostratigraphy of Triassic sections in Guizhou and Guangxi Provinces, South China. New data and publications on P-T thru L-M Triassic boundaries.

**Monbusho project and Interrad group:** A Japan-New Zealand collaboration of 13 Universities studying Southern High Latitude Radiolarian Faunas. Joint meeting planned for 1996.

**Secada working group:** 15 scientists in 5 countries studying the mid Triassic core from the Secada boring in Bolzano/Bozen, Italy. Co-sponsored meetings in the Dolomites.

## 6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2003

Joint meeting with IGCP projects 458 and 467 at the GAC annual meeting in Vancouver, Canada, May 25<sup>th</sup> -28<sup>th</sup>, 2003. Thematic session on "Extinction events, faunal turnovers, and natural boundaries within and around the Late Triassic."

Co-sponsoring of meeting in Italy on "Triassic geochronology and cyclostratigraphy – a field symposium", September 11<sup>th</sup> -15<sup>th</sup> 2003. Focus on Secada core research and Middle Triassic time scales.

Conodont workshops on both the Olenekian-Anisian (in Italy) and Carnian-Norian (in Canada) boundary in order to agree on taxonomic issues.

A new proposal for a base **Olenekian** at Chaohu, China is based on a broad dataset. Sampling and study of ammonoids and conodonts is substantially completed, the latter resulting from work by a Chinese student during a visit to Canada. The Task Group Chair is completing ammonoid studies and other collaborators are completing magnetostratigraphic studies. The FAD of the conodont *Neospathodus waageni* is proposed as the GSSP datum. It corresponds to the base of the *Flemingites-Euflemingites* ammonoid zone and falls within a brief zone of normal magnetic polarity.

At the field workshop in St Christina, after a conodont workshop, the Task Group for base

**Anisian** agreed that the appearance of the conodont *Chiosella timorensis* was the best datum for GSSP definition. This corresponds to the base of “bed 7” at Desli Caira, in Dobrogea, Romania. A formal proposal is being prepared. Further results from the Nanpanjiang Basin in South China fix this boundary at about 247 Ma.

Publication of three competing proposals on the Anisian-Ladinian boundary GSSP candidates in *Albertiana* #28, July 2003. Final arguments for the placement of the base **Ladinian** were made by the proponents at the business meeting during the St Christina meeting. The Task Group have voted on the 3 options and eliminated one of them. A vote is underway to select one of the remaining two.

Basal **Carnian** faunas are under continuing study. A proposal for Stuoures in Italy as a candidate for a GSSP has been prepared but a decision awaits completion of paleontological studies in Spiti and Nevada.

New conodont data from a potential base **Norian** GSSP at Black Bear Ridge, Western Canada was discussed during a conodont workshop in Vancouver that addressed taxonomic and nomenclatural difficulties. Collections from a second candidate section at Pizzo Mondello were compared with the Canadian material. Significant progress was made towards a consensus on North American-European faunal differences. Final results from Canada will be presented at a formal workshop at the IGC in Florence, Italy next year.

The task force on base **Rhaetian** has been active in the Tethyan region. A multidisciplinary documentation of the time interval is being prepared: it includes bio- (incl. palynology), magneto- and chemostratigraphic data from several sections.

A tour of Triassic localities and research centers in Japan was undertaken by the Chair during the month of November 2003. This afforded an opportunity to discuss Subcommittee plans and priorities with Japanese Triassic researchers, as well as understand more about provinciality in Triassic faunas.

*Albertiana* 27 (97 pages) was published in December 2002 and *Albertiana* 28 (112 pages) in July 2003. Each issue was larger than all those previously published – an illustration of greater activity within the Subcommittee. The newsletter remains an indispensable resource for identifying STS members, contact numbers, and research activities. Both issues are now available on the web.

## 7. CHIEF PROBLEMS ENCOUNTERED IN 2003

The current secretary retired from the British Geological Survey in July but was denied facilities to continue his work with STS (and SJS). He is no longer in e-mail contact and is unable to fulfill his secretarial duties.

A vote on the single candidate for the base Anisian GSSP awaits completion of formal proposal which has been delayed due to personal problems experienced by Task Group Chair.

The base Anisian deliberations remained contentious and opinions are strongly polarized around two candidates. It is hoped that the decision to go to a vote within the Task Group will resolve the choice through a 60% majority.

Organization of Triassic session at GSA, Seattle during November, 2003 was abandoned due to clash with Japan trip.

*Albertiana* production costs increased as did the pressure for additional financial subsidy.

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

Joint meeting & workshop, IGCP 458-467, Vancouver, Canada:	\$ 640
Field workshop in St. Christina. Italy:	\$1,900
<i>Albertiana</i> cost subsidy:	<u>\$1,500</u>
TOTAL	<u>\$4,040</u>

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

Final vote on two remaining candidates for the contentious **A-L boundary** GSSP within the task group. In the event of no majority decision, the group will likely be reconstituted under a new Chair.

Formal proposal and for **base Anisian** anticipated.

**June 25-July 10, 2004. Spiti, India.** Co-sponsorship (with IGCP 467) of field workshop on Triassic Time. Spiti-Himalayas, Himajal Pradesh, India, approx. June 25 to July 10, 2004. The workshop will be organized jointly by members of Vienna, Milano, and Delhi Universities, with the official support of the state of Himajal Pradesh government. It will start with a 2-days working session with the main emphasis on Triassic stage boundaries and will be followed by an 8-day bus/jeep tour to examine famous and classical Triassic sections at Muth, Kuling and surroundings areas.

Formal proposal for **base Olenekian** anticipated.

**August 20-28, 2004. Florence, Italy.** International Geological Congress. Several symposia and a workshop proposed by or involving STS members:

T-04-02.	Permian-Lower Triassic events
T-04-03.	Triassic-Jurassic boundary events
G-05-09.	Tethys reconstruction
G22-06.	Triassic in Tethys Realm
DWO-09.	Upper Triassic workshop

Progress and possible agreement on the **base** for the **Carnian, Norian, and/or Rhaetian** stages at IGC.

Publication of *Albertiana* **29**, and compilation of *Albertiana* **30**.

## 10. BUDGET AND ICS COMPONENT FOR 2004

(a) General office expenses	100
(b) Subsidy to <i>Albertiana</i> :	2,000
(c) Support for workshop in Spiti	1,000
(d) Support for IGC, Florence.	1,500
<b>TOTAL 2003 BUDGET REQUEST</b>	<b>\$4,600 US\$</b>

### 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 the STS web-site.

Earth Science Sector of Natural Resources Canada has provided support to the Chair. General support for equipment including computers, email access and telephones anticipated. Canadian IGCP committee.

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

*See Accomplishments in 2003 (above) for additional details.*

- **Permian-Triassic boundary** in China agreed and **ratified**.
- Induan-Olenekian boundary -- Working group established. A promising GSSP candidate at Chaohu, China is being proposed.
- Olenekian-Anisian boundary -- Field workshop in Romania to view boundary candidate, now characterized by ammonoid, conodont, chemo- and magneto-stratigraphic profiles. Choice of position and now index fossil for base-Anisian agreed.
- Anisian-Ladinian boundary -- Additional work done on 2 competing candidates in Italy and Hungary. Schedule for choice of base-Ladinian was agreed. A third candidate was eliminated during a vote within the task group and a further vote is underway to decide between the final two.
- Ladinian-Carnian boundary -- Field workshop in Italy viewed Ladinian-Carnian boundary candidate and published of a comprehensive volume on its character and attributes. Workshop in Spiti will afford comparative data, as will Nevada research.
- Carnian-Norian boundary -- New working group established. Data from 2 candidate sections in Canada and Sicily published. Conodont taxonomic issues addressed in workshop.
- Norian-Rhaetian boundary -- New working group established and new data acquired. Non-marine auxiliary GSSP sections identified.

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

*Meeting/field workshop schedule with themes and anticipated results:*

- 2004, June-July. Field workshop in Spiti-Himalayas, Himajal Pradesh, India. Base Carnian deliberations, and classic Triassic sites. Co-sponsored with IGCP 467
- 2004, August. IGC, Florence, Italy – August 20th –28th, 2004 et seq. Upper Triassic GSSP decisions.
- 2005, summer. International Symposium. Triassic Chronostratigraphy and Biotic Recovery. Wuhan, China – 2005. Joint meeting with IGCP 467. Base Olenekian workshop.
- 2006, March. Circum-Panthalassa Triassic Faunas and Sequences. Wellington, New Zealand. Joint meeting with IGCP 467 & the International association of radiolarian workers. Southern high latitudes correlations.
- 2006, late summer. The Boreal Triassic. Longyearbyen, Svalbard, Arctic Norway. Joint meeting with IGCP 467. Northern high latitudes correlations.
- 2007, May. The Global Triassic. New Mexico Museum of Natural History, Albuquerque, NM, USA. Publication of the symposia proceedings, a volume on the Triassic timescale.

## APPENDICES [Names and Full Addresses of Current Officers and Voting Members

### *Subcommission officers*

**Chair:** M. J. Orchard

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**Vice Chair:** Yin Hongfu

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**Vice Chair:** Y. Zakharov

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**Past Chair:** M. Gaetani

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**Secretary:** G. Warrington

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### ***List of Task Groups and their officers***

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

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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@nrca.gc.ca

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

**Non-marina auxiliaries:** S. Lucas, USA. [SLucas@nmmnh.state.nm.us](mailto:SLucas@nmmnh.state.nm.us)

### ***List of Voting Members***

**Yoshiaki Aita**, Utsunomiya, JAPAN

**Andrea B. Arcucci**, San Luis, ARGENTINA

**Darioush Baghbani**, Tehran, IRAN

**Aymon Baud**, Lausanne, SWITZERLAND

**Hugo Bucher**, Lyon, FRANCE

**Hamish Campbell**, Dunedin, NEW ZEALAND

**Yoram Eshet**, Jerusalem, ISRAEL

**Maurizio Gaetani**, Milano, ITALY

**P. John Hancox**, Wits, SOUTH AFRICA

**Dennis Kent**, Palisades, U.S.A.

**Sandor Kovács**, Budapest, HUNGARY

**W. Kozur**, Budapest, HUNGARY

**Leopold Krystyn**, Vienna, AUSTRIA

**Jinling Li**, Beijing, CHINA

**Vladen R. Lozovsky**, Moscow, RUSSIA

**Spencer Lucas**, Albuquerque, U.S.A.

**Manfred Menning**, Potsdam, GERMANY

**Alda Nicora**, Milano, ITALY

**Michael J. Orchard**, Vancouver, CANADA

**George D. Stanley**, Missoula, U.S.A.

**Vijaya**, Lucknow, INDIA

**Henk Visscher**, Utrecht, THE NETHERLANDS

**Geoffrey Warrington**, Nottingham, U.K.

**Wolfgang Weitschat**, Hamburg, GERMANY

**Hongfu Yin**, Hubei, CHINA

**Yuri D. Zakharov**, Vladivostok, RUSSIA

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## SUBCOMMISSION ON PERMIAN STRATIGRAPHY ANNUAL REPORT 2003

### 1. TITLE OF CONSTITUENT BODY

#### International Subcommittee on Permian Stratigraphy (SPS)

##### **Submitted by**

Bruce Wardlaw

*Chair, Subcommittee on Permian Stratigraphy*

Chief Paleontologist; U.S. Geological Survey

Tel: 1-7036485288; bwardlaw@usgs.gov

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

#### **Mission Statement and Goals**

The Subcommittee's primary goal 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 refined regional correlation.

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

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

- (i) The development of an internationally agreed scale of chronostratigraphic units, fully defined by GSSPs where appropriate and related to a hierarchy of units to maximize relative time resolution within the Permian period;
- (ii) Establishment of frameworks and systems to encourage international collaboration in understanding the evolution of the Earth during the Permian Period.

### 3. ORGANIZATION

The Subcommittee has an Executive consisting of a Chair, two Vice-Chairs, and Secretary, who are all Voting Members of the Subcommittee. There are sixteen total Voting Members. The Subcommittee proposes in its changeover of membership and officers for the upcoming IGC to go to an Executive of a Chair, only one Vice-Chair and a Secretary. Also it will reduce its Voting Members to 15.

The objectives of the Subcommittee are pursued by Working Groups, both Stratigraphic and Thematic, that are disbanded upon completion of their directed task. For example, the Working Groups on the Carboniferous and Permian Boundary and on the Guadalupian (Middle Permian) and its constituent stages have been disbanded on the successful establishment of their defining GSSPs. The current Working Groups are: the Cisuralian, the Lopingian, Continental Permian, and Transitional biotas as gateways for global correlation. The Subcommittee also supports a special project titled "The Permian: from glaciation to global warming to mass extinction"

#### **3a. Nominated Officers for 2004-2008:**

Chair: Charles M. **Henderson** (Canada)

Vice-Chair: Vladimir I. **Davydov** (USA)

Secretary: to be selected by Chair

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

The SPS receives strong support from Russian, Chinese, and American governments and individuals when working on the specific Series and Stages proposed in each country. The University of Calgary (Canada) and Boise State University (USA) helped support our operations. Individual donors and the U.S. Geological Survey strongly supported the activities of SPS this year.

#### 5. INTERFACE WITH OTHER INTERNATIONAL PROJECTS

The SPS interacts with many international projects on formal and informal levels. SPS is taking a very active role on the development of integrated chronostratigraphic databases participating on **CHRONOS**, initially an NSF funded initiative. SPS is active with IGCP Project 359: Correlation of Tethyan, Circum-Pacific and marginal Gondwanan Permo-Triassic and the Permian Research Group of SE Asia.

#### 6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2003

The proposal for the GSSP of the **Lopingian** was sent forward for a vote by the ICS. Planning and funding for an October, 2003, **Changhsingian** (Upper Lopingian) Working Group Meeting and Field Trip in Nanjing China was a major accomplishment and included Chinese, Australian, American and Canadian participants. A formal proposal for the Changhsingian has been approved by formal vote by the Working Group and is being prepared for the Subcommittee.

Faunal definitions were agreed to for the remaining **Cisuralian stages** (Sakmarian, Artinskian, and Kungurian). Field work was conducted to resample and remeasure potential candidate sites. One in particular, for the Kungurian, proved to be spectacular in that not only did it provide continuous faunal sampling but had several tuff horizons with good quality zircons, increasing its chronostratigraphic potential greatly.

##### **Chief products in 2003 include:**

SPS Newsletters 41 and 42 were produced in 2003 and circulated to a mailing list of 280 and placed on our Internet site hosted by Boise State University. The newsletter, *Permophiles*, now has an ISSN number (ISSN 1684-5927).

Numerous abstracts and papers were presented by members of the Subcommittee and in support of its workshop and symposium held at the International Congress on Carboniferous and Permian Stratigraphy held in August at Utrecht, the Netherlands. Many of these abstracts are highlighted in Newsletter 42.

#### 7. CHIEF PROBLEMS ENCOUNTERED IN 2003

None.

#### 8. SUMMARY OF EXPENDITURES IN 2003:

##### **INCOME**

Donations	\$ 1,000
University of Calgary support	2,000
U.S Geological Survey	10,200
ICS	800
TOTAL	14,000



## EXPENDITURE

Publication of <i>Permophiles</i>	2,000
Support for travel for international meetings and field work	10,000
Publication costs other than the newsletter	2,000
TOTAL	14,000

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

- (a) Formal vote on the **Changhsingian** GSSP by the Subcommittee.
- (b) Submittal of the formal proposal for the **Sakmarian** GSSP
- (c) Submittal of the formal proposal for the **Kungurian** GSSP
- (d) Continued work on the **Artinskian** potential stratigraphic candidates.
- (e) Produce two issues of *Permophiles*
- (f) Conduct Symposia on the Permian-Triassic and Lower Permian and an Annual Business Meeting at the International Geological Congress at Florence this summer.

## 10. BUDGET AND ICS COMPONENT FOR 2004

Cisuralian Working Group (field expenses)	\$4,000
Lopingian Working Group (Proposal development and dispersal)	1,000
Symposia and annual Meeting at IGC, Florence	3,000
Publications (Newsletter, targeted articles of scientific need)	4,000
Internet upkeep	1,000
TOTAL 2004 BUDGET	13,000
<b>TOTAL BUDGET REQUEST (ICS)</b>	<b>1,000</b>

## 11. REVIEW CHIEF ACCOMPLISHMENTS OVER LAST FIVE YEARS (1998-2002)

The SPS has approved the general divisions of the Permian and has now made 4 successful GSSP proposals for Stages (Asselian, Roadian, Wordian, Capitanian). Support for documentation (field work, publication) 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/journal.

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

- Finish the establishment of all the GSSPs of the constituent stages of the Permian.
  - 2003-2004 Formal completion of the Changhsingian GSSP.
  - 2004 Formal completion of the Sakmarian GSSP.
  - 2005 Formal completion of the Kungurian GSSP
  - 2006 Formal completion of the Artinskian GSSP

## APPENDIX

### *List of Voting Members*

#### **Voting Members of the Subcommittee on Permian Stratigraphy**

**Prof. Giuseppe Cassinis**

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**Dr. Clinton B. Foster**

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**Prof. Brian F. Glenister (Retiring)**

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**Dr. Makoto Kato (Resigned)**

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**Dr. Galina Kotlyar**

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**Prof. Ernst Ya. Leven**

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**Dr. Bruce R. Wardlaw**  
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**Dr. Yugan Jin**  
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**Dr. Zhouting Liao**  
Nanjing Institute of Geology and  
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39 East Beijing Road  
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Accepted replacements for resigned members

**Dr. Yoichi Ezaki** (for Kato)  
Department of Geosciences  
Osaka City University  
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**Prof. Joerg W. Schneider** (for Menning)  
Freiberg University of Mining and Technology  
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**Dr. Tamra A. Schiappa** (for Spinosa)  
Department of Geography, Geology, and the Environment  
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**Slate of Nominees for office:**

**Dr. Charles M. Henderson**  
Chair

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**Dr. Vladimir I. Davydov**

**Vice-Chair**

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1910 University Dr.  
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## SUBCOMMISSION ON CARBONIFEROUS STRATIGRAPHY ANNUAL REPORT 2003

### 1. TITLE OF CONSTITUENT BODY

#### Subcommission on Carboniferous Stratigraphy (SCCS)

*Submitted by:*

**Philip H. Heckel,**

*Chair of SCCS*

Department of Geoscience, University of Iowa, Iowa City, IA 52240

Phone: 319-335-1804, Fax: 319-335-1821, philip-heckel@uiowa.edu

5 December 2003

### 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 goals are 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, and ultimately to calibrate biostratigraphic with other methods of correlation 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

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.

#### 3a. Nominated Officers for 2004-2008:

This was by unanimous vote of >60% of the Subcommission after no other candidates were nominated during the open period for nominations.

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

There are several current Task Groups and an exploratory Project Group:

**Task Group to establish a boundary close to the Tournaisian-Viséan Boundary** [which will be

the base of the Middle Series of the Mississippian Subsystem, as indicated under item # 6 below]  
Chaired by George Sevastopulo (Ireland).

**Task Group to establish a boundary close to the Visean-Serpukhovian Boundary** [which will be the base of the Upper Series of the Mississippian Subsystem]  
Chaired by Barry Richards (Canada).

**Task Group to establish a boundary close to the Bashkirian-Moscovian Boundary** [which will be the base of the Middle Series of the Pennsylvanian Subsystem]  
Chaired by John Groves (USA).

**Task Group to establish a boundary close to the Moscovian-Kasimovian Boundary** [which will be the base of the Upper Series of the Pennsylvanian Subsystem]. This group is also dealing with a boundary close to the **Kasimovian-Gzhelian Boundary** within the Upper Series of the Pennsylvanian Subsystem.  
Chaired by Elisa Villa (Spain).

**Project Group on Upper Paleozoic boreal biota. Stratigraphy and biogeography,**  
Chaired by Marina Durante (Russia).

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

The SCCS receives no regular financial support outside of IUGS/ICS allocations, and is grateful for the regular grant of \$900 in 2003 and the special supplement of \$500 in 2002. The SCCS does receive small voluntary personal contributions from some of its members, but this is unpredictable from year to year. The entire account is drawn upon to support the production of its annual '*Newsletter on Carboniferous Stratigraphy*' and to cover unexpected operating expenses incurred by the officers. Individual voting members of the SCCS depend upon direct support from the institutions with which they are affiliated, specifically universities and governmental agencies such as institutes and surveys. This includes provision of technical services, secretarial support, and limited subsidies for travel to present work at meetings of the SCCS. Supplemental support is provided by some institutions or individuals that supply mailing envelopes and postage costs after the *Newsletters* have been delivered to them in bulk via economy airmail from the site of printing.

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

The SCCS has worked with the Subcommissions and Working Groups on Devonian and Permian Stratigraphy in establishing the common boundaries with the Carboniferous. The SCCS expects to be cooperating soon with the new **CHRONOS** initiative directed by Bruce Wardlaw of the US Geological Survey.

#### **6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2003**

##### **Votes on standardizing classification within the Carboniferous System**

In a ballot just completed, the SCCS voted on two issues:

- 1) It voted by 74% [out of 19 votes cast, which is 90% of the 21 members] **to classify each of the two subsystems into a Lower, a Middle and an Upper series.** Because there are current plans for only seven stages in the Carboniferous, each of the lower five series at the

current time comprises only one stage. However, there is flexibility in that if any of these geographically named stages can be further divided into two or more globally significant stages in the future, then the current stage name can be used as a series name with equal standing to the current positional series name. For example, if the long Visean Stage can ultimately be subdivided, then the name Visean will be raised in rank to series with equal standing to that of the Middle Mississippian Series. [*Complete text of the justification for this classification will be sent to the ICS shortly.*]

- 2) It voted by 89% [out of 19 votes cast, which is 90% of the 21 members] **to withdraw official recognition of stage rank from the 15 named and lettered stages previously approved in the upper part of the western European regional classification.** Because there are current plans to select boundaries for only seven global stages in the Carboniferous, this means that the former western European stages can be recognized only as regional substages, and the scale of regional and global ranks will be similar. [*Because this deals only with regional classification, it will not be submitted to the ICS.*]

**Newsletter on Carboniferous Stratigraphy, Volume 21**, published in July 2003. Its 54 pages contain commentary by the Chair on various current issues, reports of the task groups for 2002 [most containing much informative detail], and 8 articles on various topics, including: Updated cyclothem constraints on Pennsylvanian radiometric dating in North America; Defining boundary stratotypes – speciation, migration and extinction; Upper Visean-Serpukhovian conodont zonation in south China; Upper Paleozoic glaciations in Argentina; Challenge to the existence of the ‘Ostrogsky Episode’ in Siberia; Correlation of the Moscow Basin Mississippian with the Euramerican floral zonation; Correlation of new radiometric dates from the French Massif Central with other Variscan occurrences; and Carboniferous tetrapod footprint biostratigraphy and biochronology. As usual, it provides an outlet for timely presentation and discussion of useful information and opinions.

### Summary of Task Group Reports

The two new task groups established last year [**Visean-Serpukhovian**; and **Bashkirian-Moscovian**] have polled their members on what lineages and geographic areas to consider for GSSPs, and both had productive initial meetings at the Utrecht Congress, which narrowed the focus of their searches. The other two longer-standing groups have made further progress toward selecting GSSPs, with one ready to submit a GSSP for a vote [*see below*].

The **Task Group to establish the Tournaisian-Visean boundary**, chaired by George Sevastopulo, has concentrated during the past year on completing the description of the proposed GSSP for the base of the Viséan at Pengchong, Guangxi, China, and on identifying the base of the Viséan in other sections that exhibit different facies in south China. An article proposing the GSSP was published in the June 2003 *Episodes* [v. 26: p. 105-115], and with minor supplementary material, the GSSP will soon be submitted to a vote by the SCCS.

The **Task Group to establish the Visean-Serpukhovian boundary**, chaired by Barry Richards, comprises a membership of 21 scientists representing nine countries and a range of lithostratigraphic, biostratigraphic, chemostratigraphic, and magnetostratigraphic expertise:

Barnett, Andrew (Britain), stratigraphy  
Barskov, Igor (Russia), conodonts  
Belka, Zdzislaw (Germany), conodonts  
Brenckle, Paul (USA), forams  
Clayton, Geoff (Ireland), palynomorphs  
Ellwood, Brooks (USA), magnetostratigraphy  
Gibshman, Nilyufer (Russia), forams

Korn, Dieter (Germany), ammonoids  
Kulagina, Elena (Russia), forams  
Lane, Richard (USA), conodonts  
Luo Hui (China) forams  
Mamet, Bernard (Belgium), forams  
Nemyrovskaya, Tamara (Ukraine), conodonts  
Nikolaeva, Svetlana (Russia), ammonoids

Pazukhin, Vladimir (Russia), conodonts  
Qi Yu-ping (China) conodonts  
Richards, Barry (Canada), stratigraphy  
Riley, Nick (Britain), ammonoids

Saltzman, Matt (USA), chemostratigraphy  
Titus, Alan (USA), ammonoids  
Utting, John (Canada), palynomorphs

This task group has compiled preliminary information on: (1) upper Viséan to lower Serpukhovian biotic lineages that may be useful in defining the lower Serpukhovian boundary; (2) sequence stratigraphic, chemostratigraphic, magnetostratigraphic and other physical events that may prove useful in globally correlating the boundary horizon; (3) the biotic event[s] currently used to locate the Viséan-Serpukhovian boundary; and (4) the location of stratigraphic sections where marine strata 'near' the boundary reflect essentially continuous deposition, and are abundantly fossiliferous and readily accessible.

In its type region near the city of Serpukhov, south of Moscow, the Serpukhovian Stage has a regionally unconformable base and a major unconformity at the top. In the type region of the underlying Viséan Stage in the Namur-Dinant Basin of Belgium, the contact between the top of the Viséan and the overlying Serpukhovian-correlative lower Namurian succession is a regional unconformity resulting partly from Variscan tectonism, with variable hiatus covering parts of at least two regional stages [now substages]. Therefore, successions outside these regions will need to be considered for establishing the boundary. Also, it may not be possible to find a suitable global biotic event near the currently used base of the Serpukhovian. Instead, we may need to consider events down in the upper Viséan, possibly as low as the Asbian provincial stage of Britain, which is approximately correlative with the lower Chesterian of North America and the lower Warnantian provincial stage of Belgium. Conodonts, ammonoids, and foraminifers are being considered for defining lineages.

**Conodonts.** Upper Viséan to Serpukhovian conodont lineages are best preserved in relatively deep-water outer-neritic to lower-slope and basin deposits. Three groups of conodont species could be useful for defining the Viséan-Serpukhovian boundary: a) *Lochriea* species, b) the *Gnathodus bilineatus* group, and c) the *Gnathodus girtyi* group of species. The most promising and best-documented lineages are within the *Lochriea* group of species: 1) *Lochriea nodosa* - *Lochriea ziegleri* or *Lochriea senckenbergica*, 2) *Lochriea costata* - *Lochriea cruciformis*, and 3) *Lochriea nodosa* - *Lochriea multinodosa* in Pyrenees and Cantabrian Mountains of Spain. The *Gnathodus bilineatus* and *G. girtyi* groups of species need additional study.

In Europe, lineages within the *Lochriea* group of species have been studied in numerous sections in the Urals, Moscow Basin, Germany, and the Cantabrian Mountains of Spain. The best of these occurrences may be in Germany (Schaelk section in the Rheinisches Schiefergebirge) and Spain (Santa Olaja de la Varga and Triollo sections in the Cantabrian Mountains). In addition, task group member Qi Yu-ping, recently recognized the lineage *Lochriea nodosa* – *Lochriea ziegleri* and other *Lochriea* lineages in the Nashui section near Luodian in Guizhou, southern China. In North America, the best sections for defining a GSSP based on conodont lineages occur in the Chainman Formation of Nevada and western Utah and the correlative Etherington Formation of the Canadian Rockies. The Chainman succession would potentially allow correlation with the ammonoid succession.

**Ammonoids.** Traditionally, the ammonoid-based Viséan-Serpukhovian boundary in Europe has been identified by the first appearances of the ammonoid genera *Cravenoceras* and *Eumorphoceras*, but many authors have found problems using species of *Cravenoceras* to correlate the boundary. The appearance of the fairly widespread girtyoceratid genus *Edmooroceras* (= *Eumorphoceras*) is close to the Viséan-Serpukhovian boundary, and is an easily recognized event documented from China to Europe and North America. One of the advantages of using *Edmooroceras* is that it can be readily recognized using crushed material, as sutures are not needed and the ornament is distinctive. The systematics of upper Viséan to lower Serpukhovian girtyoceratids requires some revision. Once that is completed, *Edmooroceras* could be a viable



candidate for a chronostratigraphic marker.

The basin-marginal to basinal Chainman Formation of west-central Utah provides an outstanding opportunity to use ammonoids to document this boundary because: 1) virtually continuous deeper water sections contain abundant ammonoids associated with conodonts ranging from the Asbian through upper Pendleian provincial stages; 2) they are in close proximity to carbonate shelf deposits with abundant shallow-water taxa that can be fairly well correlated with the deeper water sections; 3) they are situated on Public Lands with good accessibility; and 4) the desert provides outstanding exposures. Successions in the Urals and Tien Shan probably contain good sections across the Viséan-Serpukhovichian boundary, and the extensive ammonoid work completed there provides a good foundation for future study. In the southern Urals, the best boundary stratotype candidate is the section at Verkhnyaya Kardailovka, which is well exposed, accessible, and contains ammonoids, conodonts, and foraminifers.

**Foraminifers.** Among foraminiferal lineages, those containing *Neoarchaediscus postrugosus* and “*Millerella*” *tortula* appear to be the best candidates for defining a GSSP near the Viséan-Serpukhovichian boundary because they have wide geographic distributions and can be used to correlate between Russia and North America. The appearance of *Janischewskina delicata* may also be useful for global correlation. The traditionally accepted lineage containing *Neoarchaediscus postrugosus* includes *Asteroarchaediscus bashkiricus* - *Neoarchaediscus rugosus* - *Neoarchaediscus postrugosus* - *Brenckline rugosa*, which first appears in the upper Viséan and extends throughout the Serpukhovichian. A more recently recognized lineage “*Endostaffella*” *asymmetrica* - “*Millerella*” *tortula* - *Millerella pressa* spans much of the same interval in the Serpukhovichian type region (Gibshman, 2001). However, the phylogeny of “*Millerella*” *tortula* is somewhat controversial, as Brenckle and Groves (1981) proposed that “*M.*” *tortula* evolved from *Endostaffella discoidea* (Girty) and gave rise to “*M.*” *designata* and “*M.*” *advena/cooperi* higher in the Chesterian. Both *Neoarchaediscus postrugosus* and *Janischewskina delicata* first appear near the Viséan-Serpukhovichian boundary in the Serpukhovichian type region and at sections in the southern Urals.

In the U.S. Mississippi Valley region, three upper Viséan and lower Serpukhovichian levels contain potentially useful foraminifers: 1) appearance of the eosigmoilinids at the base of the Menard Limestone, 2) appearance of “*Millerella*” *tortula* within the ?Glen Dean/Vienna limestones, and 3) appearance of asteroarchaediscins (*Neoarchaediscus* and/or *Asteroarchaediscus*) in the Ste. Genevieve Limestone. The lowest level (*Asteroarchaediscus bashkiricus* and *A. rugosus* group) is below the classic base of the Serpukhovichian, but is significant in that it is close to the onset of the major glacial-eustatic changes characterizing the Chesterian and overlying Pennsylvanian. However, work in Eurasia suggests that the boundary cannot be picked consistently using these presently accepted markers because the forams are often either rare or their first occurrences have been placed in the upper Viséan. The first appearance of “*Millerella*” *tortula* is close to the base of the Serpukhovichian and has been described from the type Glen Dean Limestone of Kentucky and recorded from several other localities including upper Viséan strata in Arrow Canyon, Nevada.

Because foraminifers are most abundant and diverse in shallow-marine intertidal to fair-weather wave base deposits, the late Viséan - Serpukhovichian eustatic events disrupt such successions with numerous subaerial unconformities. Therefore, the best candidate sections for defining a GSSP using foraminiferal lineages would be neritic limestone deposited below fair-weather wave base, where lowstand subaerial exposure would have been less likely, yet foraminifers could be moderately abundant. The best candidate sections for a GSSP defined by foraminifers occur in the southern Urals, including the Bolshoi Kizil River section and at Verkhnyaya Kardailovka, mentioned above. Most sections in the Mississippi Valley region, and the eastern part of the western U.S. and Canadian Rocky Mountains sections appear to be unsuitable as foraminifer-based GSSP candidates because they contain numerous subaerial disconformities of uncertain hiatus length, although more western deeper water sections of the Chainman and Etherington formations in the Rocky Mountains should be more continuous.

The first official meeting of the task group at the Utrecht congress clarified several issues.

Regarding placement of the Viséan/Serpukhovian GSSP relative to the current base of the Serpukhovian in its type region, European and Russian participants believe that it should be as close to the existing Viséan/Serpukhovian boundary as possible, and that a position as low as the middle Asbian substage (approximately the base of the Chesterian) would be radical enough to cause confusion in the literature. Some North American participants favored a position near the middle Asbian both because it coincides with the onset of the major glacial-eustatic sea level changes characteristic of the late Mississippian and Pennsylvanian, and the potential for finding a taxon suitable for defining the GSSP is greater there.

Regarding potentially definitive biotic lineages, ammonoid expert Dieter Korn indicated that upper Viséan and lower Serpukhovian ammonoids were not common in most marine facies and the possibility of finding a suitable ammonoid species near the present Viséan/Serpukhovian boundary was remote.

Among the conodont experts the Europeans and Russians thought the first evolutionary appearance of *Gnathodus bilineatus* near base of Chesterian is too low and that some lineages within the *Lochriea* group of species have the greatest potential. Because *Lochriea* lineages have not been observed in North America, they decided to re-examine North American conodont collections for key taxa within the *Lochriea* group and also to restudy the phylogeny of *G. bilineatus*.

The foram workers mainly discussed the phylogeny of "*Millerella tortula*" because it appears that its first evolutionary appearance could be used for boundary definition, if the controversy about its phylogeny can be resolved. Task group members Paul Brenckle and Nilyufer Gibshman will work on this problem.

**The Task Group to establish the Bashkirian-Moscovian boundary**, chaired by John Groves, was formed in mid-2002 with a membership of 17 specialists representing 12 countries and a range of stratigraphic, biostratigraphic and chemostratigraphic expertise:

Alekseev, Alexander (Russia), conodonts  
 Altiner, Demir (Turkey), forams  
 Brand, Uwe (Canada), chemostratigraphy  
 Dzhenchuraeva, Alexandra (Kyrgyzstan), forams  
 Fohrer, Beate (Germany), ostracodes  
 Groves, John (USA), forams  
 Kulagina, Elena (Russia), forams  
 Lambert, Lance (USA), conodonts  
 Nemyrovska, Tamara (Ukraine), conodonts  
 Nikolaeva, Svetlana (Russia), ammonoids  
 Pazukhin, Vladimir (Russia), conodonts  
 Poletaev, Vladislav (Ukraine), brachiopods  
 Samankassou, Elias (Switzerland), stratigraphy  
 Turner, Nick (England), palynomorphs  
 Ueno, Katsumi (Japan), forams  
 Villa, Elisa (Spain), forams  
 Wang Xiangdong (China), corals

The first meeting of the Task Group was attended by seven members in Utrecht (The Netherlands) in connection with the XV-ICCP (August 2003). Discussion centered on developing a strategy for selecting a lower Moscovian GSSP by 2008. Pursuant to the meeting, the Chair solicited formal proposals for boundary-defining events, to be submitted by 1 April 2004. Once proposals are in hand, the group will evaluate competing boundary marker candidates through detailed field and laboratory investigations.

The following general observations regarding the Bashkirian-Moscovian boundary have been distilled from preliminary reports by Task Group members:

The type area of the Moscovian Stage is in the Moscow Basin where in most places an unconformity separates Moscovian from underlying strata, and where in many places Bashkirian strata are continental in character. Accordingly, the search for a lower Moscovian GSSP must extend away from the traditional reference area.

Richly fossiliferous and possibly complete successions across the Bashkirian-Moscovian transition are known in the Cantabrian Mountains (Spain), the Donets Basin (Ukraine), the South Urals (Russia), the Taurides (Turkey), south Tien-Shan (Kyrgyzstan), and South China. Of these areas, the Donets Basin and the South Urals have received the most study.

Conodonts and fusulinid foraminifers are the two most widely utilized biotic groups for subdividing and correlating Bashkirian and Moscovian strata. Two conodont lineages that seem promising for defining a lower Moscovian boundary are the *Declinognathodus marginodosus*—*D. donetzianus* lineage and the *Idiognathoides sulcatus*—*I. postsulcatus* lineage. Among fusulinids, lineages within *Profusulinella*, from *Profusulinella* to *Aljutovella*, from *Pseudostaffella* to *Neostaffella*, and from *Verella* to *Eofusulina* are important in the Bashkirian-Moscovian boundary interval of Eurasia. Many of the key fusulinid taxa are not known from the Americas, however, thereby reducing their usefulness in global chronostratigraphy.

Temporal trends in  $^{87}\text{Sr}/^{86}\text{Sr}$  may possess global correlation potential at the Bashkirian-Moscovian boundary level, once calibrated against biostratigraphic events in key lineages.

**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 uppermost Moscovian to lower Gzhelian. For both boundaries, fusuline faunas show strong provincialism, but the recent discovery of the Eurasian genus *Protriticites* [whose typical or advanced representatives have been used to define the traditional base of the Kasimovian in various Eurasian regions] in the western USA in mid-upper Desmoinesian strata has kept that option open.

Regarding the Moscovian-Kasimovian boundary, conodont faunas are being intensively investigated in several relevant areas, with new data from the Midcontinent and Paradox Basins in North America, the Cantabrian zone of Spain, and the Moscow and Donets Basins, and southern Urals of eastern Europe. There are two major conodont faunas that characterize lower Kasimovian strata in eastern Europe and the Desmoinesian-Missourian boundary strata in North America: A) The lower fauna [in the lower Kasimovian Kreviakian Substage and in the upper Desmoinesian Stage] is characterized by the occurrence of a troughed clade [recently named *Swadelina* Lambert, Heckel and Barrick 2003 to distinguish it from the younger troughed true *Streptognathodus*], along with species of *Idiognathodus*, the genus that dominates upper Moscovian and middle Desmoinesian strata. *Swadelina* includes *Sw. makhlinae* in eastern Europe and two closely related species *Sw. neoshoensis* and *Sw. nodocarinata* in North America. B) The upper fauna [in the lower middle Kasimovian Khamovnikian Substage and lower Missourian Stage] is dominated by a group of *Idiognathodus* morphotypes that include *I. sagittalis* in eastern Europe and *I. sulciferus* and its descendant *I. eccentricus* in North America.

At the 2002 task group meeting in Ufa, Russia, A.S. Alekseev indicated that the conodont lineage that includes *I. sagittalis* now appears to hold more promise for providing a correlatable evolutionary event upon which to base a GSSP, than do previously considered older lineages in the upper Moscovian. An event in the *I. sagittalis* lineage would be slightly younger than the traditional base of the Kasimovian around Moscow, and would be closer to the Desmoinesian-Missourian regional boundary established in North America (Heckel and others, 2002), which is based on the first appearance of *I. eccentricus*, a taxon that is related to the *I. sagittalis* lineage. Fusuline worker V. Davydov stated that the boundary should remain at its traditional level and be defined on an evolutionary event within a lineage from primitive to advanced *Protriticites*, but fusuline worker S. Remizova supported a younger boundary [closer to the appearance of *I. sagittalis*] at the first appearance of *Montiparus* because it is more easily recognized than fusuline taxa around the traditional base of the Kasimovian.

In May 2003, four conodont specialists, A. Alekseev, J. Barrick, N. Goreva, and T. Nemyrovskaya, met in Moscow to work on the taxonomy of the group of morphotypes that includes *I. sagittalis*, *I. eccentricus*, *I. sulciferus*, and their relatives, and to delineate an event that can be identified in Russia, Ukraine, U.S., and other parts of the world where marine rocks exist across this boundary. Some progress was made, and discussions are ongoing. Two North American species, including *I. eccentricus*, have been reported by C. Mendez from Spain in their expected positions with respect to the fusuline correlation with the Moscow region.

Alekseev and his colleagues have intensified their search for potential GSSPs by recollecting a more complete section in the Moscow region, along with the Dalniy Tyukas sections in the southern Urals that were visited during the 2002 meeting. They have also identified another potential section near Donskaya Luka in the southern Russian Platform to be studied in detail.

The next Task Group meeting, at the Carboniferous Workshop during the August 2003 Carboniferous Congress in Utrecht, was attended by members V Davydov, H. Forke, N. Goreva, P. Heckel, M.L. Martinez Chacon, T. Nemyrovskaya, C. Okuyucu, L.C. Posada, S. Remizova, R.M. Rodriguez, K. Ueno, and E. Villa. Task group leader E. Villa summarized the advantages and disadvantages of the three biostratigraphic candidates proposed at the Ufa meeting as potential markers for a Moscovian/Kasimovian boundary: a) first appearance of typical (advanced) *Protriticites*; b) first appearance of the fusuline *Montiparus*; and c) first appearance of the conodont *I. sagittalis*. Fusuline worker Davydov reiterated his position that the present Moscovian-Kasimovian boundary based on appearance of advanced *Protriticites* should not be modified. E. Villa pointed out the difficulties of using evolutionary events in detail of wall structure that depend so strongly on excellent preservation, and the lack of evidence that the appearance of *Protriticites* is synchronous in Eurasia and North America. To Davydov's concern that a higher basal boundary would detract from the Kasimovian, P. Heckel responded that a shorter Kasimovian would enhance its value in global correlation. Certainly, the combination of first appearance of *I. sagittalis* and *Montiparus* would provide a greater potential for intercontinental correlation, because the first appearance of *I. sagittalis* and *Montiparus* are close enough to one another that a boundary based on *I. sagittalis* could be identified in conodont-poor, fusuline-rich strata by the appearance of *Montiparus*. This is consistent with the revised guidelines for selection of GSSPs [Remane et al., 1996: *Episodes*, 19: 77-81] that GSSPs should reflect capability for global correlation using as many groups as possible, more than identifying ancestor-descendant relations in just one lineage. However, the isochronous appearance of *I. sagittalis* throughout its geographic range needs to be demonstrated with independent evidence.

During the coming months group members will work on completing relevant phylogenies and on correlating the areas involved with as many taxa as possible. The next meeting is planned for Oviedo, Spain, prior to the August 2004 IGC meeting in Florence.

Regarding the **Kasimovian-Gzhelian boundary**, discussions between J. Barrick and A. Alekseev at the 2003 meeting in Moscow focused attention on using the first appearance of *Idiognathodus simulator* in its strict sense to define the base of the Gzhelian, because that taxon, which was named from North America, is found near the base of the Gzhelian in both the Moscow and southern Urals region of Russia. This taxon would be more appropriate than *Streptognathodus zethus*, which has been used informally in some recent reports, because *S. zethus* was named from upper Kasimovian strata in the southern Urals. In further discussions with P. Heckel, ammonoid workers D. Work and D. Boardman expressed strong support for using *I. simulator* s.s., because it is more consistent with the classic ammonoid boundary used in the Urals when correlated with the ammonoid succession in the southern Midcontinent of North America. This idea was further supported by Russian colleague B. Chuvashov and other European colleagues at an October 2003 meeting attended by P. Heckel and A. Alekseev in Potsdam, Germany. Work is beginning on the taxonomy of its descent from its ancestor *I. aff. simulator* in the upper Missourian of North America.

## 7. CHIEF PROBLEMS ENCOUNTERED IN 2003

One of the voting members in his first term has not responded to either of the two ballots that were circulated this year [the first on the Chair and Vice-Chair for the 2004-2008 term; the second on two alternatives for series subdivision of the Carboniferous and on the reduction in rank of regional western European stages to substages, reported above]. Nor did he respond to an invitation to join one of the Task Groups for selecting global stage boundaries in his area of expertise. I understand from colleagues that he has been ill, and so I plan to ask him to step down from the voting membership in the SCCS. Once this problem is resolved, we will finalize the selection of new voting members.

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

STATEMENT OF OPERATING ACCOUNTS FOR 2002/2003  
Prepared by David Work, Secretary  
(Definitive accounts maintained in US currency)

### INCOME (Oct. 31, 2002 – Oct. 31, 2003)

IUGS-ICS Grant 2003	\$900.00
Donations from Members	420.00
Interest	<u>5.29</u>
<b>TOTAL INCOME</b>	<b>\$1325.29</b>

### EXPENDITURE

<i>Newsletter</i> 21 (printing)	\$849.00
Postage for bulk mailings	514.14
Mailing/Office Supplies	127.94
Bank Charges	<u>120.29</u>
<b>TOTAL EXPENDITURE</b>	<b>\$1611.37</b>

### BALANCE SHEET (2002 – 2003)

Funds carried forward from 2001 – 2002	\$2150.57
PLUS Income 2002 – 2003	1325.29
LESS Expenditure 2002 – 2003	<u>-1611.37</u>
<b>CREDIT balance carried forward to 2004</b>	<b>\$1864.49</b>

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

As a result of the August 2003 Carboniferous Congress in Utrecht, the following activities are planned in the task groups [*distilled from the task group reports in # 6 above*]:

**Tournaisian-Visean boundary.** With the *Episodes* paper on the GSSP published, this task group needs only to provide some information on the relation of the ammonoid and trilobite successions in a nearby section to present the proposal to the SCCS for a vote on the GSSP.

**Visean-Serpukhovian boundary.** The Utrecht meeting culled much of the voluminous initial information compiled in the July 2003 *Newsletter*, with focus for next year's work brought down to a few particular conodont and foram lineages.

**Bashkirian-Moscovian boundary.** The Utrecht meeting focused attention on various conodont and foram lineages, although the use of foram lineages is hampered by absence of many of the taxa in the Americas. The task group chair has asked for formal proposals for boundary-defining events by early April 2004.

**Moscovian-Kasimovian boundary.** The Utrecht meeting focused on three possible lineages for boundary-defining events, two among forams, and one among conodonts that is consistent with one of the potential foram events. After more lab and field work, there will be a task group meeting in Oviedo, Spain, prior to the August 2004 IGC in Florence, Italy.

**Kasimovian-Gzhelian boundary.** Events preceding and following the Utrecht meeting focused attention on a conodont lineage that provides good potential for a boundary-defining event that is consistent with the working ammonoid definition of this boundary in the Urals. Taxonomic work on this lineage is planned for presentation at the Oviedo meeting in August 2004.

Much of the work that took place at the Utrecht Congress and the work that will be accomplished in the next few months as a result of the Utrecht Congress will be published in the Task Group reports in Volume 22 of the *Newsletter on Carboniferous Stratigraphy* in July 2004.

## 10. BUDGET AND ICS COMPONENT FOR 2004

### PROJECTED EXPENSES

<i>Newsletter</i> printing (est. 400 copies @ 70 pages at commercial rates [~0.05])	\$1400
Supplies and postage for bulk mailing of <i>Newsletter</i> to various areas	\$900*
Bank charges for international account	\$200
TOTAL PROJECTED EXPENSES	\$2500

### INCOME

Carryover ( <i>from CREDIT balance in section # 8 above</i> )** [\$590**]	\$1865
Estimated donations [average of 2002 and 2003 donations]	\$270
TOTAL INCOME	\$2135

### BALANCE

Estimated deficit from above**	[((\$1610)**)]	(\$335)
BUDGET REQUEST FROM ICS for 2004		\$1000

\*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] may be breaking down, based on reports of non-receipt from some areas. Therefore, more copies may have to be mailed individually.

\*\*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 \$1610 under ordinary circumstances. Therefore I am requesting more than what might appear necessary in order to accommodate anticipated *Newsletter* expenses for future years.

### 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.

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

This summary is updated from the information provided last year, which was derived from the Working (Task) and Project Group reports in the *Newsletter on Carboniferous Stratigraphy*.

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. This year 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.

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 now has progressed to the point that a proposal for the GSSP in south China was published in the June 2003 issue of *Episodes*.

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, we established in 2002 a new Task Group on a Boundary close to the existing **Visean-Serpukhovian Boundary** under the leadership of a new Chair, for which membership was selected and work started for presentation and discussion at the Utrecht Congress in 2003. This Task Group has now focused work on several conodont and foram lineages for potential boundary-defining events.

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 the most recent progress at the September 2001 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, for which membership was selected and work started for presentation and discussion at the Utrecht Congress in 2003. This Task Group has focused on several conodont and foram lineages, and the Chair has asked for formal boundary-defining events by April 2004.

Work on the **Moscovian-Kasimovian boundary** has been extensively reported in all 5 *Newsletters*. 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, and Southern Urals region of Russia in 2002. Fusuline workers have recognized problems of provincialism in much of the Kasimovian part of the succession in Eurasia, although one fusuline event may coincide with an event in a conodont lineage. 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 lineages are being clarified that may be able to define both the Moscovian-Kasimovian and Kasimovian-Gzhelian boundaries.

**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], who 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, which 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.

*See Accomplishments in 2003 (above) for additional details.*

## 12. 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 GSSP boundaries, keeping in mind the emphasis on selecting readily correlatable boundaries expressed by Remane et al. (1996).

The **Tournaisian-Visean Boundary GSSP** should be selected within the next year, now that the faunal definition has been approved and a proposal for the GSSP has been published in the June 2003 issue of *Episodes*. We are awaiting supplementary information on correlation using other fossil groups before we put the GSSP proposal to a vote within the SCCS.

The new **Visean-Serpukhovian Boundary Task Group** is off to a good start, and the August 2003 Utrecht Congress meeting narrowed attention to only a few conodont and foram lineages to be further studied. More work is needed to come to a consensus on the boundary-defining lineage in this task group because of the great disparity of opinions among workers, but I believe that 2008 is a realistic goal.

The new **Bashkirian-Moscovian Boundary Task Group** is off to a good start. The August 2003 Utrecht Congress meeting narrowed attention to only two conodont and two foram lineages to be further studied, with the conodont lineages being the more realistic probabilities because of the much greater endemism among the forams. The Chair's request for formal boundary-defining proposals by April 2004 will promote progress toward defining a boundary GSSP before 2008.

The **Moscovian-Kasimovian Boundary and the Kasimovian-Gzhelian Boundary Task Group** is moving ahead as the previously muddled conodont taxonomy is slowly being clarified. I believe that it will be able to select correlatable events within evolutionary lineages that can be identified in as many of the most complete successions of this age as possible [South Urals, Midcontinent North America, Donets Basin, northern Spain] for both boundaries in 1 or 2 years, with GSSPs selected by 2008.

I am hopeful that ongoing work in chemostratigraphy will identify events that can be used to at least supplement the boundaries that will be defined through 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 also 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 Oviedo, Spain, in August 2004 prior to the Florence IGC. I am encouraging other task groups to have meetings at the IGC of those members who will attend the IGC. Belgian colleagues have volunteered to host the 2005 Field Meeting in the Dinantian type region of the Tournaisian and Visean Stages.

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

**CHAIR:**

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**SECRETARY/EDITOR:**

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***Lists of Task Groups and their officers are provided in Item #3 above.***

**OTHER VOTING MEMBERS:**

Dr Alexander S. Alekseev, RUSSIA	Email: aaleks@geol.msu.ru
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Dr Darwin R. Boardman, U.S.A.	Email: amm0001@okstate.edu
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## SUBCOMMISSION ON DEVONIAN STRATIGRAPHY ANNUAL REPORT 2003

### 1. TITLE OF CONSTITUENT BODY

#### Subcommission on Devonian Stratigraphy (SDS)

*Submitted by:*

**Pierre Bultynck**

*Chairman, SDS*

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16<sup>th</sup> December 2003

### 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 stratigraphy....
- 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 world wide 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

#### 3a. Nominated Officers for 2004-2008:

Chair:	Thomas Becker (Germany) <i>and</i> Ahmed El Hassani (Morocco).
Vice-Chair:	Eberhard Schindler (Germany) <i>and</i> Jim Over (USA).
Secretary:	<i>to be selected by elected chairman.</i>

Method of selection: in May 2003 we mailed a form to SDS voting and corresponding members asking to propose candidate chair- and vice-chair persons.

Voting members will elect the chair- and vice-chair person in January 2004.

#### 3b. Organization:

Officers: Chairman, 1 vice-chairman (also webmaster and editor of Newsletter), secretary.  
Voting members (18), corresponding member (74).

Four Working Groups:

Subdivision of the Emsian, leader R. Mawson (Australia);

Subdivision of the Givetian, leader P. Bultynck (Belgium);

Subdivision of the Frasnian, leader J. Over (USA);  
 Subdivision of the Famennian, leader Th. Becker (Germany).

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

- Logistic support from the Royal Belgian Institute of Natural Sciences; University of Muenster (Germany); Department of Geology, University of Texas at Arlington (USA).
- Financial support from the Department of Geology, University of Texas at Arlington (USA) and the Petroleum Research Fund of the American Chemical Society for edition and mailing of the Newsletter.
- Individual traveling funding from scientific foundations or institutes.

#### 5. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

#### 6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2003

Compared to those of last year the progress made in the subdivision of the Emsian, Givetian, Frasnian and Famennian is rather limited. The SDS had planned a field trip and annual meeting in Iran, however because of the regional critical situation this meeting didn't take place.

- An informal SDS meeting was held during the Annual meeting of the Geological Society of America (Seattle, November). The meeting was attended by 23 people, including 3 voting members and 7 corresponding members. The substage progress and voting membership for the period 2004 (after IGC) – 2008 were discussed. Proposals for future meetings and fieldtrips were made (see item 12).
- A formal vote (VM) for the **subdivision of the Famennian** into three versus four substages was organized; provisional results: 8 in favor of 3 substages, 10 in favor of 4 substages.
- Proposals for the definition of the base of a **middle-** and **upper Givetian** substages have been formulated.
- The Clay mineralogy, zircon morphology and trace elements from late Frasnian K-bentonites from the Ardennes have been studied. U-Pb zircon ages for these bentonites will be studied (Gouwy and Bultynck).
- U-Pb zircon ages of late Frasnian K-bentonites from the Kellerwald (Germany) are in press (Kaufmann, Trap and Mezger).

#### Products

- Newsletter n° 19
- Courier Forschungsinstitut Senckenberg, 242. Proceedings of the International Senckenberg Conference: Mid-Palaeozoic Bio- and Geodynamics (2001) with collaboration of the SDS and IGCP project 421. The volume includes 16 contributions concerning the Devonian.

#### 7. CHIEF PROBLEMS ENCOUNTERED IN 2003

The SDS field trip and annual meeting scheduled for 2003 in Iran has been cancelled because of the critical situation in that area. Interest for a proposed alternative meeting in the Ardenne-Rhenish area was too low.

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

<b>Income:</b>	<i>US \$</i>
▪ Balance from 2002	450.58

▪ IUGS subvention 2003	<u>1275.00</u>
	<b>1725.58</b>

### Expenses

▪ Secretary expenses	250.00
▪ Newsletter n° 19	400.00
▪ Bank commission	10.00
▪ Financial contribution for the organization of SDS meeting in Morocco (2004)	500.00
▪ Informal SDS meeting Seattle (USA)	<u>600.00</u>
	1760.00

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

International meeting hosted by SDS and the Institut Scientifique de Rabat (Sessions and conferences in Rabat and field trip in the Western Anti-Atlas, Dra Valley): “*Devonian neritic-pelagic correlation and events*”. March 1-10, 2004

Publication of results in Travaux de l’Institut Scientifique de Rabat.

SDS will hold a short Business Meeting and an open discussion form on « Devonian substages – progress and tasks”.

32<sup>nd</sup> IGC in Florence, August 20-28. SDS organizes a session within the General Symposia: “High-resolution stratigraphy for the subdivision of the Devonian stages”.

During the SDS Business Meeting discussions on the subdivision of the Emsian, Givetian, Frasnian and Famennian stages will be finalized.

## 10. BUDGET AND ICS COMPONENT FOR 2004

	<i>US \$</i>
▪ Balance from 2003	0.00
▪ Secretary expenses	250.00
▪ Newsletter n° 20	400.00
▪ Support for Morocco Meeting (500 US \$ was paid on budget 2003)	500.00
▪ Support for IGC Meeting Florence	<u>1000.00</u>
	<b>2150.00</b>

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

### Subdivision of the Emsian

Formal vote in favor of a **Lower** and **Upper** Emsian substages. Preference is given to a boundary level at the base or close to the base of the *inversus* conodont zone and in connection with the Daleje Event. The dacryoconarid *Nowakia cancellata* and the conodont *Polygnathus gilberti* may be good biostratigraphic markers.

### Subdivision of the Givetian

Proposal for the base of the *hermanni* conodont zone as the base of an **Upper** Givetian substage, corresponding to the Upper Taghanic Onlap (Geneseo Transgression) considered to be the most significant break in the New York succession.

Proposal for a **Middle** Givetian substage. Two possible boundary levels have been proposed. One at the base of the *timorensis* conodont zone and corresponding to a sea level rise

and northward onlap in the Ardenne area. Another is at the base of the *varcus / rhenanus* conodont zone that also can be situated in a T-R cycle.

### Subdivisions of the Frasnian

Formal vote in favour of a Lower, Middle and Upper Frasnian substage. Preference is given to a **Middle** Frasnian boundary level at the base of the *punctata* conodont zone, and to the base of the “semichatovae Transgression” for the base of the **Upper** Frasnian. The two levels can be correlated with the Frasnian T-R cycles of Johnson *et al.* (1985).

*Accomplishments for 2003 (see item 6 for subdivision of the Famennian).*

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

Objectives after IGC 2004 have to be discussed by the new officers for the period 2004-2008.

**2004:** SDS will organize a session on “High-resolution stratigraphy for the subdivision of the Devonian stages” within the General Symposium “Stratigraphy of the 32<sup>nd</sup> International Geological Congress to be held in Florence (August 20-28, 2004). In agreement with former formal SDS decisions on the substages and considering the data presented at the Florence session, the Emsian, Givetian, Frasnian, Famennian substages program will be finalized. A summary paper, prepared by the four working groups, will be submitted for publication in Episodes. We also plan to edit a special volume documenting the used multidisciplinary stratigraphic criteria and the regional reference sections.

See also item 9.

**2005:** VM Yolkin and CM Izokh proposed the organization of a field trip to Siberia. Wide distribution of Devonian strata and significance for global correlation.

**2006:** Meeting in conjunction with the 9<sup>th</sup> International Conodont Symposium in England and field trip to the Old Red Devonian (proposed by CM John Marshall).

**2007:** Meeting in conjunction with an International Devonian Symposium concentrating on the Western Interior with field trips to Nevada / perhaps New Mexico.

## APPENDIX

### Subcommission officers

Chairman: P. Bultynck, Belgium. pierre.bultynck@naturalsciences.be or pierre.bultynck@belgacom.net

Vice-Chairman: Rex E. Crick, USA, crick@uta.edu

Secretary: T. Becker, Germany. rbecker@uni-muenster.de

### List of Voting Members

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## SUBCOMMISSION ON SILURIAN STRATIGRAPHY ANNUAL REPORT 2003

### 1. TITLE OF CONSTITUENT BODY and NAME OF REPORTER

#### Subcommission on Silurian Stratigraphy (SSS)

*Submitted by:*

**Rong Jiayu, Chair, SSS**

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15 December 2003

### 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 Silurian 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*)

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.

#### 3a. Officers for 2004-2008:

Chair: Rong Jiayu, Nanjing, China.

Vice-Chair: T. N. Koren', St. Petersburg, Russia.

Secretary: M. J. Melchin, Antigonish, Canada

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

In kind support of the Chairman's Institute (Nanjing Institute of Geology and Palaeontology), and the Secretary's institute (St. Francis Xavier University).

#### 5. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

**Subcommission on Ordovician Stratigraphy.** Co-sponsored meeting in Argentina and Joint working group on the restudy of the Ordovician-Silurian Boundary.

Possible collaboration on a proposed IGCP Project tentatively titled "Ordovician Palaeogeography and Palaeoclimate".

**Graptolite Working Group.** Co-sponsored meeting in Argentina and planning field meeting in Baltic region, 2005.

#### 6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2003

The eleventh issue of *Silurian Times* - the official newsletter of the Silurian Subcommission (edited by Secretary Mike Melchin) was circulated in June 2003 to all subcommission members, as well as a broad constituency of Silurian researchers around the world. This is the third 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 first year that the documents was posted as an Adobe Acrobat PDF file, making it easier to download and print for SSS members. Almost all SSS members were able to read the document in this way and relatively few copies needed to be circulated through the normal postal system. By this means, the SSS continues to realize substantial savings in postal costs. In addition, this form of transmission of *Silurian Times* means that all researchers and members of the general public who have an interest in the Silurian System can learn of the activities of the SSS. In addition, updates to the site can be posted at intervals other than the annual time of delivery so that the news can remain more current.

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. Many thanks to the organizing committee in Argentina for their efforts in making this excellent conference happen. Accompanying this conference was the publication of the volume entitled "*Proceedings of the 7th International Graptolite Conference & Field Meeting of the International Subcommission on Silurian Stratigraphy. INSUGEO, Serie Correlación Geológica. Comunicarte Editorial, Tucumán, Argentina*" edited by G. Ortega and G.F. Aceñolaza.

The two GSSP restudy working groups commissioned by the SSS, led by Mike Melchin (Canada) for the Base of Silurian; and David Loydell (UK) for the Base of Wenlock, made considerable progress. Several papers related to the GSSP for the base of the Silurian were presented at the SSS field meeting in San Juan, Argentina, in August, 2003. These papers summarized new graptolite and chitinozoan data from the current GSSP as well as new data from another section proposed for restudy, Wangjiawan, China. After the technical sessions, a workshop was held to discuss the GSSPs under study by the respective working groups. Fourteen members of the **Ordovician-Silurian boundary** working group were in attendance and, after the talks and discussion, a straw vote was held on the proposal presented by Mike Melchin, that the **current GSSP** (1.6 m above the Base of the Birkhill Shale at Dob's Linn, Scotland) be **retained, but the biostratigraphic definition be modified** to reflect the revised biostratigraphy of the section. This proposal was unanimously endorsed in the straw vote, so the organizer of the working group, Mike Melchin, will send this proposal to the SSS titular membership for a formal vote. If ratified, the



recommendation will be forwarded to the ICS for approval.

Only four members of the **Llandovery-Wenlock** working group attended the field meeting in Argentina, so it was not possible to make any formal recommendations concerning this boundary. However, the feeling among the members present, as well as the organizer of the working group (who was not in attendance, but sent his views by correspondence) was that the **biostratigraphic level** as defined at the **current GSSP** is significantly **ambiguous** and that other sections will need to be considered for restudy. Colleagues from the Czech Republic were asked to investigate the possibility that at GSSP candidate section may exist in the Prague Basin.

*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. We also anticipate that the world-wide coverage and thoroughness of *Bulletin* 493 mean that it will also receive the same enthusiastic reviews in national and international journals that *Bulletin* 491 received. *Bulletins* 491 and 493 will find their way to every "serious" earth history library.

## 7. CHIEF PROBLEMS ENCOUNTERED IN 2003

None.

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

Vice-Chair travel to the Field meeting in Argentina	\$1,600
TOTAL	\$1,600

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

- Final vote on the proposal to maintain the current GSSP for the Base of the Silurian System, but with a revised biostratigraphic definition.
- Continued study of possible candidates and levels for restudy Base of the Wenlock Series.
- Continued study of evolutionary and ecological changes and rates of change through Silurian time.
- Integration with the proposed IGCP Project tentatively titled "Ordovician Palaeogeography and Palaeoclimate". This major international effort will seek to improve our understanding of climating, oceanographic, and biogeographic changes that too place through Early Paleozoic time.
- Continued refinement of correlation between fauna/floral groups and chemostratigraphic successions through the Silurian. Improved resolution in correlation between biostratigraphic zonation and radiometric time scale, especially at GSSP sections and other well-constrained stage and series boundaries.
- August 20-28, 2004. Florence, Italy. International Geological Congress. Several symposia and a workshop involve SSS members:
  - Special Symposium - The Geological Time Scale - Recent Developments and Global Correlations
  - General Symposium - Paleobiodiversity and major biotic changes in Earth history
  - Workshop Challenges and new directions in global stratigraphy
- Compilation and publication of *Silurian Times* 12.

- Seek replacements for some retiring SSS titular members.

## 10. BUDGET AND ICS COMPONENT FOR 2004

(a) Support for Chair to travel to IGC, Florence.	2,000
TOTAL 2003 BUDGET REQUEST	<b>\$2,000 US</b>

### Potential funding sources outside IUGS

In kind support from the Secretary's Institute (St. Francis Xavier University) to cover the costs of production of *Silurian Times*. Additional support from the Chair's institute to cover the remaining costs of travel to IGC.

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

*See Accomplishments in 2003 (above) for additional details.*

- Publication of "*Silurian Cycles: Linkages of Dynamic Stratigraphy with Atmospheric, Oceanic and Tectonic Changes. New York State Museum Bulletin 491*", edited by E. Landing and M. Johnson. These are, in part, the proceedings of the James Hall Symposium on the Silurian System, held in Rochester, NY, in August, 1996.
- SSS Field meeting in Madrid, Spain and field trip in southern Spain and Portugal - resulted in publication of "*Proceedings of the Sixth International Graptolite Conference of the GWG (IPA) and the 1998 Field Meeting of the International Subcommittee on Silurian Stratigraphy (ICS-IUGS). Instituto Tecnológico Geominero de España, Temas Geológico-Mineros, 23*", edited by J.C. Gutiérrez-Marco and I. Rábano.
- 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 Paleontological Convention and the 2<sup>nd</sup> 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.

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

*See above "Work Plan, Critical Milestones, Anticipated Results and Communications to be Achieved Next Year" for additional information.*

*Meeting/field workshop schedule with themes and anticipated results:*

- Proposed SSS Field Meeting, Gotland, Sweden, 2005. Visit classic Silurian localities in Gotland and discuss the wealth of biostratigraphic, paleoecological and chemostratigraphic data that have come from this region over the past two decades, and its integration and correlation with data from other regions of the globe.
- International Symposium on the Silurian System in Nanjing, China, in 2007, to be held in conjunction with an International Symposium on the Ordovician System. Field trips will focus on classic Silurian sections in South China, possibly including a section that has been proposed for restudy of the Base of the Wenlock Series.

## APPENDIX - Names and Addresses of Current Officers and Voting Members

### **Subcommission officers**

**Chairman:** Rong Jiayu,

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**Vice Chairman:** Tatiana Koren',

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**Secretary:** Michael Melchin,

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### **List of Voting Members**

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## SUBCOMMISSION ON ORDOVICIAN STRATIGRAPHY ANNUAL REPORT 2003

### 1. TITLE OF CONSTITUENT BODY

#### Subcommission on Ordovician Stratigraphy (SOS)

*Submitted by:*

**Stanley C. Finney**  
*Chair, SOS*

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9 December 2003

### 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 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

Chairperson, S.C. **Finney** (U.S.A.)

Vice-chairperson, Chen Xu (P.R. China)

Secretary, G.L. **Albanesi** (Argentina)

18 other Voting Members

92 Corresponding Members

GOES Program - research committee

Secretary, W.B. N. Berry (U.S.A.)  
C. R. Barnes, S. M. Bergström, S.C. Finney, and R.A. Astini

### 3a. Nominated Officers for 2004-2008:

Chair:	Chen Xu, Nanjing Institute of Geology & Palaeontology, Nanjing, CHINA
Vice-Chair:	Juan Carlos Gutierrez-Marco, Instituto de Geología Económica (CSIC), Universidad Complutense Madrid, SPAIN
Secretary:	Guillermo Albanesi, CONICET - Museo de Paleontología, Universidad Nacional de Córdoba, ARGENTINA

Selection Process: Before and during the 9<sup>th</sup> ISOS in August 2003, the Subcommittee chair informally discussed possible nominees for the executive offices of the Subcommittee and found there was a general consensus for those listed above. At a formal business meeting of the Subcommittee at 9<sup>th</sup> ISOS, the nominees were presented and discussed at length, after the nominees were asked to leave the room. Those voting members present then voted in a secret ballot, the results of which were a near unanimous approval. Subsequently, in September 2003, a formal mail ballot was sent to ALL voting members of the Subcommittee. The result of the ballot is that all three nominees were approved by overwhelming majority votes.

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

SOS receives no formal support from international organizations outside IUGS/ICS. The activities of some Subcommittee members (voting and corresponding) have been supported in part by the recently completed IGCP 410. If approved for funding, the successor IGCP "Impact of changing palaeogeography and palaeoclimate on major biotic changes through the Ordovician" will continue this support. Independent support for projects comes mainly from individual Ordovician workers, through their employer organizations and through individual to multidisciplinary, cooperative, team activities supported by grants from national/regional government-funded bodies.

## 5. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

**IGCP Project 410:** The Great Ordovician Biodiversification Event. Project nearly completion with final meeting held in conjunction with the first International Paleontological Congress, Sydney, Australia in July 2002 and with completion of book entitled "The Great Ordovician Biodiversification Event" that is in press with Columbia University Press.

**IGCP Project Proposal:** Impact of changing paleogeography and paleoclimate on major biotic changes through the Ordovician. Proposers are corresponding and nominated voting members of Ordovician Subcommittee. This is a successor to IGCP 410 and will support substantial research on Ordovician strata and fossils, including travel to meetings at which Subcommittee business will be carried out. It will include activities stimulated by the GOES project of the Subcommittee.

## 6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2003

- a. Diabasbrottet and Fagelsang **GSSPs** were dedicated in Sweden in May 2003. Diabasbrottet GSSP defines **base of Second Stage** of Ordovician System (i.e., the upper stage of the Lower Ordovician Series), which will be named after the upper boundary of the stage is

- defined. Fagelsang GSSP defines **base of Upper Ordovician Series** and the **Fifth Stage** of the Ordovician System (i.e. lower stage of the Upper Ordovician Series), which will be named after the upper boundary of the stage is defined.
- b. The **9<sup>th</sup> International Symposium on the Ordovician System** was held in San Juan, Argentina in August 2003. This meeting was held in conjunction with the 7<sup>th</sup> International Graptolite Conference and a Field Meeting of the Subcommittee on Silurian Stratigraphy. There were 130 registered participants. Over three days of technical sessions, 124 papers were presented. Pre- and post-symposium and mid-symposium field trips explored Ordovician and Silurian stratigraphy and examined graptolite successions in the Precordillera and Eastern Cordillera of the northwestern Argentina. Two proceedings volumes were distributed at the meeting: "Ordovician from the Andes: Proceedings of the 9th International Symposium on the Ordovician System", edited by Guillermo L. Albanesi, Matilde S. Beresi, and Silvio H. Peralta with 94 papers and 556 pages, and "*Proceedings of the 7th International Graptolite Conference and Field Meeting of the International Subcommittee on Silurian Stratigraphy*", edited by Gladys Ortega and Guillermo F. Aceñolaza with 30 papers and 188. Also a series of field trip guidebooks were prepared and published. And, as an expression of their pride in organizing this importance symposium, the Argentine colleagues produced the book *Aspects of the Ordovician System in Argentina*, edited by F.G. Acenolaza, which includes 24 papers on a rich variety of topics related to Ordovician geology in Argentina. All this products were published by the Instituto Superior de Correlacion Geologica, Universidad Nacional de Tucuman as part of the established publication series *Serie Correlacion Geologica*.
- c. Considerable progress was made on selection of the **GSSP** for the **base of the Middle Ordovician Series** (also the base of the **Third Stage**). Proposals have been submitted to the Subcommittee for two candidate GSSPs: 1) the FAD of the conodont *Protoprioniodus aranda* in the Niquivil section, Argentina, and 2) the FAD of the conodont *Baltoniodus triangularis* in the Huanghuachang section, China. The Niquivil section was visited during the pre-symposium field excursion during the 9<sup>th</sup> ISOS. A small group of voting members and officers will inspect the Huanghuachang in March 2004. In addition, a small, dedicated section is evaluating the potential of a section in Western Newfoundland. The Subcommittee expects to move forward with voting on the candidate GSSPs in Spring 2004.
- d. In 1995, the Subcommittee voted to **subdivide** the **Upper Ordovician Series** into two stages (the Fifth and Sixth Stages of the Ordovician System) with the boundary between them being based on the FAD of the graptolite *Dicellograptus complanatus* and/or the conodont *Amorphognathus ordovicicus*. After 17 years of evaluating sections, no adequate stratotype sections could be found for these biohorizons. Accordingly, in business meetings at 9<sup>th</sup> ISOS, the Subcommittee voted to pursue a new strategy, which is to divide the Upper Ordovician Series **into three stages** with the boundaries between them placed at biohorizons with known potential for reliable global correlation and for which there exists suitable stratotype sections. The FAD of the graptolite *Diplacanthograptus caudatus* is favored as the biohorizon for defining the **base of the Sixth Stage** (base of middle stage of Upper Ordovician Series) with candidate stratotype sections at Black Knob Ridge, Oklahoma, USA and Hartfell Spa, southern Scotland, UK. The **Seventh Stage** (or uppermost stage of the Upper Ordovician Series) **will be the Hirnantian Stage**. One GSSP proposal is the base of the *Normalograptus extraordinarius-N. ojsuensis* graptolite biozone in the Wangjiawan section in China. A call has gone out for additional proposals. The Wangjiawan section will be visited by the Subcommittee in March 2004. A January 10, 2004 deadline has been set for GSSP proposals for all boundaries for all Upper Ordovician

stages. The goal is to move towards voting on candidate GSSPs in the Spring 2004.

- e. *Ordovician News No. 20* was produced and posted on the Subcommittee web site in September 2003 and a limited number of hard copies were printed and distributed.

## 7. CHIEF PROBLEMS ENCOUNTERED IN 2003

Progress stalled on identifying potential GSSPs for the base of the Middle Ordovician Series and for the base of the stage boundary within the Upper Ordovician Series. Accordingly, the Subcommittee was forced to devise a new strategies, which it is now pursuing as describe above.

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.

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

Plaques for Diabasbrottet and Fagelsang GSSPs:	\$ 625
Condont work to refine Niquivil GSSP proposal:	\$ 500
<i>Ordovician News No. 12</i> production costs:	\$ 500
Supplement for 2 voting members to visit GSSPs in China in March 2004	\$ 275
Supplement for travel of Subcommittee Chair to 9 <sup>th</sup> ISOS	<u>\$ 600</u>
TOTAL	\$2500

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

Inspection of Huanghuachang section, China, candidate GSSP for base of Middle Ordovician Series, March 2004.

Inspection of Wangjiawan section, China, candidate GSSP for base of Hirnantian Stage, March 2004.

Selection of new voting members of Subcommittee and retirement of several long-term voting members.

Evaluation of candidate GSSPs for **base of Middle Ordovician** Series and decision to proceed with voting or to reconsider a different biohorizon, April 2004.

Evaluation of candidate GSSPs for **base of Hirnantian Stage** (7<sup>th</sup> stage of Ordovician System) and decision to proceed with formal ballot, April 2004.

Evaluation of candidate GSSPs for base of middle stage of Upper Ordovician Series (6<sup>th</sup> stage of Ordovician System), and decision to proceed with formal ballot, April 2004.

Sponsorship of General Symposium G - 22.02 "The global Ordovician Earth system" at the 32nd International Geological Congress, Florence, August 2004

Production and internet distribution of *Ordovician News No. 21* in May 2004.

## 10. BUDGET AND ICS COMPONENT FOR 2004

<i>Ordovician News No. 12</i> production costs:	\$ 250
Support for secretarial office	\$ 250

Travel subsidies for voting members attending Subcommission activities at 32 <sup>nd</sup> IGC	\$1000
Field work support for studies of candidate stratotype sections	\$1000
Travel support for Chair to attend GSSP dedications	<u>\$1000</u>

TOTAL 2004 BUDGET REQUEST **\$3,500** (through Mar, 2005)

### Potential funding sources outside IUGS

Newly submitted IGCP Project, "Impact of changing palaeogeography and palaeoclimate on major biotic changes through the Ordovician", if approved, will provide travel subsidies for Subcommission members from developing countries to attend meetings with activities of the Subcommission.

The department of Geological Sciences at California State University at Long Beach provides support for the Subcommission website, including a web master, for postage, and for postage, and partially supports the international travel of the Subcommission chair.

As in previous years, financial support is obtained on occasion by individual members from their grant-awarding bodies for specific projects such as research projects and meetings.

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

- 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 three GSSPs remaining to be selected** and approved by the Subcommission, 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. 8th International Symposium on the Ordovician System in Prague, Czech Republic in July 1999, and publication of a 543 page proceedings volume (*Acta Universitatis Carolinae, Geologica*, v. 43, no. 1/2). 147 participants represented 21 countries; 142 papers were presented in technical sessions.
- f. 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 Subcommission on Silurian Stratigraphy and publication of proceedings volume.
- g. Publication of *Ordovician News* nos. 16-20 and their posting on the Subcommission's web site.
- h. Development of the web site "Ordovician Stratigraphy Discussion Group" to facilitate discussions on selection of the GSSP for the base of the Middle Ordovician Series. This site has evolved into the Subcommission's web site and also includes postings of *Ordovician News*.
- i. Sponsorship of a technical session and field excursion on the GSSP for the base of the Middle Ordovician Series at the Annual Meeting of the Geological Society of America in November 2000.
- j. Sponsorship at the 31st International Geological Congress of the symposium "Paleontological, stratigraphical, and paleogeographical relations among South America, Laurentia, Avalonia, and Baltica during the Ordovician."
- k. Sponsorship at the 32nd International Geological congress of the symposium "The global Ordovician Earth system."
- l. Launched GOES (Global Ordovician Earth System) Program to stimulate integrated multi-disciplinary studies of global events (mass extinction, sea-level changes, greenhouse



conditions, tectonics) during the Ordovician Period.

- m. Sponsorship of 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.

## 12. OBJECTIVES AND WORK PLAN FOR NEXT 5 YEARS (2004-2009)

Selection of GSSP for base of Middle Ordovician Series.

Selection of GSSP for base of middle stage of Upper Ordovician Series (6<sup>th</sup> stage of Ordovician System)

Selection of GSSP for base of Hirnantian Stage (7<sup>th</sup> stage of Ordovician System)

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

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

Transfer of executive to new chair.

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

## APPENDICES [Names and Full Addresses of Current Officers and Voting Members

### Subcommittee Officers

**Chair:** Stanley C. Finney,

Department of Geological Sciences, California State University at Long Beach, Long Beach, California 90840, USA, e-mail: scfinney@csulb.edu

**Vice Chair:** Chen Xu,

Nanjing Institute of Geology & Palaeontology, Academia Sinica, 39 East Beijing Road, Nanjing, China, e-mail: xuchen@jlonline.com

**Secretary:** Guillermo L. Albanesi,

Museo de Paleontologia, Universidad Nacional de Cordoba, Casilla de Correo 1598, 5000 Cordoba, Argentina, e-mail: galbanesi@arnet.com.ar

### List of Voting Members

**Florencio G. Acenolaza**, Tucuman, ARGENTINA

**Christopher R. Barnes**, Victoria, CANADA

**Stig M. Bergstrom**, Columbus, USA

**David L. Bruton**, Oslo, NORWAY

**Roger A. Cooper**, Lower Hutt, NEW ZEALAND

**Andrej V. Dronov**, St. Petersburg, RUSSIA

**Olda Fatka**, Prague, CZECH REPUBLIC

**Richard A. Fortey**, London, UNITED KINGDOM

**Juan Carlos Gutierrez-Marco**, Madrid, SPAIN

**Warren D. Huff**, Cincinnati, USA

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**Alan W. Owen**, Glasgow, UNITED KINGDOM

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## SUBCOMMISSION ON CAMBRIAN STRATIGRAPHY ANNUAL REPORT 2003

### 1. TITLE OF CONSTITUENT BODY

#### International Subcommittee on Cambrian Stratigraphy (ISCS)

*Submitted by:*

**John H. Shergold**, *Chair, ISCS*

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**Gerd Geyer**, *Secretary, ISCS*

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25<sup>th</sup> November 2003

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

- Rationalization of global chronostratigraphical classification.
- To complete and publish regional correlation charts for the Cambrian System.
- Definition of Stage boundaries and selection of global stratotype sections.

Only one internal GSSP has been chosen yet for the Cambrian System. This partly reflects the scarcity of suitable biostratigraphic markers for intercontinental correlation at the stage level and faunal provincialism. However, research in progress on trilobites and conodonts (for the latter half of the Late Cambrian) show promise for long-range correlation and definition of stages. The time interval is of growing international interest, and research is being actively pursued by ISCS members, particularly by the members of the *Cambrian Subdivision Working Group*.

### 3. ORGANIZATION

ISCS is a Subcommittee of the Commission on Stratigraphy.

Officers (Chair, two vice-chairmen, past Chair, secretary), voting members (19), honorary members (9) and corresponding members (88). (*see separate list*)

Only one internal GSSP has been chosen yet for the Cambrian System. This partly reflects the scarcity of suitable biostratigraphic markers for intercontinental correlation at the stage level and faunal provincialism. However, research in progress on trilobites and conodonts (for the latter half of the Late Cambrian) show promise for long range correlation and definition of stages. The time interval is of growing international interest, and research is being actively pursued by ISCS members, particularly by the members of the *Cambrian Subdivision Working Group*.

#### 3a. Nominated Officers for 2004-2008:

Chair: Shanchi **Peng**

First Vice-Chairperson: Małgorzata **Moczyłowska**

Second Vice-Chairperson: Gerd **Geyer**

Secretary: Loren E. **Babcock**

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

The objectives of the ISCS are largely dependent on informal, logistical, and administrative support from host institutions. The small sums received from IUGS/ISC are needed to offset the cost of mailing, to prepare materials for meetings, and partly to support travel expenses of members to formal ISCS meetings. The cost of research and the major part of travel expenses to meetings has been met by "home institutions," national academies of sciences, and the Institute for Cambrian Studies, Boulder, CO.

#### 5. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

**IGCP Project 376:** Laurentian-Gondwana Connections Before Pangea.

**IGCP Project 410:** The Great Ordovician Biodiversification Event. Ranges from latest Cambrian to early Silurian.

#### 6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2003

##### 6.1. Regional correlation charts

Regional correlation charts have not been published in 2003. The correlation chart on the Cambrian System of the Mediterranean Region and the Gondwanan sector of Central Europe is in progress. More-or-less completed are the chapters on Morocco, Algeria, Libya, Israel, Jordan, the Iberian Peninsula, Germany and Bohemia.

##### 6.2. Cambrian Working Groups

The major focus of activities in 2003 on the *Cambrian Global Subdivision Project* (CGSP) led to further progress on this field..

##### (a) Working Group on a *Ptychagnostus/Acidusus atavus* level GSSP

The clear majority support for defining a Cambrian GSSP at the level of *Ptychagnostus* (or *Acidusus*) *atavus* level led to establish a Working Group on a *Ptychagnostus/Acidusus atavus* level GSSP following a ballot of the Voting Members and suggestions of the Voting and Honorary Members in summer 2002.

A multi-person team (including L. E. Babcock, Columbus, OH, R. A. Robison, Lawrence, KS, and M. R. Saltzman, Columbus, OH) are in the course of performing studies in the Drum Mountain section, western Utah, United States, which momentarily appears to be a prime candidate for a GSSP at the *Ptychagnostus/Acidusus atavus* level. Results from these studies were already presented the 7<sup>th</sup> *Conference of the Cambrian Subdivision Working Group* in Caunes-Minervois in September 2002. Additional field work took place in 2003.

Another prime candidate for this level is in the Kirshabakty section, Maly Karatau, Kazakhstan. A field meeting organized by ISCS VM Gappar Ergaliev was planned to be held in September 2003 but had to be cancelled due to several problems. In addition, Gappar Ergaliev claimed to be more-or-less unable to do any further field work because of financial and logistic problems.

##### (b) Working Group on a *Cordylodus proavus* level GSSP

The clear majority support for defining a Cambrian GSSP at the level of *Cordylodus proavus* level led to establish a formal WG at that level following a ballot of the Voting Members and

suggestions of the Voting and Honorary Members in summer 2002. Although a large database already exists as a result of the activities of the ISOS WG on the Cambrian-Ordovician boundary more than a decade ago the recent activities are scarce, and the WG has not yet shown any notable progress.

Critical comments on the necessity of such an intra-Cambrian boundary that marks a particularly short interval suggested to consider this level as defining the base of a substage rather than a stage. Suggestions also advocated to save the problem until the framework for the rest of the Cambrian will be defined.

**(c) Working Group on a GSSP defined by the FAD of *Oryctocephalus indicus* or another fossil in a comparable stratigraphic position**

The clear majority support for defining the Cambrian GSSP at the level of *Oryctocephalus indicus* required a ballot for an approval of formal WGs. Following the suggestions of the majority of the Voting Members, the majority of the Honorary Members and some of the Corresponding Members, the ISCS executive performed a ballot on the formal introduction of a Working Group on a GSSP defined by the FAD of *Oryctocephalus indicus* or another fossil in a comparable stratigraphic position. Background for this complicate paraphrase is that unlike for all earlier introduced intra-Cambrian subdivision levels there is a large disagreement of how to define the base of a Middle Cambrian series and of the fine-scale correlation of the Lower-Middle Cambrian boundary interval.

*Oryctocephalus indicus* has received great attention during the last years, particularly by studies of the Linda McCollum and Fred Sundberg in western Nevada and Yuan Jin-liang and Zhao Yuan-long in western Guizhou (plus a prolific cooperation of both teams). *Oryctocephalus indicus* was apparently able to overcome tremendous difficulties to correlate from and into Laurentia in the Lower-Middle Cambrian boundary interval. However, it appears to be impossible to confidently identify the *Oryctocephalus indicus* level in western Gondwana, Avalonia, and Baltica. Consequently, alternative candidates for biostratigraphically correlatable levels were suggested, such as that of *Oryctocara (Ovatoryctocara) granulata* or *Arthricocephalus chauveaui* (the identity of which has been matter of recent debates; see Fletcher, 2001).

In April/May 2003, the Voting Members and Honorary Members were asked to vote or, respectively, to offer their opinion. The result are as follows: From the 19 Voting Members, 16 responses were received, but a few VMs only sent comments. Eleven of the VMs formally agreed that the FAD of *Oryctocephalus indicus* and other index fossils in comparable stratigraphic position should define the base of a global Cambrian stage. Two Voting Members answered with "No." The other responses were to be counted as "Abstain." Accordingly, there is 60+ percent majority in favor for the FAD of *Oryctocephalus indicus* and other index fossils in comparable stratigraphic position to define a GSSP, and thus for the formal establishment of a WG.

Attached to the ballot were two questionnaires. One of them asked for suggestions of experienced members to form a *Working Group*. Suggested members of such a WG are P. Ahlberg\*, L. Babcock\*, D. K. Choi, W. Dean, E. Dies, G. Ergaliev\*, T. P. Fletcher, R. A. Fortey, J. A. Gámez Vintaned, G. Geyer\*, R. Gozalo, N. Hughes, J. Jago\*, P. Jell, I. Korovnikov\*, P. Kruse\*, E. Landing\*, J. Laurie, E. Liñán\*, L. McCollum\*, M. Moczyłowska\*, I. Montanez, A. R. Palmer\*, T. Pegel\*, Shanchi Peng\*, R. A. Robison, M. Saltzman, Yu. Ya. Shabanov, J. H. Shergold\*, F. Sundberg\*, S. Westrop, Xiang Liwen, Yuan Jin-liang, Zhao, Yuanlong\*, and Zhu Maoyan\*. Persons marked with an asterisk were suggested more than once.

The second question asked for a personal rating of the momentarily best known sections with diverse faunas that include the relevant stratigraphic level. The sections include those from which *Oryctocephalus indicus* was described such as Laurentia (Nevada) and South China

(Guizhou), with *Oryctocara/Ovatoryctocara granulata* and *O. indicus* (Siberia) and those with additional trilobite faunas with notable potential for intercontinental/global correlation such as Spain, Morocco, and Australia. It should be noted that this level was studied during the *China 2001* conference in the Kaili Formation at the Miaobanpo and Wuliu sections in Guizhou.

The second ballot asked about whether a stage boundary at the FAD of *Oryctocephalus indicus* or another fossil in a comparable stratigraphic position should define the base of the Middle Cambrian series. This question received even more critical comments. Six VMs voted in favor, five against. Therefore, this questions clearly has to be solved when a GSSP for the stage lower boundary has been agreed upon.

In September 2003, Linda McCollum (Cheney, WA) and Fred Sundberg took the lead of the new WG and invited a number of scientists to collaborate. The interest presently focuses on the highly rated sections in western Nevada (with results of recent field activities published in 2003) and South China (particularly the Kaili Formation of the Guizhou Province, visited during the ISCS *China 2001* conference). A special website for this Working Group is presently in the process of being launched.

#### **(d) Working Group on Geochemical Correlation**

Another Working Group of the ISCS formed under semi-informal conditions in summer 2003. The ISCS now has a *Working Group on Geochemical Correlation* headed up by Graham Shields (now James Cook University, Townsville, Queensland). The group consists of John Lindsay (Houston, TX), Martin Brasier (Oxford, UK), Isabel Montanez (Davis, CA), Rob Ripperdan (Mayaguez, Puerto Rico), Matthew Saltzman (Columbus, OH), Harald Strauss (Münster, Germany), Jan Veizer (Bochum, Germany, and Ottawa, Canada), and Artem Kouchinsky (Uppsala, Sweden). The major task of this WG is the application of non-conventional (i.e. non-paleontologic) correlation techniques and aspects of Cambrian stratigraphy such as isotope profiles based on carbon, oxygen, strontium and sulphur, and magnetostratigraphy, and numeric age determinations and to calibrate them with biostratigraphic data. It is in part what the ISCS executive was demanding under the working title *Working Group on Isotope Stratigraphy and Radiometric Dating*.

#### **(e) Additional Working Groups**

In addition to these existing Working Groups, further ballots will have to decide about the potential *Working Group on a Ptychagnostus punctuosus level GSSP*.

A *Working Group on the Yangtze Platform* was suggested to calibrate interests and activities of scientists working on various aspects of the Cambrian in South China. The Group installed around a German-Chinese scientific cooperation project established in 2001. About 30 scientists from Germany and China reached a bilateral agreement to put forward a proposal on a Sino-German cooperation project termed "From 'Snowball Earth' to the Cambrian bioradiation: a multidisciplinary analysis of the Yangtze Platform, China". The project, a direct contribution to the suggested ISCS Working Group on the Yangtze Platform, was officially approved in 2001 as a bilateral project by the *Deutsche Forschungsgemeinschaft* (DFG) and by the *National Natural Science Foundation of China* (NSFC). The concept and objective of this interdisciplinary project is to investigate the physical and biological environmental processes and interactions which are documented by the multifacies sedimentary sequences of the stratigraphic interval between the Sturtian-Marinoan glacial deposits (Nantuo tillites) and the appearance of the Chengjiang fauna on the Yangtze Plate.

Twenty-five Chinese and 14 German scientists of the different working groups met for a conference termed "From Snowball Earth To The Cambrian Bioradiation" in Potsdam, Germany, 26-29 March, 2003, where they presented 25 oral reports on the activities during the last 18 months since the start of the joint projects. Extended abstracts of these results, most of which deal with problems connected with Cambrian stratigraphy, were presented as a conference volume (Erdtmann, B.-D., Zhu Maoyan & Steiner, M., eds., Sino-German Conference, *From Snowball Earth*

to the Cambrian Bioradiation: A Multidisciplinary Analysis of the Yangtze Platform, China". 26-29 March 2003, Potsdam. Program and Abstract Volume, 129 pp.).

### 6.3. Cambrian Subdivision Working Group meetings

The IX Conference of the Cambrian Stage Subdivision Working Group was planned to be held in August/September 2003 primarily as a field meeting in the Maly Karatau Mts., Kazakhstan, organized by ISCS VM Gappar Ergaliev. Due to various problems, the meeting had to be cancelled and is post-poned for an uncertain period.

*South China 2003*, an "International Symposium on the Cambrian Fossil-Lagerstätten in Guizhou Province, China" was planned to be held in Guiyang, in September 2003, organized by Zhao Yuanlong (Guiyang), Zhu Maoyan (Nanjing), L. E. Babcock (Columbus, OH), B.-D. Erdtmann (Berlin), and Peng Shanchi (Nanjing), with a post-conference field trip to the Kaili biota of Taijiang, the Weng'an biota at Weng'an, and the Niutitang fauna at Songlin. This meeting under patronage of the ISCS should have given the opportunity to study sections of the Kaili Formation, particularly relevant to the newly established *Working Group on a GSSP defined by the FAD of Oryctocephalus indicus or another fossil in a comparable stratigraphic position*. This meeting was also cancelled as a result of the SARS problem in China 2003.

### 6.4. Trilobite synonymy files

The principal project of the *Institute for Cambrian Studies* during the last years was the development of databases for objective synonymy files on the major groups of Cambrian organisms. Data on the trilobites were processed by A.R. Palmer were transferred to an electronic data base available since 2002 as files in a so-called SYNPLUS program. It is aimed to aid researches in checking synonymy and existing literature on all Cambrian trilobites. However, the files also include information on age, biogeography, and stratigraphy. The program, generated by A.R. Palmer (Institute for Cambrian Studies, Boulder, CO) and E. Fowler (Acton, CA), was developed into version 2.0 in 2003 that overcame some bugs present in the original version.

### 6.5. Homepage of the International Subcommittee of Cambrian Stratigraphy

The Internet homepage of the *International Subcommittee on Cambrian Stratigraphy* (revised) can be accessed under <http://www.uni-wuerzburg.de/palaeontologie/ISCS/index.htm>.

New additions include various field pictures, particularly on rarely seen sections from central Iran, references and announcements on future meetings.

### 6.6. Publications

A plethora of articles relevant to Cambrian stratigraphy has been published after completion of the ISCS 2002 Annual Report. The period 2002/2003 brought again an unusually large number of important publications on the Cambrian so that the unusual is by now the usual. We registered more than 250 articles, books, and abstracts published in 2002 and in 2003, which deal, at least in part, with aspects of Cambrian stratigraphy. However, articles that focus purely on stratigraphy is a minor part among them. The general trend recognized over a few past years that it became fashionable to write about aspect of the "Cambrian explosion," or the Burgess or Chengjiang lagerstätten, appears to have passed its peak. The amount of hard-core stratigraphic information in articles appears to have risen. However, many articles still prove a fairly drastic (and regrettable) ignorance of stratigraphic knowledge in a global, an intercontinental, or even an interregional connection.

The new *Geologica Acta* (formerly *Acta Geologica Hispanica*) started its new life with an issue (Vol. 1, no. 1) entirely dedicated to the Cambrian. This 150-page issue, edited by G. F. Aceñolaza and titled "*Advances in the knowledge of the Cambrian System*", includes 14 articles, mostly by members of the ISCS, dealing with various aspects of Cambrian geology, paleontology, and stratigraphy in various parts of the world.

As noted above, a volume with extended abstracts has been issued for the meeting "*From Snowball Earth To The Cambrian Bioradiation*" in Potsdam, Germany, 26-29 March, 2003. This

volume (Erdtmann, B.-D., Zhu Maoyan & Steiner, M., eds., Sino-German Conference “*From Snowball Earth to the Cambrian Bioradiation: A Multi-disciplinary Analysis of the Yangtze Platform, China*”. 26-29 March 2003, Potsdam. Program and Abstract Volume, 129 pp.) includes the abstracts of 25 oral reports on the activities during the last 18 months since the start of a Sino-German cooperation project with the same label as the abstract volume. Most of the projects deal with problems connected with Cambrian stratigraphy.

A comprehensive list of important publications including stratigraphic aspects of the Cambrian is available from the ISCS secretariat.

## 7. CHIEF PROBLEMS ENCOUNTERED IN 2003

The cancellation of the two meetings under patronage of the ISCS (in Kazakhstan and South China) in 2003 creates a delay in the Working Group activities, namely for the *Working Group on a Acidusus atavus level GSSP* and the new *Working Group on a Oryctocephalus indicus level GSSP on that of another fossil in a comparable stratigraphic position*.

The ICS subvention was the only financial source that was directly available for the ISCS. This subvention by ICS was raised considerably compared to earlier years, and this amount for the first time permitted direct activities of the ISCS executive. However, this amount does not permit field activities which imminently contribute to a progress in global stage-level chronostratigraphic classification of the Cambrian System.

The majority of the newly established Working Groups require intensive field studies to achieve rapid progress in long range correlation and definition of urgently needed global stages. However, the ability of active pursuit is limited to a number of critical ISCS members, which would need a substantial financial support to visit Subcommittee meetings and conferences. Both the ISCS Chair and the ISCS Secretary are momentarily without a position and therefore have limited access to funding of scientific activities.

## 8. SUMMARY OF EXPENDITURES IN 2003

(a) General office expenses	24.20 EURO
(b) Partial reimbursement of field work	310.00 EURO
(c) Travel expenses for regular executive meetings	<u>350.00 EURO</u>
TOTAL	684.20 EURO

## 9. WORK PLAN, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED 2004 and 2005

### 9.1 Meetings

A major driving agent of the CGSP activities during the last years were the international field conferences held in various regions with critical Cambrian outcrops. Two meetings (in Kazakhstan and South China) which were planned for 2003 had to be cancelled or postponed due to logistic problems, the SARS epidemic in China and related problems. Thus the schedule for the coming years is modified as follows:

ISCS VM Duck Keoun Choi (Seoul) and his colleagues Sung Kwun Chough (Seoul) and Dong Jin Lee (Andong) will organize the ***IX Conference of the Cambrian Subdivision Working Group*** in Korea. The conference is scheduled for September 16-21, 2004 in Seoul and Taebaek, South Korea.

Rapid accumulation of biostratigraphical and isotopic data and progress in intercontinental correlation during the last decade have created a platform on information which seems to permit



entering of an advanced level of stratigraphic subdivision of the Cambrian System. Necessary for an optimized handling of the available data is an integrated management. In any case, it is highly desirable to bring together the scientists actively working on and interested in the Cambrian to another comprehensive Cambrian Symposium. The *Third International Symposium on the Cambrian System*, held 1990 in Novosibirsk marked a major input towards application of modern visions and techniques. However, after 15 years the time appears to have come for another step.

The idea of a ***Fourth International Symposium on the Cambrian System*** was already born a few years ago, but limited financial sources for organizing and attending international meetings have postponed the planning as well as conflicts with major international meetings during the years 2003 and 2004. Our Chinese colleagues, namely Peng Shanchi, Zhu Maoyan and other scientists from the Nanjing Institute of Geology and Palaeontology, Academia Sinica, have now agreed to organize the *Fourth International Symposium on the Cambrian System* in China in 2005. It is planned to distribute a first circular in fall this year. The meeting could be loosely tied with the Fourth Trilobite Conference in Brisbane, Australia.

VM Ed Landing agreed to organize a conference of the Cambrian Subdivision Working Group in the eastern United States, starting from Burlington, VT and ending in Albany, NY. This conference was first thought to take place in 2003 and then postponed. The plan is now to organize it in 2006 as the ***X Conference of the Cambrian Subdivision Working Group***. According to Ed Landing, "Albany 2006" will visit classic localities of the Cambrian of northeast Laurentia which are exposed along a roughly north-south belt in eastern New York and western Vermont. This belt begins on the Canadian border and extends 300 km south to the Albany, New York, area, beginning in Burlington, Vermont. A technical session with oral and poster presentations and a business meeting of the Subcommittee at the State Museum in Albany will follow the field trip. It is the hope that the field trip guide, submitted abstracts of oral and poster presentations, and contributed papers on one or two themes (i.e., geochronology, Cambrian eustasy and global and biotic changes) will be organized as a *New York State Museum Bulletin*.

*South China 2003*, an "International Symposium on the Cambrian Fossil-Lagerstätten in Guizhou Province, China", organized by Zhao Yuanlong (Guiyang), Zhu Maoyan (Nanjing), L.E. Babcock (Columbus, OH), B.-D. Erdtmann (Berlin), and Peng Shanchi (Nanjing), with a post-conference field trip to the Kaili biota of Taijiang, the Weng'an biota at Weng'an, and the Niutitang fauna at Songlin, was planned to be held in Guiyang, end of August 2003. Due to the SARS problems in China, the meeting was cancelled and is postponed possibly to be held in combination with the *Fourth International Symposium on the Cambrian System*.

## 9.2 The Cambrian Subdivisions Project (CSP)

As noted earlier, the main goal of the Cambrian Subdivisions Working Group is to achieve a decision on formal Cambrian global stages and to choose GSSPs. The selection of global Cambrian subdivisions is the most difficult task of the ISCS and will require compromises to be made.

Scientific progress in fields which require a formal framework for orientation is generally in need of guidance, and, thus, the ISCS executive began to act as a steering committee. A general article on Cambrian global correlation levels and possible chronostratigraphic units was published (Geyer & Shergold, 2000) together with a comprehensive correlation table compiled by G. Geyer, J.H. Shergold, and S. Peng. This correlation table is regularly updated (latest edition in Shergold & Geyer, 2003).

The activities of the Working Group and a formal ballot on the utility as potential GSSP levels has led to a progressive agreement on a number of major chronostratigraphic units in the Cambrian and to the establishment of new Working Groups on the biostratigraphic level which were chosen as suitable for potential GSSPs.

The activities of the ***Working Group on a Glyptagnostus reticulatus level GSSP*** led in 2002 to the establishment of a first intra-Cambrian GSSP which defines the base of the **Furongian Series** (replacing the traditional Middle-Upper Cambrian boundary) and the base of the **Paibian Stage**. A ***Working Group on a Ptychagnostus/Acidusus atavus level GSSP***, a ***Working Group on a***

*Cordylodus proavus level GSSP*, and a *Working Group on a Oryctocephalus indicus level GSSP on that of another fossil in a comparable stratigraphic position* were formally established. A *Working Group on a Ptychagnostus punctuosus level GSSP* awaits formal ratification.

Particularly the ***Working Group on a Ptychagnostus/Acidusus atavus level GSSP*** should trigger a wealth of new results as a core group examining one of the prime GSSP candidates (Drum Mountains, western Utah, United States) have already started with field activities.

The ***Working Group on a Cordylodus proavus level GSSP*** has the opportunity to be able to resort on data assembled during the process of defining the lower boundary of the Ordovician System. New results on the phylogenetic development of the relevant conodont group require a moderate re-assessment of earlier data. An additional problem exists in the fact that some of the specialists for the group are no longer active or not able to cooperate.

The new ***Working Group on a Oryctocephalus indicus level GSSP on that of another fossil in a comparable stratigraphic position*** deals with a particularly complicated stratigraphic situation that will require careful and probably long-term search for an agreement on one of several alternative concepts. This GSSP is specifically under focus because it is at the interval that represents the traditional, yet inadequately defined Lower-Middle Cambrian boundary.

The ***Working Group on the Yangtze Platform*** optimizes, concentrates, controls, and triggers various kinds of scientific activities on an important Cambrian continent in terms of integrated and international cooperation as well as logistics and optimization of resources. The emphasis on this Cambrian continental region comes from the insight during the last years that South China has proved to be a key area for Cambrian global correlation and the understanding of the life history and evolution during the Proterozoic-Cambrian transition and the earliest Phanerozoic.

Members of this *WG* (which partly interfaces with the *Working Group on a Ptychagnostus/Acidusus atavus level GSSP* and the *Working Group on a Oryctocephalus indicus level GSSP on that of another fossil in a comparable stratigraphic position*) are most active. In addition, they generate results that are helpful for the intercontinental correlation of the Lower Cambrian and contribute to a better knowledge of the Precambrian-Cambrian boundary and the famous Chengjiang lagerstätte of Yunnan.

The Subcommittee seeks to assemble data from non-conventional (i.e. non-paleontologic) correlation techniques and aspects of Cambrian stratigraphy such as isotope profiles based on carbon, oxygen, strontium and sulfur, and magnetostratigraphy, and numeric age determinations. These data, calibrated with biostratigraphic data, are expected to solve the intricate problem of stage definitions for the Lower Cambrian. In this context, a ***Working Group on Cambrian Geochemical Correlation*** was installed in 2003 to enforce application of geochemical correlation techniques and aspects of Cambrian stratigraphy such as isotope profiles based on carbon, oxygen, strontium and sulphur isotopic data.

These *WGs* have the major task to agree on potential candidate sections and to examine for all these sections the geological requirements to be satisfied such as exposure over an adequate thickness, continuous sedimentation, sufficiently rapid sedimentation rate and absence of metamorphism and strong diagenesis; biological requirements such as abundance and diversity of well preserved fossils, absence of vertical facies changes and favorable facies for long-range correlation; and other desirable requirements such as suitability for radioisotope dating, magnetostratigraphy, chemostratigraphy and sequence stratigraphy, indication by a permanently fixed marker, avoidance of very remote locations, free access by researchers regardless of nationality, free access for research and permanent site protection.

### 9.3. Regional Correlation Charts

First priority projects of the Cambrian Correlation Working Group are to complete correlations projects on (1) Central and Southern Europe, North Africa and parts of the Near East, (2) Avalonia, and (3) Laurentia-South America. The following Correlation Charts are under construction:

- 1) The Cambrian System of the Mediterranean Region and Central Europe. G. Geyer and M.

Moczyłowska, coordinator. In progress.

2) The Cambrian System of Avalonia. Ed Landing, coordinator.

3) The Cambrian System of Laurentia. A. R. Palmer, lead coordinator.

Some progress was achieved in the last year for chart 1). However, relevant authors for the chapters on France, Sardinia and Turkey still have not submitted their contributions. The volume for the Mediterranean Region and Central Europe could be close to completion toward the end of 2004.

## 10. BUDGET AND ICS COMPONENT FOR 2004

(a) General office expenses	30.00 US\$
(b) Organization of 2004 Field Conference, Korea	600.00 US\$
(c) Preparation of the 4 <sup>th</sup> International Symposium on the Cambrian System	750.00 US\$
(d) Executive and VM attendance funds for Field Conference Korea	1800.00 US\$
(e) Executive and VM attendance funds for meeting during the IGC 2004	1200.00 US\$
(f) Postage for Annual Newsletter and other materials	40.00 US\$
(g) Regular executive meetings	<u>350.00 US\$</u>
TOTAL	4770.00 US\$
Carry-over from 2003, 3307.27 Euro	<u>3859.25 US\$</u>
TOTAL 2004 BUDGET REQUEST	<u>910.75 US\$</u>

### Potential funding sources outside IUGS

Logistical, financial and publicational funding of ISCS activities (direct or indirect) in 2003 came from a number of sources, namely the New York State Museum, Albany, and the Institut für Paläontologie, Würzburg University.

The Institut für Paläontologie, University of Würzburg, provides space and facilities for the ISCS Secretariat. Furthermore, the institute provides hardware to run and maintain the ISCS homepage.

John Shergold is able to communicate electronically thanks to the Institut des Sciences de l'Évolution, Université de Montpellier II.

The *Institute for Cambrian Studies*, Boulder, Colorado, supports A.R. Palmer's subcommission and working group works by providing space, equipment, and postage. Grants-in-aid are available to Cambrian scientists by successful application. The Institute for Cambrian Studies is prohibited by its by laws from providing salary or travel funds to officers of the corporation (A.R. Palmer, President; L.E. Babcock, Vice Chair; J.H. Shergold, N. Hughes).

The Cambrian System has oil and gas resources, which seem to have developed during the initial rifting of supercontinents. As our integrated biostratigraphy-chemostratigraphy-sequence stratigraphy improves, there is growing potential to explore for some commercial funding.

## 11. REVIEW CHIEF ACCOMPLISHMENTS OVER LAST FIVE YEARS (1998-2002)

*See Accomplishments in 2003 (above) for additional details.*

- Furongian Series lower boundary in China agreed and ratified.
- Paibian Stage lower boundary in China agreed and ratified.
- Working Group on a *Glyptagnostus reticulatus* level GSSP established (stopped to exist after ratification of the GSSP on the base of the Furongian Series and Paibian Stage in 2002).
- Working Group on a *Ptychagnostus/Acidusus atavus* level GSSP established; several

candidates identified and studied.

- Working Group on a *Cordylodus proavus* level GSSP established.
- Working Group on an *Oryctocephalus indicus* level GSSP or that of another fossil in a comparable stratigraphic position established; two candidates identified and studied.
- Working Group on the Yangtze Platform established
- Working Group on Cambrian Geochemical Correlation established.
- Olenekian-Anisian boundary -- Field workshop in Romania to view boundary candidate, now characterised by ammonoid, conodont, chemo- and magneto-stratigraphic profiles. Choice of GSSP for base-Anisian was agreed.
- Cambrian Subdivision Group – Field Conference in Sweden 1998.
- Cambrian Subdivision Group – Field Conference in the Great Basin area, U.S.A., 1999.
- Cambrian Subdivision Group – Field Conference in Argentina 2000.
- Cambrian Subdivision Group – Field Conference in South China 2001.
- Cambrian Subdivision Group – Field Conference in the Montagne Noire, France, 2002.

## 12. OBJECTIVES AND WORK PLAN FOR NEXT 5 YEARS (2002-2006)

### **Meeting/field conferences schedule and WG activities with themes and anticipated results.**

- *International Geological Congress*, Florence, Italy – August 20th –28th, 2004. General meeting.
- *IX Conference of the Cambrian Subdivision Group* in Korea, September 16-21, 2004. Upper Cambrian subdivisions.
- *Fourth International Symposium on the Cambrian System*, Nanjing, China, 2005. Decisions on several GSSPs.
- *X Conference of the Cambrian Subdivision Group*, Albany, U.S.A., and Vermont and New York State, August 2005.
- Online forum of the Working Group on an *Oryctocephalus indicus* level GSSP, starting December 2003.

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

### **Subcommission officers**

**Chair:** J. H. Shergold

La Freunie, Benayes, 19510 Masseret, France, e-mail: John.Shergold@wanadoo.fr

**Vice Chair:** E. Landing

New York State Geological Survey, New York State Museum, Albany, NY 12230, U.S.A., e-mail: elanding@mail.nysed.gov

**Vice Chair:** A. Yu. Zhuravlev

Palaeontological Institute, Russian Academy of Sciences, ul. Profsoyuznaya 123, Moscow 117647, Russia, e-mail: azhur@paleo.ru

**Past Chair:** M. D. Brasier

Department of Earth Sciences, University of Oxford, Parks Road, Oxford OX1 3PR, U.K., e-mail: martin.brasier@earth.ox.ac.uk

**Secretary:** G. Geyer

Institut für Paläontologie, Universität Würzburg, Pleicherwall 1, 97070 Würzburg, Germany, e-mail: palo001@rzroe.uni-wuerzburg.de

***List of additional Voting Members***

<b>Per Ahlberg</b> , Lund, SWEDEN	per.ahlberg@geol.lu.se
<b>J. J. Álvaro</b> , Villeneuve d'Ascq, FRANCE	Jose-Javier.Alvaro@univ-lille1.fr
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## SUBCOMMISSION ON THE TERMINAL PROTEROZOIC PERIOD

### ANNUAL REPORT 2003

#### 1. TITLE OF CONSTITUENT BODY

##### Subcommission on Terminal Proterozoic Stratigraphy

*Submitted by:*

**Andrew H. Knoll, Chair**

Department of Organismic and Evolutionary Biology, Harvard University

26 Oxford Street, Cambridge MA 02138, USA

Telephone: 1-617-495-9306, Email: [aknoll@oeb.harvard.edu](mailto:aknoll@oeb.harvard.edu)

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

To better understand the geological and biological history of the late Neoproterozoic Era, to construct global correlations of uppermost Proterozoic strata, and to recommend a definition and characterization of a terminal Proterozoic period. The subcommission's work is part of a longstanding program in international stratigraphy and geological correlation

#### 3. ORGANIZATION

The subcommission has a Chair (A.H. Knoll, USA), vice-Chair (M.R. Walter, Australia), a secretary (G. Narbonne, Canada), and 16 additional voting members. Our newsletters go out to more than 100 individuals, of which ca. 40 are active as corresponding members.

**3a. Nominated Officers for 2004-2008: Still under negotiation**

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

The subcommission receives no sustaining support from any external agency. In past years, national and regional authorities have supported the subcommission's field-based conferences in Russia, China, Norway, Australia, India, and Namibia. Partial costs of miscellaneous expenses and newsletter preparation are supported by the Department of Geological Sciences, Queen's University, Canada, and Harvard University, USA. Individual subcommission members are, of course, supported by their own national funding agencies.

#### 5. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

The Subcommission worked has closely with a number of IGCP Projects, most recently Project 303 (Late Proterozoic and Cambrian Event Stratigraphy -- which covers Precambrian-Cambrian boundary events but not earlier terminal Proterozoic stratigraphy), Project 319 (Global Paleogeography of Late Precambrian and Early Paleozoic), Project 366 (Ecological Aspects of the Cambrian Radiation) and the recently established Project 493 (The Rise and Fall of the Vendian

Biota). The subcommission also maintains ties to the ICS Commission on Cambrian Stratigraphy.

## 6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2003

In 2003, after thirteen years of research and discussion, the Subcommission completed the first phase of its work. By strong majority vote, the Subcommission approved a recommendation to place the beginning of the terminal Proterozoic period at a **GSSP** located at the base of the Nuccaleena cap carbonate above Marinoan tillites exposed along Enorama Creek in the **Flinders Ranges of South Australia**. In a separate ballot, the Subcommission approved the name **Ediacaran Period** for the interval of time bounded by Enorama GSSP at its beginning and the initial GSSP of the Cambrian Period at its end. A report detailing these recommendations is nearly complete and will be submitted to the ICS before the end of calendar year 2003.

Recently determined radiometric dates give a new sense of geochronometric definition to this period. U-Pb dates on ash interbedded with Marinoan-age tillites indicate an age of 640-630 Ma for this global glaciation. Pb-Pb ages on phosphorites of the post-glacial Doushantuo Formation, China, that contain the oldest microscopic evidence for animal life are  $599 \pm 4$  Ma, ash beds that literally cover bedding planes strewn with Ediacaran macrofossils in Newfoundland have U-Pb ages of  $575 \pm 1$  Ma. The oldest known trace fossils of bilaterian animals are  $555 \pm 3$  Ma, while a strong positive C-isotopic excursion associated stratigraphically with the first skeletonized animals is  $548 \pm 1$  Ma. Ash beds on three continents now confirm an age of  $543 \pm 1$  Ma for the remarkable C-isotopic excursion that marks the stratigraphic break between faunas dominated by Ediacaran fossils and the earliest shelly fossil assemblages of Cambrian aspect.

The subcommission published two newsletters in conjunction with its several votes.

## 7. CHIEF PROBLEMS ENCOUNTERED IN 2003

Fortunately, the personal problems that hindered progress in 2002 ebbed somewhat, enabling the subcommission to complete its principal task of boundary definition. Engaging new leadership has proven to be a formidable task, but this should be resolved by the end of calendar year 2003. New leaders are keen to press on with the formal stratigraphic subdivision of the Ediacaran Period, certainly a reachable goal in coming years. Once again, however, it is recommended that the subcommission be expanded into a more comprehensive Neoproterozoic working group that can build an improved stratigraphic framework for the entire Era. We need fresh problems, fresh ideas, and fresh blood.

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

No expenditures were made in 2003, but it is anticipated that the ICS funding of \$200 will be expended in early 2004.

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

In the first instance, a new set of leaders and voting members must be established for the next phase of subcommission work. A new, forward-looking agenda will be set at a discussion meeting on the Ediacaran biota, to be sponsored principally by IGCP Project 493 and convened August 26-28, 2004, in Prato, Italy (in conjunction with the **International Geological Congress** in nearby Florence).

## 10. BUDGET AND ICS COMPONENT FOR 2004

No funds are requested for 2004. The carryover from 2003 will be adequate for mailing costs and a contribution to operating costs of the Prato meeting noted above; most communications will be via Internet.

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

In the past five years, the subcommission has **completed its task** of recommending an initial **GSSP** for the terminal Proterozoic Period. It has also laid the stratigraphic groundwork for both formal subdivision of the newly named **Ediacaran Period** and for the backward extension of the geological time scale to include a geochronologically defined Cryogenian Period before the Ediacaran interval. New fossils and refined isotopic records add to the stratigraphic basis for terminal Proterozoic correlation, while new radiometric dates have provided an unprecedented sense of the timing of terminal Proterozoic events. Several volumes summarize these data, including *Precambrian Research* volume 100(1-3), *The Neoproterozoic of Australia*, edited by Malcolm Walter and, if I may, a recent book entitled *Life on a Young Planet* by Andrew Knoll (2003, Princeton University Press).

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

The next phase of subcommission work will focus on (1) the formal stratigraphic subdivision of the Ediacaran Period and (2) the establishment of a GSSP for a geochronologically defined Sturtian Period that preceded the Ediacaran Period. Field excursions will surely be part of these processes, but planning for awaits the confirmation of new leadership for the subcommission.

## APPENDIX Terminal Proterozoic Subcommission Membership

### *Subcommission officers*

**Chair: Andrew H. Knoll (USA),**

Department of Organismic and Evolutionary Biology, Harvard University, 26 Oxford Street, Cambridge MA 02138, USA (aknoll@oeb.harvard.edu)

**Vice-Chair: Malcolm Walter (Australia),**

Department of Earth and Planetary Sciences, Macquarie University, Sydney 2109, Australia (malcolm.walter@mq.edu.au)

**Secretary: Guy Narbonne (Canada),**

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### *Additional Voting Members:*

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## SUBCOMMISSION ON STRATIGRAPHIC CLASSIFICATION ANNUAL REPORT 2003

### 1. TITLE OF CONSTITUENT BODY

#### Subcommission on Stratigraphic Classification (ISSC)

*Submitted by:*

**Maria Bianca Cita**

*Chair, ISSC*

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25<sup>th</sup> November 2003

### 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

They 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 *elect*: Ashton **Embry** (Canada)

Secretary and Webmaster: Maria Rose **Petrizzo** (Italy)

*(see Appendix for complete list of members)*

Since ICS pointed out the opportunity to have an international (intercontinental) participation in the directory Ashton Embry acts as Vice-Chair elect starting from now.

Two TASK GROUPS have been identified and leaders have been appointed to face major problems encountered in stratigraphical classification. Ashton Embry is the leader for Sequence Stratigraphy. Andreas Strasser (Switzerland) is the leader for Cyclostratigraphy. Mandate, deadline

and composition of the Task Groups will be defined in the near future.

### 3a. Nominated Officers for 2004-2008:

A postal ballot for the elections of Chair and Vice-Chair for the term 2004-2008 gave the following results:

Votes received = 24

#### Votes for Chair (2004-2008):

First choice: CITA = 22  
 EMBRY = 1  
 BERGGREN = 1  
 Second choice: BERGGREN = 4  
 SALVADOR = 3  
 RICCARDI = 2  
 LUTERBACHER = 1

#### Votes for vice-Chair (2004-2008)

First choice: EMBRY = 17  
 BERGGREN = 2  
 GLADENKOV = 1  
 MURPHY = 1  
 Second choice: GLADENKOV = 5  
 SALVADOR = 3  
 EMBRY = 2  
 ZACHARIASSE = 1  
 CITA = 1  
 WATERHOUSE = 1

Chair: Maria Bianca **Cita** (Italy)  
 Vice-Chair elect: Ashton **Embry** (Canada)  
 Secretary and Webmaster: Maria Rose **Petrizzo** (Italy)

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

The Subcommittee does not receive financial support from outside IUGS-ICS, except for office support (computer, access to internet services, telephone, etc.) from the host institution (University of Milano). Members obtain individual (personal?) research or conference grants for activities related to the Subcommittee.

The first attempts to obtain external funds were only in part successful, but we will try harder. Next year (2004) is very important for the future of ISSC: it should be a turning point and internal/external funds are wanted.

## 5. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

ISSC has always been directly or indirectly linked to big international Project as ODP and IGCP.

## 6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2003

- A project of ISSC started by Prof Ivo Chlupác from the University of Prague (Czech republic) on a multilingual Glossary of Geological Terms used in stratigraphy, could not be completed because Prof. Chlupác died meanwhile. The project is still alive and we plan to continue until all

the versions expected will be obtained. Still missing is the French version, whereas the version in oriental languages has been abandoned for practical reasons. We are looking for a journal interested in the publication.

- The electronic mail proved to be an invaluable means of communication and allowed a break through in revitalizing the Subcommittee.
- Two *Newsletters* were distributed electronically and/or via traditional mail, one in January (*Newsletter* n. 1 = *Circular* n. 102) and one in May (*Newsletter* n. 2 = *Circular* n. 103), and many comments, proposals, ideas followed.
- Twelve new members (*see Appendix for list*) were nominated and elected after consultations, negotiations, nominations, in order to fill some gaps in representation of strong stratigraphic communities and to improve the relationships with national/multinational Stratigraphic Commissions, with Geological Surveys, etc.
- The traditional organization of members in ex-Officio, individual and organizational has been abandoned. Pre-existent members are now listed as “old” in the *Appendix*. Members that asked to resign the membership, and members that failed to respond during the last year to communications from the chair have been dropped from the member list.
- A new bottom-up approach to stratigraphic classification, kind of experiment to test the degree of acceptance of the present rules (International Stratigraphic Guides edited by Hedberg, 1976 and by Salvador, 1994) has been distributed to old and new ISSC members with *Newsletter* n. 2 “Stratigraphic Classification Test n. 1” on the Permian of Southern Alps. The answers to this test will be commented in *Newsletter* n. 3 (to be distributed in December 2003) along with the presentation of two new tests, one on the Jurassic of Arctic Canada and another one on the Devonian of central Europe. It is a very interesting experiment indeed!
- Preparation of Workshop on “Post-Hedberg developments in Stratigraphic Classification” to be held in Florence on August 27, 2004, in occasion of the IUGS Congress, sponsored by ISSC. We are working hard to make this a real scientific event.
- Meeting with vice-Chair elect in Seattle (USA) on Nov. 2 2003 to discuss ISSC problems and strategy.
- Participation to NACSN Annual meeting –along with vice-Chair elect- for exchange of information in general and coordination of two During Congress Workshops (Firenze 2004).
- Meeting on Nov. 3 2003 with co-conveners of DWO 04 Bob Jordan and Lucy Edwards and common request to have abstracts and schedule included in the Congress Program.
- Meeting with American (Lasca, Edwards, Owen, Lane, Berggren, Ogg) and European (Piller) members of ISSC.

## 7. CHIEF PROBLEMS ENCOUNTERED IN 2003

No problems, but the lack of funds.

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

<b>I. INCOME</b>	US DOLLARS
Carry-over from 2002	--
2003 ICS subvention	<b>1500.00</b>
<b>II. EXPENDITURES</b>	US DOLLARS
Exchange charges	30.00
Mail	50.00

Office material	400.00
Secretarial help	500.00
Meetings in Seattle	2107.00
<i>ISSC Newsletter 1, 2 and 3</i>	<u>750.00</u>
<b>Total Expenses</b>	<b>3937.00</b>

**Excess expenditures over income** - 2437.00  
*[Mainly Chair's travel expenses to Seattle GSA]*

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

Next year will be crucial for the development of future activity:

- The Task Group on Sequence stratigraphy is in the solid hands of Ashton Embry and we expect that a third generation approach is successful.
- Andreas Strasser, leader of the Task Group on Cyclostratigraphy, is delegated to further develop this theme, in which he was already involved in the past few years.
- A series of strong liaisons with other ICS Subcommissions will be created by delegating individual ISSC members to act as watch-dog that controls the correct application of principles and concepts of stratigraphic classification.
- Organization DWO15. This workshop is sponsored by the International Commission on Stratigraphy (ICS) of IUGS, and is organized by its Subcommission on Stratigraphic Classification (ISSC). It is planned for Friday August 27, last of a series of during congress workshops dedicated to various aspects of stratigraphy, a classic theme now "on stage". After an introduction on Background and Motivation of the meeting, we plan to have: (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 Business meeting on August 27, 2004 to be held after the DWO15.

## 10. BUDGET AND ICS COMPONENT FOR 2004

(b) General office expenses	400	US Dollars
(c) <i>ISSC Newsletter</i> no 104 and 105	500	
(d) Contribution towards cost to finalization and Publication of Chlupac's multilingual Glossary of most common stratigraphic terms	400	
(e) Contribution towards cost of web-site	400	
(f) Contributions to Conveners to help costs of Task Groups	2000	
(g) Support for meetings	4000	
(h) Secretarial help	1000	

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TOTAL BUDGET REQUEST

**8700** US Dollars

### Potential funding sources outside IUGS

The Subcommission does not envisage being able, as an organization, to obtain significant funding from outside IUGS/ICS sources.

As in previous years, financial support will be sought by individual members from their grant-

awarding bodies for specific projects such as research projects and meetings.

General support will be provided to the Secretary by University of Milano Department of Earth Sciences for equipment including computers, email access and telephones. The web-site of the International Subcommission on the Stratigraphic Classification ([http://www.geocities.com/issc\\_arg](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 operating the site, for a nominal payment.

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

Significant results of the International Subcommission on Stratigraphic Classification activities are listed below.

- Publication of abridged version of the International Guide (Murphy and Salvador Editors, 1999. *Episodes*, 22, 4: 255-271), reprinted in *Geo Arabia* and translated into Russian, Lithuanian, Catalan and Spanish.
- **International Guide** reviewed (30 reviews in 15 countries). First edition sold out. Translated in Chinese (1996), in Japanese (2001) and in Russian (2002).
- Participation to the UNESCO-IUGS Geological map of the World and Global Stratigraphic Chart (2000). The ISSC vice-Chair M.B. Cita was a member of the ad-hoc Working Group of experts.
- Creation and world-wide distribution of eleven *ISSC Circulars*:
- Circular 94 (May 24, 1999), Circular 95 (June 14, 1999), Circular 96 (October 29, 1999)
- 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)
- Circular 102 = Newsletter n.1 (February 2003), Circular 103 = Newsletter n. 2 (May 2003), Circular 104 = Newsletter 3 (December 2003).
- 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-Chair 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 full fill (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!).

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

ISSC substantially differs from all the other Subcommissions because it is not focused on a definite time-slice, to be identified and correlated world-wide by means of various fossil groups or other chronologically identifiable criteria, which require a certain number of specialists of the various fossil groups (from different bio provinces) and/or of other techniques.

ISSC is concerned with concepts and principles, and with their application in the various continents. Generalists of sedimentary geology with knowledge of conceptual problems as well as field experience are required but also stratigraphers working in Geological Surveys and in oil companies, not only in Academia. Language barriers, cultural barriers, different work styles are expected. No joint activity in the field is foreseen with direct personal contacts. The work is essentially theoretical, and meetings are very seldom organized.

Now that the operation “new blood” is successfully (if not yet fully) completed and that the elections for the new term 2004-2008 went well beyond expectations, we can think realistically of a pluriennial plan of work.

Other topics beyond the important themes of the Task Groups to be developed include:

- to test the degree of acceptance by ISSC members of the present rules by means of the Stratigraphic Classification Tests (see point 6);
- to eventually obtain a position paper on the difficulties in applying the hedbergian rules to orogenic belts and/or tectonically disturbed areas;
- to monitor recent critiques by the scientific community to the Golden Spike concept, and its application (Holland, 1986; Aubry et al, 2000; Walsh, 2001);
- to consider recent proposals to introduce new categories of stratigraphic units (i.e. impact-related units).

If the ISSC-sponsored workshop in Florence is successful, and a strong international group of motivated stratigraphers is put together, then a realistic long-range plan will be presented.

The FINAL GOAL is the publication of a new version of the *Guide*, simple, well illustrated, user-friendly, including both standard and new techniques.

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

### Subcommission officers

**Chair: M.B. Cita,**

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**Vice Chair: A. Embry,**

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

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### **List of Task Groups and their officers**

**Cyclostratigraphy:** Ashton Embry, Canada, AEmbry@NRCan.gc.ca

**Sequence Stratigraphy:** Andreas Strasser, Switzerland, andreas.strasser@unifr.ch

#### **List of New Members**

**Shiro Hasegawa**, Kumamoto, JAPAN

**Frederik J. Hilgen**, Utrecht, THE NETHERLANDS

**Maria Rose Petrizzo**, Milano, ITALY.

**Nick Riley**, Keyworth, U. K.

**Andreas Strasser**, Fribourg, SWITZERLAND

**Jan Zalasiewicz**, Leicester, U. K.

**Duck K. Choi**, Seoul, KOREA

**Lucy E. Edwards**, Reston, USA

**Piero Gianolla**, Ferrara, ITALY

**Yuri N. Karogodin**, Novosibirsk, RUSSIA

**Manfred Menning**, Potsdam, GERMANY

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#### **List of "old" Members**

**Timothy A. Anderson**, San Ramon, USA

**William A. Berggren**, Woods Hole, USA

**R.M. Carter**, Townsville, AUSTRALIA

**Michael D. Dermitzakis**, Athens, GREECE

**Fernando Etayo Serna**, Santafé de Bogotá, COLOMBIA

**Yuri B. Gladenkov**, Moscow, RUSSIA

**Algimantas Grigelis**, Vilnius, LITHUANIA

**Charles H. Holland**, Dublin, IRELAND

**Donald E. Owen**, Beaumont, USA

**Alberto C. Riccardi**, La Plata, ARGENTINA

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**Marin Ivanov**, Sofia, BULGARIA

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**Henk de la R. Winter**, Johannesburg, SOUTH AFRICA

**Zhang Shouxin**, Beijing, CHINA

**Albert T. Brakel**, Canberra, AUSTRALIA

**P.V. Tchoumatchenco**, Sofia, BULGARIA

**Jacques Thierry**, Dijon, FRANCE

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**Laurence Robb**, Witwatersrand, SOUTH AFRICA  
**Rong Jia-yu**, Nanjing, CHINA  
**P. Bultynck**, Brussels, BELGIUM  
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**Bruce R. Wardlaw**, Reston, VA, USA  
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## STRATIGRAPHIC INFORMATION SERVICES ANNUAL REPORT 2003

### 1. TITLE OF CONSTITUENT BODY

Stratigraphic Information System (SIS), a task group under ICS Executive

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

#### Mission Statement

SIS aims to promote and coordinate the gathering of selected stratigraphic information worldwide and to organize logically its presentation through the SIS/ICS website. The Subcommittee first priority is to enable the world geoscience community to have quick and free access to a vast amount of stratigraphic information, thus helping to spread the knowledge and foster the advancement of the science globally.

#### Goals

SIS goal is to gather selected stratigraphic information (such as databases, compilation of regional time scales and biozonal schemes, stratigraphic standards, and geohistory teaching modules) and develop a method of classification to organize, logically, the databases and related links, and make easy search and use of the contents through its website to the world scientific community. This way, the Subcommittee primarily aims to promote scientific cooperation and the advancement of the science worldwide, and to maintain the leading role of ICS in the stratigraphic information network. Therefore, to accomplish this objective we plan to carry out over the next 5 years the following tasks, which basically will comprise a 4-fold basic structure of the main website, as follows:

#### Activities in 2003

The SIS website was organized under *www.stratigraphy.org*. In discussion with the ICS Executive, it was established that SIS will start preparation of regional stratigraphic tables and figures, linked to the standard international time scale. These figures can be drafted under auspices of the GTS2004 project and uploaded on the SIS/ICS website. Hence, each major region in the world can ascertain its principal stratigraphic linkages.

### APPENDIX to ICS REPORT 2003

A complete table of past, current and potential GSSPs with approximate ages and primary correlation horizons is attached as the file "GSSPs\_Dec2003.xls". This table is an updated version of the compilation published in *Episodes* of November, 2002.