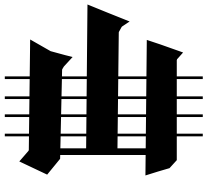

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International Union of Geological Sciences

International Commission on Stratigraphy (ICS)

CONSOLIDATED ANNUAL REPORT

FOR 2002

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

- The first portion of this report (**items 1 - 8**) is a summary of the current goals and scientific activities of the Commission and its component Subcommissions.
- The second portion (**items 9 - 13**) details the plans for 2003 and associated budget, and a multi-year overview of past achievements and future goals.
- Added to this compilation is a list of ICS officers and reports of each individual Subcommission.
- **Appendix 1** is the Report of the ICS Strategic Planning Meeting ' Future Directions in Stratigraphy' held in Urbino, Italy in June 2002.
- **Appendix 2** (in file GSSP2002.XLS) lists the established Global Boundary Stratotype Sections and Points (GSSPs).

1. TITLE OF CONSTITUENT BODY

International Commission on Stratigraphy (ICS)

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) the establishment and publication of a standard global stratigraphic time scale and the preparation and publication of global correlation charts, with explanatory notes,
(b) the compilation and maintenance of a stratigraphic data base center for the global earth sciences.
(c) the unification of regional chronostratigraphic nomenclature by organizing and documenting stratigraphic units on a global database,
(d) the promotion of education in stratigraphic methods, and the dissemination of stratigraphic knowledge,
(e) the evaluation of new stratigraphic methods and their integration into a multidisciplinary stratigraphy, and
(f) the 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 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 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.

In particular, the current objectives of ICS relate to three main aspects of IUGS policy:

(a) The 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 2002 structure of ICS consists of the Executive Committee, one executive committee (Stratigraphic Information Services), and 14 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
Stratigraphic Classification
Stratigraphic Information System

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 Bureau + webmaster and the officers of the 14 Subcommissions) come from 20 countries: Argentina, Australia, Belgium, Botswana, Brazil, Canada, China, France, Germany, Ireland, Italy, Japan, Netherlands, Norway, Romania, Russia, South Africa, Sweden, Switzerland, UK, and USA.

Websites:

ICS main site	*www.stratigraphy.org*
Neogene	*www.geo.uu.nl/SNS*
Paleogene	*www.uni-tuebingen.de/geo/isps*
Ypresian task group	*wzar.unizar.es/perso/emolina/ypresian.html*
Cretaceous	
Jurassic	
Triassic (newsletter)	*www.uni-muenster.de/GeoPalaeontologie/Palaeo/Palbot/albomsl.htm*
Permian (newsletter)	*pri.boisestate.edu/permophiles/*
Carboniferous	
Devonian	*sds.uta.edu/*
Silurian (newsletter)	*iago.stfx.ca/people/mmelchin/SILURIAN9.HTM*
Ordovician (discussion site)	*seis.natsci.csulb.edu/ordstrat2/default.htm*
Cambrian	*www.uni-wuerzburg.de/palaeontologie/ISCS/index.html*
Stratigraphic Classification	*www.geocities.com/issc_arg* (commercial site)

Stratigraphic Information Systems
CHRONOS database network *www.eas.purdue.edu/chronos/*

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, to the ODP Stratigraphic Database Center in Bremen, and to INQUA regarding the stratigraphy of the Quaternary.

ICS subcommissions are traditionally affiliated with a considerable number of IUGS and IGCP activities. Several of these are mentioned specifically by subcommissions in their 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 research groups on Graptolites, Conodonts, 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.

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6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2002

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

ICS Executive Committee

- Organization of the highly successful (first ever!) ICS planning meeting in Urbino, Italy, on 'Future Directions in Stratigraphy' (see special report in Appendix 1).

- Reorganization
  - Ratification of new Statutes consistent with IUGS guidelines
  - Re-establishment of task-oriented Quaternary Subcommission jointly with INQUA.
  - Dissolution of Geochronology Subcommission
  - Formation of Stratigraphic Information System Subcommission

- "www.stratigraphy.org" central website established:
  - Geological time scale information and graphics on-line (including downloads of international stratigraphic charts in standard color schemes of North America or of the World Map.
  - Tables of GSSP status, and documentation graphics of stratigraphy of many GSSP sites
  - ICS annual reports (by subcommission), statutes, strategic plan
  - Stratigraphic Code (condensed version)

- Global Stratotype Sections and Points (GSSPs)
  - Base of Cenomanian Stage upper Cretaceous) ratified by IUGS.
  - Base of Paibian Stage (upper Cambrian) approved, and submitted to IUGS for ratification
  - Base of Ypresian Stage (base Eocene Series) approved, and submitted to IUGS for ratification
  - Bases of Tortonian (upper Miocene), Turonian, Santonian (Cretaceous), Pliensbachian (lower Jurassic) and Anisian (mid Triassic) in or nearing ICS voting process.

- Stratigraphic Databases
  - The ***CHRONOS*** concept of a network of global stratigraphic databases has been submitted to the U.S. National Science Foundation for consideration as a 6-year development program. The initial program would develop and link Life-through-Time, Climate-through-Time, Radiometric Ages, paleomagnetics, and the standard geological time scale. The ***CHRONOS*** program would be under the scientific auspices of ICS. Information on the concept and links to some component databases are posted at *www.eas.purdue.edu/chronos/*.

Quaternary Subcommission (jointly with INQUA)

- At the ICS strategic planning meeting in Urbino (June, 2002), it was decided to establish a joint ICS-INQUA subcommission for formalizing the main divisions of Quaternary stratigraphy. The "Quaternary" is an informal term, which encompasses the major glaciation-dominated climate of the past 2.5 myr (spanning the last portion of the Pliocene, the Pleistocene, and the Holocene epochs) of the Neogene Period.
- The limited mandate of the Quaternary Subcommission is to establish three GSSP/GSSAs – base Holocene, base of Upper Pleistocene, and base of Middle Pleistocene. No "stages" will be formalized.

Neogene Subcommission

- Much progress was made in the formalization of a 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). This GSSP proposal will be submitted to all voting SNS members before the end of 2002.

- Substantial progress is also made with respect to the **Serravallian** GSSP. A Maltese sequence is an excellent candidate section for the Serravallian GSSP once the discrepancy in astronomical tuning of sedimentary cycles is solved.

Paleogene Subcommission

- The base of the Carbon Isotope Excursion was approved by ICS as the criterion for the recognition of the base of the **Eocene** Epoch (and Ypresian Stage) in the Dababiya Section near Luxor (Egypt).
- A preliminary decision has been taken to place the GSSPs of the Danian-Selandian and the Selandian-Thanetian boundaries in the Zumaya Section in northern Spain. The GSSP of the base of the **Selandian** will be placed at a level somewhere between approximately the P2/P3a and P3a/P3b boundaries. The GSSP of the base of the **Thanetian** will be placed at the base of magnetochron C26n.
- The website of ISPS (www.uni-tuebingen.de/geo/isps) has been well accepted and is periodically updated.

Cretaceous Subcommission

- **Cenomanian**: A GSSP for the base of the Cenomanian has been ratified by IUGS in 2002.
- **Santonian**: The Olazagutia section near Bilbao (Spain) is the leading candidate for the GSSP section.
- **Turonian**: A final proposal for both the base of the Turonian and the base of the Middle Turonian has been approved by SCS Voting Members and will be submitted to ICS in late 2002.
- **Berriasian:** A Task Group is now formed, with responsibility for defining the base of the Berriasian Stage and the base of the Cretaceous.

Jurassic Subcommission

- The main highlight of the year was the highly successful 6th International Symposium on the Jurassic System (12-22 September 2002 in Mondello, Sicily) with some 100 oral and 92 poster presentations.
- **Pliensbachian**: A GSSP at Wine Haven Robin Hood's Bay, Yorkshire, England is now in process of being approved by vote of the Jurassic Subcommission.

Triassic Subcommission

- **Anisian:** The GSSP for the base of **Anisian** was informally agreed to be fixed at the base of "bed 7" at Desli Caira, in Dobrogea, Romania. This corresponds to the appearance of a defining conodont, a significant change in the ammonoid fauna, and the peak of a negative C isotope anomaly. A formal vote is expected by summer, 2003.

Permian Subcommission

- The proposal for the GSSP of the **Lopingian** passed the working group by a 92% favorable vote and is now being readied for the vote of the full subcommission.

Carboniferous Subcommission

- The SCCS now has four functioning Task Groups dealing with all the likely Stage and Series boundaries to be recognized within both subsystems of the Carboniferous.
- A formal ballot decided that the biostratigraphic criterion for the base of the Viséan would utilize the *Eoparastaffella* lineage.

Devonian Subcommission

- The annual SDS meeting (24.06.02) was hosted by the Eight International Conodont Symposium Held in Europe (ECOS VIII – 22 to 25.06.02, Toulouse-Albi). The scientific discussions mainly dealt with the subdivision of the Givetian, Frasnian and Famennian.
- **Emsian:** A formal vote was in favor of a Lower and Upper substage; with a preference 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.
- **Givetian:** Proposal for the base of the *hermanni* conodont zone as the base of an Upper Givetian substage, corresponding to the Upper Taghanic Onlap. Two possible boundary levels have been proposed for the base of a Middle Givetian substage.
- **Frasnian:** A formal vote was in favor a Lower, Middle and Upper 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.
- **Famennian:** In a separate straw poll, there was an even split whether the **Famennian** will have three or four substages.

Silurian Subcommission

- In 2001, it was decided to re-examine the GSSPs of the Base of Silurian and Base of Wenlock in light of the experience that researchers have had in using these GSSPs as well as new information that had become available since they were established. Task groups to restudy these boundaries have been initiated.

Ordovician Subcommission

- The GSSP for the **base of the Second Stage**, yet to be named, for the Ordovician System (upper stage of Lower Ordovician Series) - the base of the *Tetragraptus approximatus* graptolite Zone in the Diabasbrottet section in southern Sweden - was approved by the International Commission on Stratigraphy and ratified by the IUGS executive.
- The GSSP for the **base of the Upper Ordovician** Series and the **Third Stage** (lower stage of Upper Ordovician Series, yet to be named) - the base of the *Nemagraptus gracilis* graptolite Zone in the Fågelsång section in Sweden - was approved by the International Commission on Stratigraphy and ratified by the IUGS executive.
- Discussion continued on the GSSP for the **base of the Middle Ordovician** Series.

Cambrian Subcommission

- Voting indicated that only the *Cordylodus proavus*, the *G. reticulatus*, the *Pt. Punctuosus*, *A. atavus*, the *Pt. Gibbus*, and *O. indicus* levels and horizons should be taken into consideration for closer examination as potential GSSPs for major chronostratigraphic levels in the Cambrian. The ISCS has formally decided that the way to arrive at Cambrian subdivisions should commence with the *selection of horizons* which allow a precise interprovincial and intercontinental correlation and which are suitable to define the bases of Cambrian subdivisions. Working Groups should then search for the *best sections* in which these levels might be found to establish a GSSP.
- **Paibian:** The ICS ratified a newly established **Paibian Stage** and the equally new **Furongian Series** (as a synonym of the revised upper Cambrian series). The GSSP is defined at 369.06 m above the base of the Huaqiao Formation, Paibi section (Peng et al., 2001a), NW Hunan province of south China, at the base of the first calcilutite layer containing the cosmopolitan agnostoid trilobite *Glyptagnostus reticulatus*.
- The *VIII Conference of the Cambrian Stage Subdivision Working Group* was held in Caunes-Minervois in Languedoc, southern France, September 12-14, 2002. ISCS Officers E. Landing and G. Geyer organized a Topical Session on the Geological Society of America Annual Meeting in Denver, CO, October 29, 2002, titled "Reconstructing the Cambrian World: Temporal and Spatial Changes in Physical and Biotic Environments".
- We registered more than 300 articles, books, and abstracts published in 2001 and in 2002, which deal, at least in part, with aspects of Cambrian stratigraphy.

Terminal Proterozoic Period Subcommission

- A formal ballot was prepared asking members to indicate preference for one of four proposed type areas for the GSSP. One contender is in the Flinders Ranges of Australia, but other regions have strong potentials. This ballot will be distributed in December 2002.
- It is now increasingly clear that there were three major ice ages and, likely, a fourth, earlier glaciation limited to Africa. The Marinoan ice age, of global extent, is now constrained to be older than 600 Ma and younger than 650 Ma; unpublished U-Pb zircon ages on ash beds suggest that the age will center close to 620 Ma. A post-Marinoan ice age is more precisely constrained to be 580 Ma. Moreover, the nature and isotopic composition of carbonates immediately below and above the three major ice ages can be differentiated, immeasurably improving confidence in correlations. A distinctive biostratigraphic signal characterizes the interval between the two younger ice ages, and a remarkable C-isotopic event occurs at what should be recognized as a globally correlatable Proterozoic-Cambrian boundary. Radiometric dates firmly establish the age of the oldest microscopic animal remains (599+/-4 Ma), the oldest Ediacaran assemblages (575+/-1 Ma), the C-isotopic anomaly at the end of the terminal Proterozoic Period (543/-1Ma), and several points of change in the highly distinctive C-isotopic profile that runs through the terminal Proterozoic interval.

Geochronology Subcommission

- This subcommission had satisfactory completed its original objectives, and the main activities had been incorporated within other subcommissions. Therefore, the Geochronology Subcommission was dissolved in late 2001.

International Stratigraphic Classification Subcommission

- The Working Group on Sequence Stratigraphy concluded that it was time to disband, and this proposal is now under consideration by the ISSC membership.
- The Working Group on Cyclostratigraphy produced a final report "Concept and Definitions in Cyclostratigraphy" which was circulated in ISSC Circular 101 and is now being considered by the ISSC membership.
- An ISSC Website went on-line.

Stratigraphic Information System

- This new 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 Timescale, and launch *E-Strata* (ICS's electronic stratigraphic journal!).

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7. CHIEF PROBLEMS ENCOUNTERED IN 2002

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

ICS Executive Committee

- Progress on Global Stratotype Section and Point (GSSP) selection did not proceed in the timely manner indicated by several subcommission projections in 2001.
- Merger of Quaternary workers under the Neogene Subcommission umbrella had to be abandoned.
- Focused Precambrian subcommissions or working groups (Archean, Proterozoic) were recommended to be re-established, but enthusiasm (especially to serve as organizers) has not appeared.
- *See comments from Paleogene Subcommission (below) for general global aspects.*
- *Many ICS initiated and sponsored products (guides, special studies etc) could be of financial benefit to ICS if proper business mechanisms were enacted, as exist in other geo-scientific 'associations'.*

Quaternary Subcommission (joint with INQUA)

- Initialization of the Quaternary Subcommission was slowed by disagreements between ICS and INQUA on the appropriate representation of marine-based stratigraphers among the proposed officers. This was resolved satisfactory in November 2002.
- The extent of financial contributions of INQUA to the operations of the joint Quaternary Subcommission operations is under discussion.

Neogene Subcommission

- Apart from the temporary adventures associated with the merger between Neogene and Quaternary subcommissions, no organizational problems were encountered in 2002.
- Selection of GSSP sections for the bases of the Langhian and Burdigalian Stages (Miocene) is certainly more difficult compared to the other intervals because much less preliminary work has been done.

Paleogene Subcommission

- In general, research on stratigraphic problems is given rather low priority by funding agencies and particularly scientists tend to turn to more 'glamorous' areas. ISPS has some problems to attract fresh blood.
- Particularly needed are travel funds allowing workers from less affluent countries to participate in meetings and symposia. The financial collapse of several countries has exasperated this situation in 2002. More and more researchers from poorer countries become marginal to the main stream of research because of financial reasons.

Cretaceous Subcommission

- Some of the preliminary GSSP recommendations of the 1995 Brussels meeting have required more further research than was initially appreciated!
- A GSSP for the **Jurassic/Cretaceous Boundary** remains an elusive goal.

Jurassic Subcommission

- The **Triassic/Jurassic Boundary** – endemism of the key ammonite faunas has made it impossible so far to establish inter-continental correlations with the requisite precision, so that discussions are still continuing.
- 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.

Triassic Subcommission

- Difficulty for Russians to undertake necessary fieldwork on potential GSSP of the Olenekian near Vladivostok - lack of funds. A similar situation with participants from the former E. block.
- The Shallow Tethys scheduled for August 2003 was postponed leaving the planned STS meeting orphaned.

Permian Subcommission

- No serious problems.

Carboniferous Subcommission

- No serious problems other than declining voluntary support for Newsletter expenses.

Devonian Subcommission

- No serious problems.

Silurian Subcommission

- No serious problems.

Ordovician Subcommission

- The lack of travel support limited the participation of Voting Members from outside North America in Subcommission activities.

Cambrian Subcommission

- 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 critical ISCS members need substantial financial support to visit Subcommission meetings and conferences.
- Both the ISCS chairman and the ISCS Secretary are momentarily without a position or without a permanent position and therefore have limited access to funding of scientific activities.

Terminal Proterozoic Period Subcommission

- Lack of a funding base and lack of initiative by many subcommission members continue to pose problems, as outlined in previous reports. The current mandate of the terminal Proterozoic subcommission will soon be completed.
- The subcommission can best be revitalized by a new challenge, and to this end urge that the ICS consider expanding the group's purview to include the entire Neoproterozoic -- with the aim of establishing a geochronologically based Sturtian Period.

International Stratigraphic Classification Subcommission

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

Stratigraphic Information System

- Slow progress in establishing a widespread active membership.

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8. SUMMARY OF EXPENDITURES IN 2002 (ANCIPATED EXPENDITURES THROUGH MARCH 2003):

The ICS Executive Bureau established the following budget for April 2002 – March 2003 after consideration for relative needs, planned activities, and funding requests of the subcommissions.

It was necessary to reduce all programs in the original budget submitted to IUGS (ICS annual report of December, 2001) in order to fund the 3-day ICS Strategic Planning meeting (Urbino, Italy, June 2002) – a total $9250, of which $4400 was provided by a special ICSU grant for travel of subcommission chairs, and $4850 was diverted from ICS program funds (IUGS annual grant). The success of the ICS Strategic Planning meeting was only possible through low-cost intra-Europe travel, low prices in the mountain town of Urbino, and individuals who paid for a portion of their own expenses.

After receiving the IUGS grant ($34,000) in late April, 2002, the final subcommission transfers were made in May, 2002. The financial reports of individual subcommissions are contained within their attached annual reports. All Subcommissions were limited to a maximum of $750 for communications and administration costs.

The ICS maintains a small contingency fund, maintained by the Executive Secretary, which is used for unforeseen expenses of subcommissions, for web site improvements, and for initiating "special opportunity" projects that may arise during the fiscal year.

	Initial 2002 Request	**Reduced 2002 Allocation**	***Comments on distribution***
Neogene	4000	**3300**	
Paleogene	3480	**2750**	
Cretaceous	500	**500**	*Reduced level from 2001*
Jurassic	3600	**3000**	*Major Jurassic symposium was held*
Triassic	3500	**3000**	*Support for field workshops for potential GSSP evaluation*
Permian	750	**750**	
Carboniferous	1000	**800**	*An additional $500 "Urbino travel" is carryover to 2003.*
Devonian	1500	**1200**	
Silurian	200	**200**	
Ordovician	3950	**3250**	*Support for field workshops for potential GSSP evaluation*
Cambrian	3800	**3000**	*Support for field workshops for potential GSSP evaluation*
T. Proterozoic	200	**200**	*Subcommission will complete its mandate in 2002.*
Precambrian	0	**0**	*Subcommission is dormant*
Geochronology	200	**200**	*Reimbursement for 2001 newsletter. Subcommission was then disbanded.*
Classification	1000	**800**	
Strat. Info. System	3000	**0**	*No allocation during initial organization.*
ICS Executive	3900	**3500**	*Workshop travel, mailings, Webmaster, Web software, etc.*
Contingency	1800	**2700**	*Special Subcommission and ICS needs*
SPECIAL -- Strategic Planning (Urbino, Italy, June 2002)	15,000	**4850**	*Accommodation and per diem for 20 participants, $500 facility usage*
TOTAL (all funds in USD)	**51,380**	**34,000**	*$29,150 for continuing operations, $4,850 for Strategic Planning meeting*

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9. WORK PLAN, CRITICAL MILESTONES AND ANTICIPATED RESULTS TO BE ACHIEVED FOR April 2003-March 2004:

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

ICS Executive Committee

- All subcommissions will be preparing activities for the 32nd International Geological Congress (Florence, 2004).
- The ICS website will be greatly enhanced in coordination with the ***CHRONOS*** database initiative.
- The election procedure will be initiated for ICS executive and subcommission officers.
- The new ICS Stratigraphic Chart and new Geological Timescale (GTS-2004) are being finalized for the 32nd IGC, using private donations to complete drafting, print proofing, etc.
- A second set of charts, including a wall chart, are prepared for the large public education market.
- The newly established ICS Stratigraphy Awards committee (Hedberg and Steno Prizes) will organize awards candidates elections, with the awards to be awarded at the 32nd IGC.
- Negotiations are ongoing on a 'new' Stratigraphy Journal, with 'E-Strata', ICS's electronic journal slated to be online in 2003.
- A special volume on all GSSPs will be prepared (chief editor Stan Finney) for the 32nd IGC.

Quaternary Subcommission

- This new subcommission will establish 3 task groups to recommend GSSPs for base-Holocene, base-Upper Pleistocene, and base-Middle Pleistocene.
- The subcommission will prepare charts of how these three GSSPs correlate with different regional marine and terrestrial scales.
- Upon completion of these two programs, the subcommission will have completed its mandate.

Neogene Subcommission

- Voting on the **Tortonian** GSSP will be completed during summer 2003 so that it can be ratified by the IUGS in late 2003.
- A proposal for the **Serravallian** GSSP will be submitted in late 2003 to early 2004.
- A workshop will be organized on guiding criteria for **Langhian** and **Burdigalian** boundaries and potential GSSP sections.

Paleogene Subcommission

- Publish the description of the GSSP for the base of the **Ypresian** (=base of **Eocene**) in *Episodes* after its ratification.
- Complete the work on the GSSPs of the bases of the **Selandian**, **Thanetian**, and **Chattian**, which are well advanced.
- Revive or close those Regional Committees and Working Groups which are inactive.
- Maintenance and update of the ISPS website. Newsletters for members not having access to website.

- Symposium on the Paleogene -- Preparing for modern Life and Climate", 25-30 August 2003 in Leuven (for details, see website of ISPS).

Cretaceous Subcommission

- At least two GSSP proposals (**Turonian**, **Santonian**) and perhaps Hauterivian or Barremian will be prepared for voting.
- Papers presented at the Santonian Task Group meeting submitted for publication as a part of *Cretaceous Research*.
- The Subcommission's Kilian Group is jointly sponsoring an international workshop on the ammonite zonation of the Aptian Stage in SE France in September 2003

Jurassic Subcommission

- Voting will be completed on GSSP proposals for **Pliensbachian** and **Callovian**.
- It is likely that GSSP proposals for the **Oxfordian** and **Kimmeridgian** will be presented.
- Design and establish an informative Jurassic website for the subcommission.

Triassic Subcommission

- Publication of proposals on the **Anisian** and **Ladinian** GSSP candidates in *Albertiana* #28, Spring 2003. Formal votes in Fall/Winter 2003.
- Joint meeting with IGCP projects 458 and 467 at the GAC annual meeting in Vancouver, Canada, May 25th -28th, 2003. Thematic session on "Extinction events, faunal turnovers, and natural boundaries within and around the Late Triassic." Post-GAC conference fieldtrip and workshop to Williston Lake northeast British Columbia, 29th May-2nd June, to view base Carnian, base Norian, base Rhaetian, and base Hettangian localities.
- Co-sponsoring of meeting in Italy on "Triassic geochronology and cyclostratigraphy – a field symposium", September 11th -15th 2003. This will focus on Secada core research and Middle Triassic time scales.

Permian Subcommission

- Formal vote on the **Lopingian** GSSP by the Subcommission.
- Submittal of the formal proposal for the **Changhsingian** and the **Sakmarian** GSSPs.
- Development at the **Cisuralian** Working Group Meeting of viable proposals for the **Artinskian** and **Kungurian** and a proposal timeline

Carboniferous Subcommission

- All Task Groups dealing with all the remaining undefined stage/series boundaries within the system will meet at the XV International Congress on Carboniferous-Permian Stratigraphy (Utrecht, The Netherlands in August 2003).
- Consensus will be sought on competing suggestions for series and stage names and classification.
- Tournaisian-Visean Boundary: A field meeting will be held early in December 2002 in Guangxi, China.

Devonian Subcommission

- SDS will come to a consensus on the number of substages for the Givetian (2 or 3) and for the Famennian (3 or 4).
- SDS will conduct a final discussion on the boundary levels for the substages of the Emsian, Givetian, Frasnian and Famennian.

Silurian Subcommission

- The base of the Silurian the current GSSP is being restudied to see if it adequately serves its purpose of providing a precise frame of reference for workers taking a variety of approaches in stratigraphic correlation. One such alternative section has already been proposed, the Wangjiawan section in the Yichang area of China. Progress on the restudy of the current GSSP and also new data on the proposed alternative candidate will be presented at the SSS field meeting in August in Argentina.

Ordovician Subcommission

- The goal for 2003 is to select GSSPs for base of Middle Ordovician Series and for base of upper stage of Upper Ordovician Series, and then to formally name all un-named stages.
- The 9th International Symposium on the Ordovician System will be held in San Juan, Argentina, 18-21 August 2003. The Niquivil section (a candidate GSSP for the base of Middle Ordovician Series) will be visited and evaluated.
- Dedication ceremonies for the Diabasbrottet and Fågelsång GSSPs in Spring 2003.

Cambrian Subcommission

- Although the Cambrian Subdivision project has the highest priority among the activities of the ISCS, 2003 will be mainly dedicated to collect data on the various GSSP candidates to be selected.
- The 9th Field Meeting of the Cambrian Subdivision Working Group of the International Subcommission on Cambrian Stratigraphy is planned for July/August 2003 in Albany, NY, U.S.A. The *Fourth International Symposium on the Cambrian System* is planned for China in 2004.
- The regional correlation charts for the Mediterranean Region and Central Europe could be close to completion toward the end of 2003.

Terminal Proterozoic Period Subcommission

- In its first ballot, the subcommission approved placement of the initial GSSP for the terminal Proterozoic period at the base of the cap carbonate overlying a Marinoan tillite. In the second ballot, voting members are asked to choose among four nominated candidate sections in Australia (2), India, and China.
- Quite simply, we plan to submit our recommendation for an initial GSSP and associated nomenclature for the terminal Proterozoic period and complete our work.

International Stratigraphic Classification Subcommission

- It is not foreseen that final documents of the two Working Groups appointed in the last year will result soon in new chapters of the International Guide, either because no final document was presented (as is the case for the Sequence Stratigraphy WG), or because the document produced is not considered satisfactory (as is the case for the Cyclostratigraphy WG). These two themes are very important and will, by no way, be dropped, but some re-thinking and understanding the reasons behind these unsuccessful outcomes are required before appointing new Task-Groups.
- Efforts by the new Chairman are focused to call a Special meeting of ISSC at the 2004 IGC in Florence to discuss all critical points and dress a new long-term research plan, based on a clarified and widely international background.

Stratigraphic Information Services

- Establishing a wide range of on-line information, such as stratigraphic procedures and standards.
- The new journal *E-Strata* is coming on-line.

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10. BUDGET REQUEST TO IUGS FOR 2003 (USD $)

The following budget is for operations and special initiatives through March 2004 (the date when funds are generally transferred from IUGS). The individual "Initial 2003 Request" from each Subcommission and ICS Executive components has already been adjusted for residual balances of 2002 (see Subcommission reports), although much of these "residual funds" will be expended prior to receipt of the IUGS contribution. For convenience, it has been assumed that one Euro is equivalent to one $U.S. It is important to note that the 2002 allocations of all subcommissions and other programs were reduced by almost 20% in 2002, due to the re-allocation for the ICS Strategic Planning meeting.

	Reduced 2002 Allocation	Initial 2003 Request	**ICS revised 2003 allocation**	Comments on "ICS revised" subcommission requests
Quaternary	**0**	2000	**2000**	New Subcommission
Neogene	**3300**	3000	**2000**	
Paleogene	**2750**	6100	**3000**	Major Paleogene symposium. Special travel needs included in ICS special fund.
Cretaceous	**500**	890	**800**	
Jurassic	**3000**	5350	**3500**	"banking" for IGC 2004 session was reduced
Triassic	**3000**	5500	**3000**	*Albertiana* newsletter subsidy was reduced
Permian	**750**	1000	**1000**	
Carboniferous	**1300**	1000	**1000**	2002 allocation reflects $500 supplement
Devonian	**1200**	2500	**1500**	Travel support to annual meeting was reduced
Silurian	**200**	4000	**1000**	Partial support for field meeting in Argentina
Ordovician	**3250**	3950	**2500**	Requests support for field workshops for potential GSSP evaluation
Cambrian	**3000**	2350	**2350**	
T. Proterozoic	**200**	0	**0**	Subcommission did not expend funds granted in 2002.
Precambrian	**0**	0	**0**	Subcommission is dormant
Classification	**800**	4700	**1000**	Requests for funding meetings and task groups re-assigned to ICS contingency, until such activities are organized
Strat. Info. System	**0**	6000	**3000**	2003 request reduced to place potential workshop requests into ICS general contingency
ICS Executive	**3500**	3000	**3000**	
Special travel needs (*)	**0**	5000	**5000**	See explanation below (*)
Contingency	**2700**	5000	**5000**	Held for special Subcommission and ICS needs
SPECIAL -- Strategic Planning meeting	**4850**			
TOTAL (in USD)	**34,300**	**56,340**	**40,650**	

(*) Several subcommissions have indicated a pressing need for travel funds allowing workers from less affluent countries to participate in meetings and symposia. The financial collapse of several countries has exasperated this situation in 2002. More and more researchers from poorer countries become marginal to the main stream of research because of financial reasons. We have grouped

these requests into a special line-item "travel funds" below (to be dispersed by the ICS secretary-treasurer according to various needs, rather than allocate to individual subcommissions).

The initial total of all Subcommission 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 2002 (prior to one-time reduction, see explanation in Part 8 above). The ICS Contingency Fund is designed to support additional special needs of subcommission as these arise in the later part of 2003-2004.

We therefore request a total allocation of **$40,650** from IUGS for the 2003 fiscal year.

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

A combined 4-year review was compiled as part of the ICS report for 2000, and the accomplishments for 2002 are listed in Item #7 above. A subset of major accomplishments is reproduced here.

11.1. GSSPs (boundary-stratotypes) created since 1998

Neogene

- Stabilization of the GSSP for the base of the **Pleistocene** Stage (1999)
- base of the **Gelasian** Stage at Gela, Italy - *Episodes*, vol. 21/2 (1998): 82-87
- base of the **Piacenzian** Stage at Punta Piccola, Italy - *Episodes*. vol. 21/2 (1998): 88-93
- base of the **Zanclean** Stage and of the **Pliocene** Series at Eraclea Minoa, Italy, ratified in Jan. 2000
- base of the **Messinian** Stage at Oued Akrech ,Morocco, ratified in Jan. 2000
- base of the **Neogene** System and of the **Aquitanian** Stage, Lemme-Carrosio section, Italy - *Episodes*, vol. 20/1 (1997): 23-28.

Paleogene

- base of the **Eocene** Series (and Ypresian Stage) in the Dababiya Section near Luxor (Egypt). Approved by ICS in 2002.

Cretaceous

- base of the **Maastrichtian**, the uppermost Cretaceous stage at Tercis, France, ratified in Jan. 2000.
- base of the **Cenomanian**, and of the Late Cretaceous Series, at Risou, France, was approved by ICS in Dec. 2001.

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Jurassic

- base of the **Aalenian** Stage and of the Middle Jurassic Series at Fuentalsaz, Spain, ratified in Jan. 2000.

- base of the **Sinemurian** Stage at East Somerset, England, ratified in 2001.

Triassic
- base of the **Triassic** System at Meisan, China, ratified in Jan. 2001.

Permian
- Base of the **Guadalupian** Series (Middle Permian) and component **Roadian**, **Wordian** and **Capitanian** Stages in Guadalupian mountains, USA, ratified in 2001.
- base of the **Permian** System and of the **Asselian** Stage, in the Aidaralash Creek, Kazakhstan - *Episodes*, vol. 21/1 (1998): 11-18.

Carboniferous
- base of the **Pennsylvanian** Subsystem, "Mid-Carboniferous boundary" at Arrow Canyon, Nevada, USA - *Episodes*, vol. 22/4 (1999): 272-283.

Devonian
- *all Devonian stage boundaries are defined by a GSSP*

Ordovician
- base of the **Upper Ordovician** Series (un-named stage) at Fågelsång in Sweden, ratified in 2002.
- base of the upper stage of the **Lower Ordovician** Series at Diabasbrottet in southern Sweden, ratified in 2002.
- base of the **Ordovician** System and of the **Tremadocian** stage at Green Point, Newfoundland, Canada, ratified in Jan. 2000.

Cambrian
- base of the **Paibian** Stage and the **Furongian Series** (as a synonym of the revised Upper Cambrian) in the Paibi section, NW Hunan province, south China. Approved by ICS in 2002.

11.2. Websites and Newsletters by ICS Subcommissions

In addition to a hub Website "www.stratigraphy.org" of ICS, about half of the subcommissions have established websites that have placed an impressive amount of virtual information on geological time into the public domain.

Several subcommissions of ICS publish regularly newsletters or circulars of a high scientific level: Terminal Proterozoic System, Ordovician, Silurian (*Silurian Times*), Devonian, Carboniferous, Permian (*Permophiles*), Triassic (*Albertiana*), Jurassic, Paleogene, Neogene, Geochronology (*Bull. of/de Liaison*), ISSC, Committee on Quantitative Stratigraphy. They 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, but hard copies are still necessary for distribution in countries without the necessary computer equipment. *Permophiles* was the first to be available on Internet, and the other subcommissions are following this example.

11.3. The International Stratigraphic Chart

Thanks to an excellent collaboration within the Inter-Commission Working Group for the Internal Stratigraphic Chart (J. Remane and M.-B. Cita of ICS, J. Dercourt, P. Bouysse, A. Faure-Muret of the Commission on the Geological Map of the World, and F. Repetto of UNESCO, the International Stratigraphic Chart was distributed in August 2000 at the International Geological Congress in Rio de Janeiro. This new type of International Stratigraphic Chart, 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 would give an objective picture of the present state of the art in chronostratigraphy. The colors to be used were those of the International Geological Map of the World. This chart is continually updated, and public graphics can be downloaded in either the colors of the International Geological Map of the World or of the U.S. Geological Survey at www.stratigraphy.org.

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

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 2003-2004.

ICS Executive Committee

- Define GSSP sections for all stages of the Phanerozoic Era, and solidify subdivisions of the Precambrian. All GSSPs will be ratified by 2008.
- 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).

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 4 Neogene stages lack a GSSP.
- Evaluate the present status of Pleistocene chronostratigraphy and to possibly arrive to a formal chronostratigraphic subdivision of the Pleistocene and selection of related GSSP sections.

Paleogene Subcommission

- Continue and complete the work on the remaining GSSPs of Paleogene stages. All Paleogene GSSPs should be ready for the International Geological Congress 2004 in Florence (Italy).
- Produce an updated version of an integrated Paleogene time scale.

Cretaceous Subcommission

- To bring recommendations for the remaining 9 GSSPs before ICS as soon as possible, and not later than 2006:
  - 2003 -- Hauterivian, Barremian and Santonian.
  - 2004 -- Valanginian, Albian and Campanian
  - 2005 -- Aptian and Coniacian
  - 2006 -- Berriasian (base of Cretaceous)
- To communicate the results as widely as possible.

Jurassic Subcommission

- The future focus of the Subcommission will evolve away from Stage boundary GSSP proposals to further refinement of the chronostratigraphic scale by integration of multidisciplinary methods of correlation.
- The Palaeoclimate Working Group should begin to produce a series of maps showing the palaeoclimate 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 Subcommission

- Complete Triassic GSSP selection
  - 2003 – Anisian, Ladinian , and Carnian
  - 2004 -- Norian
  - 2005 -- Olenekian and Rhaetian
  - 2006 -- Summary volume of all Triassic GSSPs. Emphasis switches to choice of non-marine auxiliary sections.

Permian Subcommission

- Complete Late Permian GSSP selection (goal is by 2003)
- Complete Early Permian GSSP selection

Carboniferous Subcommission

- Tournaisian-Visean boundary GSSP should be selected within the next three years.
- An acceptable series and stage subdivision will be achieved within the Carboniferous System and it two Subsystems.

Devonian Subcommission

- SDS plans to come to conclusions on the subdivision of the Emsian, Givetian, Frasnian and Famennian stages at the 32nd IGC, Florence, 2004. SDS has proposed a symposium on "Multidisciplinary high resolution stratigraphy of Devonian stages as a tool for standardization of global substages" for this IGC.

Silurian Subcommission

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

Ordovician Subcommission

- Approval and ratification of GSSPs remaining to complete subdivision of Ordovician System with goal of completion by 2004.
- Sponsorship of "Global Ordovician Earth Systems" symposium at 32nd International Geological Congress in 2004.
- Redirection of Subcommission's focus to interdisciplinary investigation of the global Ordovician Earth system.

Cambrian Subcommission

- Four regional correlation chart volumes are on the way.
- During the next years, a suite of five bio-datums have been recognized as primary correlation criteria for defining GSSPs of global stages (yet to be named). In addition, the base of the *Glyptagnostus reticulatus* level is generally accepted to be suitable as the base of a formal Middle-Upper Cambrian boundary.

Terminal Proterozoic Period Subcommission

- 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.

International Stratigraphic Classification Subcommission

- Organization of a WG on Chemostratigraphy.
- Analysis of eventual changes, additions and improvements in the International Stratigraphic Guide.

13. SUBMITTED JOINTLY BY:

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POSITION: ICS Chair ***and*** ICS Secretary-General
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1 Dec.2002

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SUBCOMMISSION ON QUATERNARY STRATIGRAPHY

ANNUAL REPORT 2002

1. TITLE OF CONSTITUENT BODY

Subcommission on Quaternary Stratigraphy (SQS)
(Newly established in October, 2002.)

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

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

- Formalization of Global Stratotype section and Points (GSSP) for the Lower/Middle and for the Middle/Upper subseries/subepoch boundaries of the Pleistocene Series/Epoch. The formal nomenclature for the subseries/subepoch divisions of the Pleistocene will be Lower/Early, Middle/Mid, and Upper/Late.
- Formalization of a GSSA for the base of the Holocene Series/Epoch.
- An international correlation chart for the most commonly used regional stratigraphic units and isotope stages. No international stage-level subdivisions for the Pleistocene or Holocene will be formalized.
- Progress and discussions within the Subcommission will be summarized through an active SQS newsletter and a website. Each SQS newsletter will be provided to the ICS Secretary for the permanent ICS archives.

3. ORGANIZATION

After a year of uncertainty, the Subcommission of Quaternary Stratigraphy (SQS) was re-established in October 2002 by the Executive Committee of the International Stratigraphy Commission (ICS). At its meeting the ICS Executive Committee that:

- A new SQS within ICS will be formed.
- The International Quaternary Association (INQUA) Executive Committee proposed Ph. Gibbard, as chair, who will select a secretary. ICS will propose one or two vice chairs to complete the SQS executive.
- 3The ICS Executive Committee requests that one of the vice chairs or the secretary should include a marine-based Tethyan Pleistocene stratigrapher, and that two of the executives are from outside Europe, preferably North or South America, Far Asia or Australia-New Zealand.
- The new executive of SQS is to be approved by the executive committees of both the ICS and INQUA and proceeds to select maximally 20 voting members, to be ratified by ICS and by INQUA.
- The new executive of the SQS reports to the executive of ICS, and its close link to INQUA is directly to the Executive Committee of INQUA and not to the INQUA Commission on Stratigraphy.

- This group of officers serves until the 32nd International Geological Congress in Florence 2004, at which time it will hold internal elections as usual for all Subcommissions.
- 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.

In the past weeks the ocean sediment geologist, Dr J. McManus (Wood's Hole Oceanographic Institute, USA) has agreed to act as first vice-chair and the vertebrate biostratigrapher, Dr Th. van Kolfschoten (Leiden) as secretary. 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. In addition, the ICS Executive proposed Dr J. van Couvering (City University of New York, USA), a long-established Neogene stratigrapher, to act as second vice-chair, and he has accepted.

4. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2002

The provisional SQS already held a one-day discussion meeting to consider the 'ground rules' for the division of the Pleistocene at Leiden in mid-July 2002 at a meeting held jointly with the INQUA Commission on Stratigraphy and the INQUA Subcommission on European Quaternary Stratigraphy. The meeting was attended by 35 people from 9 countries.

The Subcommission looks forward to a productive period of active work over the coming few years.

5. WORK PLAN, CRITICAL MILESTONES AND ANTICIPATED RESULTS:

See ***Overall Objectives*** (above)

6. BUDGET AND ICS COMPONENT FOR 2003

An initial start-up budget of $2000 is requested from ICS for 2003/2004 for the following items:

1. Publication and distribution of a newsletter
2. Establishing and maintaining an informative Web site
3. Aiding in the initial meetings of the different task groups
4. Preparing activities for the 2004 IGC in Florence

7. SUBMITTED BY:

P.L.Gibbard
Chair SQS

Proposed Voting Members of SQS:

This list is under approval by the ICS executive

Chairman: Philip Gibbard
Godwin Institute of Quaternary Research, Department of Geography,
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Secretary: Thijs van Kolfschoten
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Vice-Chair: Dr Jerry McManus
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Mike Walker (GB) walker@lamp.ac.uk

SUBCOMMISSION ON NEOGENE STRATIGRAPHY

ANNUAL REPORT 2002

1. TITLE OF CONSTITUENT BODY

Subcommission on Neogene Stratigraphy (SNS)

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

Now the merger between SNS and SQS has come to an end and a new SQS has taken up the formalization of GSSPs for Pleistocene subseries boundaries and base Holocene, the SNS is again the primary body responsible for providing optimum clarity and stability in the ***Neogene*** Chronostratigraphic Scale by carefully selecting and defining Global Stratotype Sections and Points (GSSPs) for Series and Stages.

3. ORGANIZATION

The SNS is a subcommission of the International Commission on Stratigraphy, founded in 1971. Reference is made to the annual report of 1995 for a brief historical resume of the Subcommission. 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 Executive consists of

Jan Willem Zachariasse (Chairman, Utrecht University, The Netherlands)
Davide Castradori (Vice-Chairman, ENI/Agip, San Donato M., Italy)
Frits Hilgen (Secretary, Utrecht University, The Netherlands)

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,
(3) WG for defining GSSP sections for the Langhian and Burdigalian chaired by Isabella Raffi.

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

The SNS does not receive financial support from outside IUGS-ICS, except for office support from the host institutions of the bureau. The 2002 budget suffice to allow some traveling and to contribute to workshops and field activities. The budget is however too limited to fully cover the expenses related to surveying, measuring, and sampling candidate GSSP sections. These field campaigns are costly and usually funded at the university level.

5. INTERFACE WITH OTHER INTERNATIONAL PROJECTS

There are close links with (I)ODP and the IGCP. Especially, ODP has played an 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 2002

The past year the SNS bureau has spent a disproportional part of its time in the unsuccessful merger between SNS and SQS (see resume in *SNS Newsletter* 9 on www.geo.uu.nl/SNS). However one of the positive results of this aborted merger is that a new and active SQS is presently in formation and that the short and forced contacts between SNS and (the active part of) SQS (a.o. materialized in a joint contribution to the ICS position paper prepared for the Urbino meeting and active participation of the SNS bureau in a workshop on the subdivision of the Quaternary) are made permanent through the appointment of the SNS vice-chair Davide Castradori as voting member of the new SQS and chairman of the new WG on the formalization of the Lower/Middle Pleistocene boundary.

SNS prepared a summary report on the current status of Neogene chronostratigraphy, which was read at the ICS meeting in Urbino June 2002 (see *Newsletter* 9).

Much progress was made in the formalization of a GSSP for the base of the **Tortonian** Stage. In a workshop organized by Frits Hilgen in Coldigioco on 14-16 May 2002 it was agreed that the best choice for a Tortonian GSSP would be the level corresponding with the midpoint of the sapropel of cycle 76 in the Monte dei Corvi beach section near Ancona (for a full report of this meeting, see *SNS Newsletter* 9). Meanwhile a draft proposal for the Tortonian GSSP has been written and will be submitted to all voting SNS members before the end of 2002.

Substantial progress is also made with respect to the **Serravallian** GSSP. Suitable sections of open marine sediments with the potential of tuning have been found on Malta and Tremiti Islands (Italy) and are under study by various groups. Since the Maltese sequence contains the longest exposed record extending a fair distance beyond the critical interval and has a promising magnetic signal it seems the most promising of the two. During a second field campaign on Malta in October 2002 led by Frits Hilgen, a preliminary tuning of the complex sedimentary cycle pattern to the newly calculated solutions of Laskar was made using imported astronomical ages of bioevents and detailed records of magnetic susceptibility and carbonate content. Although the tuning seems to make sense it differs from the tuning published earlier by Sprovieri et al. (*Riv. It. Pal. Strat*. **108**: 183-193, 2002). The SNS bureau believes that the Maltese sequence is an excellent candidate section for the Serravallian GSSP once the discrepancy in the tuning is solved.

7. CHIEF PROBLEMS ENCOUNTERED IN 2002

Apart from the temporary adventures associated with the merger between SNS and SQS no problems were encountered in 2002.

8. SUMMARY OF EXPENDITURES IN 2002 (ANCIPATED THROUGH MARCH 2003):

Carry-over from 2001	€ 1041
IUGS Contribution 2002	€ 3407

The contribution was divided as follows:

SNS Chair/secretary (Utrecht)	€ 3848
RCPNS	€ 300
RCMNS	€ 300
TOT	**€ 4448**

The budget for the bureau:

INCOME

From ICS-IUGS	€ 3848
TOT	€ 3848

EXPENDITURES

Participation SNS bureau in SQS workshop Leiden July 2002	€ 522
Contribution to measuring/sampling candidate section for defining the Serravallian GSSP (Malta) October 2002	€ 1000
Contribution to WG meeting Coldigioco	€ 350
Contribution to measuring/sampling candidate section for defining the Serravallian GSSP (Malta) Spring 2003	€ 1000 (reservation)
Planned business meeting WG for Langhian – Burdigalian GSSPs	€ 1000 (reservation)
TOT	**€ 3872**

9. WORK PLAN AND MILESTONES TO BE ACHIEVED FOR NEXT YEAR PLUS ANTICIPATED RESULTS:

The bureau expects that the SNS and ICS voting on the **Tortonian** GSSP will be completed summer 2003 so that it can perhaps be ratified by the IUGS late 2003 to early 2004. The bureau also expects the submission of a proposal for the **Serravallian** GSSP late 2003 to early 2004. The planning further includes the organization of a workshop on guiding criteria for **Langhian** and **Burdigalian** boundaries and potential GSSP sections.

10. BUDGET REQUEST FOR 2003

INCOME

Request from bureau	€ 3000
TOT	€ 3000

ANTICIPATED EXPENDITURES

Travel/organization WG meeting on defining GSSP for the base of the Serravallian	€ 2400
Contribution to RCPNS and RCMNS	€ 600
TOT	€ 3000

Allotment requested from IUGS/ICS for 2003	**€ 3000**

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

1998: Preparation and submission to the ICS of proposals for Zanclean and Messinian GSSP sections. Organization of a postal ballot within SQS and SNS on the proposal to lower the Pliocene/Pleistocene boundary from its defined position in the Vrica section to a new position corresponding with the Gelasian GSSP section. Preparing a memorandum against such a lowering by the SNS bureau as attachment to the postal ballot. Release of *Newsletter* **5**.

1999: Acceptance of proposals for Zanclean and Messinian GSSP sections by the ICS. Proposal for lowering the position of the Pliocene/Pleistocene boundary rejected. Requests to the ICS by the SNS bureau to communicate the outcome of the voting on the lowering of the P/P boundary in *Episodes* or any other suitable journal failed. Setting up of a WG on Miocene chronology chaired by Nick Shackleton. Beginning of the reorganization of the SNS. Release of *Newsletter* **6**.

2000: Ratification of Zanclean and Messinian GSSP sections by IUGS and publication in Episodes 23. Reorganization of SNS completed. The new organization consists of 20 voting members and 38 corresponding members. Chairman is W.J. Zachariasse (Utrecht University, The Netherlands), vice-chairman is D. Castradori (ENI/Agip, San Donato, Italy), and secretary is Frits Hilgen (Utrecht University, The Netherlands).

2001: Establishment of Tortonian and Serravallian GSSP WG (chaired by Frits Hilgen) and Langhian and Burdigalian GSSP WG (chaired by Isabella Raffi). Launching of the SNS website and submission of a proposal for 2 excursions in Sicily and the Marche during the 2004 Florence Geological Congress.

2002: see above

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

The objective of the SNS is to define GSSP sections for all stages of the Neogene system. At present 4 Neogene stages lack a GSSP. The ambition of the present bureau is to get proposals for **Tortonian** and **Serravallian** GSSP sections ratified before August 2004 (end of present office). The bureau anticipates that it will take another term to complete the selection of GSSP sections for the **Langhian** and **Burdigalian**.

13. SUBMITTED BY:

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Position: **Chairman SNS**
Date: **30/10/2002**

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SUBCOMMISSION ON PALEOGENE STRATIGRAPHY

ANNUAL REPORT 2002

1. TITLE OF CONSTITUENT BODY

Subcommission on Paleogene Stratigraphy (ISPS)

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

a) to agree on an international set of stages and series for the Paleogene
b) to establish boundary stratotypes of the Paleogene stages and series
c) to encourage research into the Paleogene by setting up Working Groups and Regional Committees to study and report on specific problems.

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 Section and Point (GSSP) for the lower boundary of each of these stages.

At present, the GSSPs of the base of the **Danian** (= Cretaceous/Paleogene Boundary), the base of the **Rupelian** (= Eocene/Oligocene Boundary) and the base of the **Aquitanian** (Paleogene/Neogene Boundary) have been established and ratified by the International Union of Geological Sciences. The GSSP for the base of the **Ypresian** (Paleocene/Eocene Boundary) in the Dababiya Section (Upper Egypt) has been accepted by ISPS, and approved by ICS. The proposal has been submitted to IUGS for ratification.

The search for the remaining GSSPs has been continued in 2001. Good progress has been made mainly in the early and middle Eocene and the Oligocene. We hope to present proposals for most of the remaining GSSPs prior to the next International Geological Congress in 2004.

3. ORGANIZATION

ISPS is a Subcommission of the International Commission on Stratigraphy.
Officers:

Chairman	H.P.Luterbacher, Germany
Vice-Chairman	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 Subcommission, we have set up the following Working Groups and Regional Committees:

a) Paleocene Working Group
Chairman: B.Schmitz, Sweden

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

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

In 2002, ISPS received € 3.200,00 as support from IUGS/ICS.

National support is derived from the participating members, regional support is derived *via* Working Groups and Regional Committees; global support for research is undertaken *via* worldwide projects such as the Ocean Drilling Program. However, research in stratigraphic problems is not ranked very high by many funding agencies and financial support is dwindling.

A large part of the administrative and other costs of ISPS is paid for by the parent institutions of the chairpersons and secretaries of working groups and regional committees and of the executive members..

5. INTERFACE 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 (started 1996)

Ocean Drilling Program, International Subcommission on Neogene Stratigraphy, International Subcommission on Cretaceous Stratigraphy: some of our members participate also in the work of these subcommissions.

6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2002

The decision of the Voting Members of ISPS in 2000 to adopt the base of the Carbon Isotope Excursion as criterion for the recognition of the Paleocene/Eocene Boundary has cleared the way for the proposal of a GSSP for the **base of the Eocene** (i.e. the base of the **Ypresian**). The Working Group on the Paleocene/Eocene Boundary proposed the location of the GSSP in the Dababiya Section near Luxor (Upper Egypt). This GSSP has been accepted unanimously by the Voting Members of ISPS. It has been approved by ICS and has been submitted for ratification by IUGS. We hope that this GSSP will be in place early in 2003.

Since the Working Group on the Paleocene/Eocene Boundary has completed successfully its task, it has been dissolved. During the past two decades, this Working Group under the leadership of M.-P. Aubry has been very active and has enormously expanded our knowledge and understanding of the events taking place at this critical boundary.

The website of ISPS (www.uni-tuebingen.de/geo/isps) has been well accepted and is periodically updated. It largely replaces the Newsletter.

The Chairman of ISPS has taken part in the meeting of ICS on "Future Directions in Stratigraphy" in Urbino (Italy) in June 2002.

The Bureau of ISPS met in Leuven (Belgium) early in June 2002 in order to discuss the preparation of the "Symposium on the Paleogene" to be held in Leuven on August 25-30, 2003. The First Circular of this Symposium has been distributed in June 2002.

7. CHIEF PROBLEMS ENCOUNTERED IN 2002

The problems addressed in previous annual reports continue to exist:

Lack of funds does not allow the ISPS to support meetings and publications and to help substantially Working Groups and Regional Committees outside Western Europe and North America. Particularly needed are travel funds allowing workers from less affluent countries to participate in meetings and symposia. The financial collapse of several countries has exasperated this situation in 2002. More and more researchers from poorer countries become marginal to the main stream of research because of financial reasons.

In general, research on stratigraphic problems is given rather low priority by funding agencies and particularly scientists tend to turn to more 'glamorous' areas. ISPS has some problems to attract fresh blood.

Until now, most of the costs for secretarial expenses and meetings have been covered by the institutions of the officers and other members of the ISPS. The continued degradation in funding of basic research renders it more and more difficult to draw on these ‘unofficial’ sources.

8. SUMMARY OF EXPENDITURES IN 2002 (ANCIPATED THROUGH MARCH 2003):

INCOME		
From ICS		€ 3,200
	TOT	**€ 3,200**
ANTICIPATED EXPENDITURES		
Carry-over deficit 2001		€ 285
Secretarial and postage		€ 726
Support Working Groups and Regional Committees		€ 1,500
Home page		€ 960
	TOT	**€ 3,471 ($3,401.58)**
Deficit for 2002:		**€ 271.00 (US $265,58)**

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

- Publish the description of the GSSP for the base of the **Ypresian** (=base of **Eocene**) in *Episodes* after its ratification.
- Complete the work on the GSSPs of the bases of the **Selandian**, **Thanetian**, and **Chattian**, which are well advanced.
- Revive or close those Regional Committees and Working Groups which are inactive.
- Maintenance and update of the ISPS website. Newsletters for members not having access to website.
- Symposium on the Paleogene -- Preparing for modern Life and Climate", 25-30 August 2003 in Leuven (for details, see website of ISPS).

10. BUDGET AND ICS COMPONENT FOR 2003

Newsletter		€ 120
Secretarial and postage (ISPS		€ 800
Symposium on Paleogene, Leuven*)		€ 2500
Support to Working Groups and Regional Committee **)		€ 2000
Maintain Home Page		€ 500
Carry-over deficit 2002		€ 270
	TOT	**€ 6,191**
Total request for 2001		**€ 6,191.00 (US$ 6067.18)**

*) Although the University of Leuven and other Belgian agencies contribute a large part of the costs of the symposium to be held in Leuven, we will need additional funds to cover all the expenses. In particular, we would like to earmark the sum of € 1,800.00 to support the travel expenses of invited participants from Eastern Europe, Latin America and other countries who will not be able to attend otherwise.

**) As discussed in paragraph 8, financial situation and support of research has drastically deteriorated in recent years. This is particularly true for Latin America, the countries of the former Soviet Union that have very active Regional Committees. The requested rise of subvention would help us to support their work more effectively.

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

- Continue and complete the work on the remaining GSSPs of Paleogene stages. All Paleogene GSSPs should be ready by 2007.
- Produce an updated version of an integrated Paleogene time scale.
- A General Symposium "Paleogene Subdivisions and Boundaries" by ISPS is scheduled for the 32nd International Geological Congress in Florence in August 2004.
- Rejuvenate the membership of ISPS

13. SUBMITTED BY:

Hanspeter Luterbacher Tübingen, 12 October 2002

APPENDICES

List of Voting Members
Annual Report 2002 of the Paleocene Working Group
Annual Report 2002of the Ypresian/Lutetian Boundary Stratotype Working Group
Annual Report 2002 of the Working Group on Paleogene Stratigraphy of the North Pacific
Annual Report 2002 of the Paleogene Shallow Benthos Working Group
Annual Report 2002 of the Paleogene Planktonic Foraminifera Working Group
Annual Report 2002 of the South American Regional Committee on Paleogene Stratigraphy
Annual Report 2002 of the Russian Paleogene Commission
Annual Report 2002 of the Working Group on Paleogene Stratigraphy of the North Pacific

1. List of Voting Members (20):

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

Annual Report 2002 of the Paleocene Working Group

Report by Birger Schmitz, Chairman

After discussions among several of the members of the Paleocene Working Group a preliminary decision has been taken to place the GSSPs of the Danian-Selandian and the Selandian-Thanetian boundaries in the ***Zumaya Section*** in northern Spain. This section is easily accessible and contains a very complete and expanded record of the Paleocene. The position of the section between the Tethys and the North Sea makes it an important link between these two regions.

The GSSP of the base of the **Selandian** will be placed at a level ***somewhere between approximately the P2/P3a and P3a/P3b boundaries***. Further studies and discussions are necessary before a decision can be taken on this. A document is presently produced laying out the theoretical base for such a decision.

The GSSP of the base of the **Thanetian** will be placed at the ***base of magnetochron C26n***. Members of the Paleocene Working Group are outlining the theoretical foundation for this choice. Contact have/will be taken with researchers at the Zaragoza and Bilbao universities in order to coordinate further studies of the Zumaya Section.

Annual Report 2002 of the Ypresian/Lutetian-Boundary Stratotype Working Group

Report by Eustoquio Molina, Chairman

During the past year, the Ypresian/Lutetian Boundary Stratotype Working Group continued looking for suitable sections in which eventually to define the GSSP. A Cuban-Spanish group was examining suitable sections in the western part of Cuba. The best section sampled is located in the Avenida de los Presidentes in La Havana City. This is a classical section described by Brönnimann & Rigassi (1963) and is now under study and evaluation. Apparently, the main problems are the lack of free accessibility and the location in the city of La Havana, although the outcrop seems to be permanent.

Furthermore, a preliminary paper was published by Gonzalvo, C., Macheño, M.A., Molina, E., Rodriguez-Estrella, T & Romero T. in *Geogaceta*, v.29, p.65-68 (2001) on the Ypresian at La Fortuna, Murcia Region (Betic Cordilleras). A more detailed study of this section is in progress, integrating foraminifera (E. Molina, C. Gonzalvo, S. Ortiz), calcareous nannofossils (K. von Salis), stable isotopes (B.Schmitz) and mineralogy (M.A.Macheño). This paper was presented by E.Molina at the "XVIII Jornadas de la Sociedad Española de Paleontología" in Salamanca (Spain). In order to inform and generate a more active participation a web page can be visited at the following address: http://wzar.unizar.es/perso/emolina/ypresian.html . This page is updated frequently. It contains an explanation of the aims of the Ypresian/Lutetian Working Group, its members, descriptions of the best potential sections and recent publications.

Annual Report 2002 of the Working Group on Paleogene Shallow Benthic Foraminifera

Report by Lukas Hottinger, Chairman

The work of the group focused on two main goals, a more specialized one aiming at the stratigraphic distribution of selected index fossils in the younger part of the Eocene and a more general one consisting in the revision of selected taxa and their structural patterns.

The group is still intensively working on the material collected in Oman in 2000 and 2001 which covers the entire photic zone in the Paleocene and Eocene. The microfossils have to be compared with those from similar sequences in Pakistan and Egypt collected in earlier years. In the so-called "*Lockhartia* Sea" which extended during the Paleocene and Eocene across the Middle East and Eastern Africa to at least Somalia, the shallowest facies, as exposed in the Omani Province of

Dhofar, causes the major difficulties, since the paleontology of the microfossils of these facies has not been studied systematically since Henson (1950, cf. Simmons, 1994). Consequently, numerous Eocene genera currently called "*Meandropsina*","*Rhapydionina*", "*Peneroplis*", "*Archaias*", etc. have to be redescribed, in particular their diagnostic architecture and their biostratigraphic ranges at genus and species level. A parallel attempt is made to revise selected *Nummulites, Heterostegina* and *Spiroclypeus* from Hungary and elsewhere based on isolated free specimens. G.Less kindly guided another field trip to Hungarian key exposures in order to provide additional comparative material to interested participants. The laboratory study of all this material is underway, however at slow progress rates, because in these days the number of researchers and technical help in paleontology is declining dramatically in most European academic institutions.

The Working Group has been well represented at the "Forams 2002" meeting in Perth (Western Australia), where progress in the understanding of the architecture of nummulitids, pellatispirinids, larger miliolids and archaiasinids has been presented in several posters and a keynote lecture. A new category of cavities in the foraminiferal shell has been introduced in order to understand the morphogenesis in the lamellar-canaliferous groups: Nummulitinae, Pellatispirininae and Siderolitinae. In addition to chamber cavities and interlocular spaces, interlamellar cavities are fed by shell passages others than foraminifera and covered by regular bilamellar-perforate primary walls.

The following major contributions have been published:

Bartholdi,J. (2002): *The architecture of Nummulites (Foraminifera) re-examined*. - Ph.D.thesis, Freie Universität Berlin, 97 p.

Hottinger,L. (edit.) (2001): *The shell cavity systems in elphidiid and pellatispirine bilamellar foraminifera*. - Micropaleontology, vol..47, suppl. 3, 77 p.

Annual Report 2002 of the Paleogene Planktonic Foraminifera Working Group

Report by Brian Huber, Secretary.

The Paleogene Planktonic Foraminifera Working Group (PPFWG) has met one or two times per year since 1997 to work toward completion of an illustrated Atlas of Eocene Planktonic Foraminifera. The Atlas will present detailed taxonomic and complete morphologic descriptions for all Eocene species of planktonic foraminifera that are considered as senior synonyms with complete morphological descriptions and SEM illustrations of primary type specimens and hypotypes, synonymy lists, and updated biostratigraphic, biogeographic, and, where available, depth ecology information. The phylogeny of the taxonomic groups included in the Atlas will be reconstructed based on wall texture and shell morphology comparisons using the best preserved specimens available from land-based and deep-sea marine sequences. The PPFWG will meet from 11-14 December 2002 to finalize the plates and discuss phylogenetic hypotheses for several remaining problematic groups. We anticipate submitting the Atlas for publication by Summer 2003.

Annual Report 2002 of the South American Regional Committee on Paleogene Stratigraphy

Report by N.Malumián, Chairman.

In cooperation with local geologists, N.Malumián is continuing his study of the Paleogene in Tierra del Fuego. This summer, investigations have concentrated on the Paleocene/Eocene transition. The exact position of the boundary will be located by carbon isotope analysis carried out by B.Schmitz. Probably, several foraminiferal genera typical of the Austral Faunal Province have their first occurrences at or close to this boundary. Initial results have been published in the abstract volume of the 'Forams 2002' conference. The monographic description of the genera which are typical and abundant in the Austral Faunal Province is in progress.

In cooperation with Peruvian geologists, the Oligocene/Miocene boundary has been studied in Peru where it is marked by the appearance of the Transversigerinas.

C.Nañez has presented a paper on the Cretaceous/Paleogene boundary in northern Patagonia which will be published in a Special Publication "Palynology and Micropaleontology of Stratigraphical Boundaries" of the Geological Society of London. Besides a general description of the sections, it concentrrates on calcareous nannofossils, clay minerals and the peculiar foraminiferal genera *Antarcticella* and *Prepararotalia* which are very abundant and very variable at the base of the Danian.

Annual Report 2002 of the Russian Paleogene Commission

Report by M.A.Akhmetiev, Chairman.

The meeting of the Russian Paleogene Commission took place in Saint Petersburg at the All Russian Geological Institute (VSEGEI) on 10-11 April 2002 together with geologists and paleontologists from Ukraine and Kazakhstan. This meeting had 32 participants, 21 of them members of the Paleogene Commission.

Program of the Meeting:

1. Akhmetiev,M.A: (Geological Institute RAS, Moscow) - *New data on the Paleogene Stratigraphy of South Siberia, connected with complex paleontologic and paleomagnetic studies of two borehole sections (500-600m) near Omsk (Southeastern Siberia)"* One of the boreholes penetrated 350m of marine Paleocene-Eocene deposits and >100m of non-marine Oligocene deposits.
2. Beniamovski,V.N. (Geological Institute RAS, Moscow) - *New approaches for the age interrpretation of some Paleogene intervals of the Crimea and the Caucasus by foraminifera.*
3. Nikolayeva, I.A. (VSEGEI, Saint Petersburg). - *New Paleogene zonal scale by ostracoda for the Crimea-Caucasus area and adjacent regions.*
4. Bakieva, L.B. (Sci.Prospecting Institute for Oil and Gas, Tyumen, Western Siberia) - *The results of the palynological study of the Paleogene deposits in the central part of the south-western Siberian Plate.*
5. Ryabakon,T.S. (Institute of Geological Sciences, Ukrain.Acad.Sci., Kiev) - *The Eocene foraminiferal assemblage from the Kiev and Obukhov formations of the Dneprovo-Donetsk Trough.*

Short papers

6. Kozlova,G.E. (All-Russian Sci. Prospecting Oil Institute (VNIGRI), Saint Petersburg) - *Paleogene Radiolaria assemblages of the Western Siberian Plate and the middle Lower Volga basin.*
7. Zakrevskaya,I.Yu. (State Geological Museum, Moscow) - *New data on Nummulitidae from some important sections of the Crimea-Caucasus region.*
8. Dydenko-Kisslitsina,I.K. (SouthKazGEO Department, Alma-Ata, Kazakhstan) - *Cenozoic stratigraphy of south-eastern Kazakhstan.*

At the meeting, the members of the Paleogene Commission had an opportunity to examine the new *Stratigraphic Scheme of the Paleogene of the Eastern Siberian Platform and the Aldanian Basin* authored by O.V. Gerinenko (member of the Paleogene Commission, Geological Survey, Yakutsk). The author received many remarks concerning correlations and the age attributed to different stratigraphic subdivisions. The members of the Paleogene Commission recommended improvements to this scheme.

In addition, the members of the Paleogene Commission took part in different regional geological meetings and presented talks on subjects related to Paleogene stratigraphy of which abstracts have been published.

Some papers dealing with aspects of the Paleogene were presented at the All-Russian Paleontological Conference (Saint Petersburg, 8-10 April 2002), the Ural Regional Geological Conference (Ekaterinburg, 2002) and the Micropaleontological Symposium (Saint Petersburg, April 2002).

At the conference on the "Geology of the Ural and neighboring regions" (Moscow, May 2002), V.N. Beniamovski presented a paper on the Paleogene stratigraphy and paleogeography of the Eastern European Platform and the Western Siberian Plate including new stratigraphical schemes by the Paleogene Commission.

M.A.Akhmetiev will present the results of projects dealing with the Paleogene climate of Russia at the Conference of the Russian Foundation of Scientific Investigations (Moscow, October 2002).

The XI All-Russian Palynological Conference will be held in Moscow in October 2002. Palynologists who are members of the Paleogene Commission will present 7 papers; 4 of them on Paleogene dinocysts and 3 on Paleogene spores and pollen. An abstract volume will be published and its content will be discussed in the report for 2003.

Unfortunately, two conferences held in 2001 have been omitted in the report for 2001: Regional Conference *"Geology of the Volga River basins"*, Saratov, October 2001. Lectures dedicated to the memory of A.N.Krystofovich (Botanical Institute RAS, Saint Petersburg, 2001) and of Professor V.A.Vakhrameev (Geological Institue RAS, Moscow, April 2002). Some abstracts of these conferences are included in the list of publications.

Field Work

During the preparation of the of the Regional Stratigraphic Scheme of the East European Platform (1999-2001), various questions concerning the correlation and age of some local stratigraphic subdivisions remained open. In order to solve these problems, we organized in June-July 2002 field studies in the Volga River basins (Ulyanovsk-Saratov Trough, the northern shelf and coastal plane of the Paleocene-Eocene sea). G.N.Aleksandrova (dinocysts, pollen and spores), M.A.Akhmetiev (paleobotany), V.N.Beniamovski (foraminifera), T.V.Oreshkina (diatoms), F.P.Radionova (diatoms) - all from the Geological Institute of RAS) participated in this field work. This group visited 24 localities. The most important of them are "Granae Ukho" near the town of Sengiley (Paleocene diatoms of the same age as those of the Moller Formation in Denmark), the Insa Quarry (Danian siliceous deposits). The participants paid attention to the Cretaceous-Paleocene transition and the character of the contact between the Maastrichtian marls and the Paleocene siliceous and sandy deposits. They checked and improved the correlation and age of the Paleocene diatoms and the sand strata by the study of fossil plants and other groups of biota. Preliminary studies of the flora from both the Thanetian and late Selandian strata of the Volga Basin showed that it is similar to the Gelinden-type flora. This conclusion is important for the climatic reconstruction of the Paleocene in Eastern Europe.

The field work has been continued by V.N.Beniamovski, T.V:Oreshkina, E.P.Radionova (Geological Institute RAS), S.Yu.Markov (Voronezh University) and Yu.I.Iosifova (Moscow Geological Survey) together with Ukrainian geologists (V.S.Zasimovich and T.S:Rabokon, Insitute of Geology Ukrainian Acad.Sci.) near Voronezh with a study of the Middle-Late Eocene Kiev and Obukhov formations in order to improve the correlation and concordance of the subdivisions in the Russian and Ukrainian stratigraphic.schemes of the neighbouring parts of the Dneprovo-Donetsk Trough and the Voronezh Uplift.

M.A.Akhmetiev, T.M.Kodrul (Geological Institute RAS), T.V.Kezina (AmurKNII, Blagovestchensk), E.V.Bugdaeva, V.S.Markevich (Far East Department FAS, Vladivostok), L.B.Golovneva (Botanical Instiotute RAS, St. Petersburg) will take part in the conference at Chanchum (China, 4-12 September 2002) and in the field work in the border districts of the Chinese and Russian sides of the Amur River in order to study geological sections and collect fossil plants. Participants of this meeting will be from China, Russia, Japan, Germany, U.S.A., Great Britain and South Korea. The Russian participants have prepared several papers and a field guide on the geology,

the Paleogene stratigraphy and the flora of the Amur-Zeya Depression. The aim of the joint investigations is the study of the coal deposits , the Cretaceous and Paleogene flora and the stratigraphical scheme of the Paleogene in the Russian Amur District and north-eastern China (Heilongjiang Province).

Short information on other investigations carried out during 2002.

1. N.I.Zaporozhets and G.N.Aleksandrova found the Carbonate Isotope Excursion at the Paleocene-Eocene boundary in black clays at new locations in Russia (middle part of the Western Siberian Plate near the town of Khanty-Mansiysk and eastern part of the Siberian Plate in the Vassyugan Basin), in the Northern Caucasus (Kheu River, Kabardino-Balkaria). In addition to lithological and isotope date, the two authors found also dinocyst assemblages with the *Apectodinium* plexus and beds with *A.augustum* in the same strata.
2. V.S.Volkova (Institute of Geology and Geophysics, Siberian Branch of RAS, Novosibirsk) found late Oligocene brackish dinocyst assemblages in the southern part of the Western Siberian Plate which are similar to those from the upper Paleogene of eastern China (Coastal Plain of the Yellow Sea, small separate basins). Previously, a continental origin had been proposed for the Oligocene deposits of the Siberian region. The presence of brackish-water conditions in south-western Siberia during the late Oligocene could indicate a marine ingression from the northern Peritethys through the Turgai Strait (?).
3. Early Paleogene red beds and evaporites found in the southern part of the Siberian Platform (Minusssinsk Basin and Tuva) indicate arid conditions.
4. The Bartonian-Priabonian Tavdinskaya Formation of Western Siberia has been studied in detail. It consists of two transgressive-regressive cycles, but the younger Priabonian regressive half-cycle is reduced and continental Oligocene deposits cover the open-marine facies of the youngest strata of the Tavdinskaya Formation. The formation is subdivided - at least in the southern and central part of the Western Siberian Plate - into a lower marine and a middle brackish member. In eastern direction, the latter is replaced by continental deposits. Towards the end of this interval, cooling events are indicated by palynological data.
5. The paleontological investigation (dinocysts, ostracoda, foraminifera, pollen and spores, molluscs, diatoms, radiolaria) of two bore-hole sections near Omsk (Western Siberia)) has been completed. The regional zonal scales of various fossils groups have become more detailed and the exact correlation between zonations based on different groups of fossils became possible. The understanding of the changes between siliceous intervals and thin terrigenous intercalations during the Middle Eocene has been improved. Data on the nannoplankton and the dinocysts of the terminal Maastrichtian allow to evaluate the interruption of sedimentation in the Cretaceous-Paleocene interval.
6. Geologists from Vladivostok (V.Besverkhny, T.Gorovaya and V.Markevich) have furnished new informations on the Paleogene stratigraphy and geological history of the Kurile Abyssal Plain (Okhotsk Sea). They discovered thin Paleocene-early Oligocene and late Oligocene terrigenous deposits.
7. Exotic blocks of Paleocene siliceous clayey shales were discovered in Neogene deposits of the Central Western Siberian Plate in bore-holes, intervals of <10-12m). The blocks may have been emplaced by glacial or gravitational processes.
8. V.A.Krasheninnikov together with colleagues from Israel finished and published the monograph "Geology of the Eastern *Levant*".
9. New seismo-stratigraphic data on the marine and continental Paleogene deposits of the Arctic and Pacific oceans are published in the book "*Geology and Mineral Resources of the Russian shelf areas*" (425 p., GEOS,Moscow, 2002) which discusses the geology of hydrocarbons, coal and

placers. It also indicates also prospective areas. The book contains many new data on the tectonics, geological interpretation of geophysical data and paleogeography of the Russian shelf and inland seas.
10. The first phase of the study of the flora from the Cretaceous-Paleogene transition of the Amur region by M.A.Akhmetiev, T.M.Kodrul (Russia) and S.R.Manchester (USA) has been finished. Newly described plant species support the idea of close connections between Eastern Asia and North America during the early Paleogene. The list of plant fossils includes now more than 100 species.

NOTE: A compilation of major publications related to the Russian Paleogene stratigraphy (2001-2002) is posted on the Paleogene web site: *www.uni-tuebingen.de/geo/isps.*

Annual Report 2002 of the Working Group on Paleogene Stratigraphy of the North Pacific

1. Experts in the Paleogene of Eastern Russia met in August 2002. They discussed possibilities of exact correlations of marine and continental Paleogene stratigraphic units of the Far East with the International Standard Scale. Attention was also drawn to the integration of all available data to achieve the best resolution of the stratigraphic schemes. In particular, the problem of the regional Middle Eocene unconformity in Kamtchaka was considered.
2. Field work in Kamtchaka and Sakhalin was carried out in July-September. The West-Kamtchaka key sections were examined by a group of Russian (Prof.Yu.Gladenkov and others) and Japanese (Prof.K.Osgasawara) specialists.
3. Some papers on the Paleogene in the Far East (particularly on the Oligocene diatom zonation) have been published. A book "*The Cenozoic Geology and the Oil and Gas Occurrence in Sakhalin*" (Editor Yu.Gladenkov, 225 p., GEOS, Moscow) will be published later in 2002. A monograph is being completed on the Upper Paleogene of Kamtchaka based on data on the foraminifera, mollusks and the flora. A monograph is in press by A.E:Shantser and A.I.Chelebaeva on the Late Cretaceous-Early Paleogene flora of Kamtchaka.
4. In August, Russian and Japanese specialists met to discuss plans of comparative studies of Paleogene sections in Japan and Kamtchaka.

Report by Yu.I.Gladenkov, Chairman.

SUBCOMMISSION ON CRETACEOUS STRATIGRAPHY

ANNUAL REPORT 2002

1. TITLE OF CONSTITUENT BODY

Subcommission on Cretaceous Stratigraphy

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,
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Vice-Chair: Dr. Annie V. Dhondt,
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Secretary: Dr. Silvia Gardin,
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There are an additional 15 Voting Members of the Subcommission, from all the continents. Over 130 Cretaceous scientists belong to one or more of the 12 Stage Task Groups of the SCS, or to the Lower Cretaceous Ammonite Task Group (see 17 below). 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***.

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, for both necessary research and travel to appropriate meetings. Unfortunately, few institutions provide any direct financial support.

5. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

The Subcommission 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 next Congress will take place in Neuchâtel, Switzerland, in 2005, and will include a session for SCS activities.

The Subcommission will be hosting a session at the International Geological Congress (IGC) in Florence, Italy, in 2004.

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

6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2002

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. 2002 saw the following main developments:

- **Cenomanian**: A GSSP for the base of the Cenomanian has been ratified by IUGS.
- **Santonian**: Professor Marcos Lamolda (Chair, Santonian Task Group) organized a very successful WG meeting in Bilbao, Spain, 13-17 September 2002. It was attended by 22 scientists from 10 countries. Field-work concentrated on the Olazagutia section, and the participants agreed that this should be the chosen candidate GSSP from the three put forward at the 1995 Brussels meeting.
- **Turonian**: A final proposal for both the base of the Turonian and the base of the Middle Turonian (prepared by Professor W. J. Kennedy and colleagues) has been approved by SCS Voting Members. Professor Kennedy is now slightly modifying the proposal for the GSSP for the base of the Turonian for submission to ICS.
- **Coniacian**: We are delighted to welcome Irek Walaszczyk as the new chairman of the Coniacian Task Group.
- **Berriasian:** A Task Group is now formed, with responsibility for defining the base of the Berriasian Stage and the base of the Cretaceous. Only a small number of people have so far volunteered to join it but we anticipate further interest as its activities commence.

The **Lower Cretaceous Ammonite WG** met in Lyon on 11 July 2002. Eighteen members attended from 13 countries, from as far afield as Argentina and Mexico. The group agreed modifications to parts of the Lower Cretaceous ammonite zonal scheme, and their conclusions have now been submitted to *Cretaceous Research*. The group also agreed to change its name to the **Kilian Group**.

Two **electronic newsletters** have been circulated and a third is being compiled for circulation before the end of November. The newsletters go to more than 140 Cretaceous specialists.

The areas for further research pinpointed by the 1995 Brussels meeting continue to generate research publications. In particular, the final volume of IGCP Project 362 (Tethyan/Boreal Cretaceous) has been published and contains several papers relevant to our objectives.

7. CHIEF PROBLEMS ENCOUNTERED IN 2002

As noted in previous years, some of the preliminary recommendations of the 1995 Brussels meeting have required more further research than was initially appreciated! In addition one or two of the Working Groups have been making very slow progress because of the conflicting work commitments of the chairs. The change in chairmanship of the Coniacian Task Group is noted above.

8. SUMMARY OF EXPENDITURES IN 2002 (ANCIPATED THROUGH MARCH 2003):

I. INCOME

Debit carried over from 2001	$ - 45
ICS Additional subvention for 2001 [(1)]	$ 750
ICS subvention for 2002 [(2)]	$ 600

Total income	$ 1305

[(1)] Additional to the $750 already accounted for in the 2001 Annual Report.
[(2)] Includes $100 allocated specifically towards Chairman's attendance at Urbino meeting

II. EXPENDITURE

Chairman's office expenses (telephone, photocopying, fax etc.)	$ 65	
Vice-chair's expenses incurred in attending meetings	$ 200	
Santonian WG chair: arranging field/indoor meeting to finalize Santonian GSSP	$ 400	
Chairman's expenses for attending Urbino meeting of ICS	$ 360	
Support for WG activities (anticipated)	$ 300	
Bank charges (conversion of currency)		$ 70
Total expenditure	$ 1395	
EXCESS OF EXPENDITURE OVER INCOME	$ 90	

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

It is anticipated that at least two more GSSP proposals will be prepared for voting upon by the Subcommission.

Papers presented at the Santonian WG's Bilbao meeting are to be prepared and submitted for publication as a part of *Cretaceous Research*.

The Subcommission's Kilian Group is jointly sponsoring an international workshop on the ammonite zonation of the Aptian Stage in SE France in September 2003.

10. BUDGET AND ICS COMPONENT FOR 2003

Estimated Expenditures

Chairman's office expenses (Fax, phone, postage etc)	$ 50
Chairman's expenditure on duplicating GSSP proposals for SCS Voting Members	$ 150
Secretary's office expenses (postal voting etc)	$ 100
Task Group Chairs - expenses incurred in preparatory work for draft GSSP proposals etc:	$ 500
Total estimated expenditure	$ 800
Add projected debit from 2002	$ 90
Allotment requested from ICS for 2003:	**$ 890**

There are no formal funding sources outside IUGS.

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

Renewed research by WG members (resulting in numerous publications, still ongoing), based on research needs pinpointed by the1995 Brussels meeting.

Completion of the first 3 GSSP proposals: **Maastrichtian** (ratified 2001), **Cenomanian** (ratified 2002) and **Turonian** (currently accepted by SCS and being modified for ICS voting).

The Chair or Vice Chair represented the SCS at:

150 years of the Maastrichtian Stage: Maastricht, November 1999.
6th International Cretaceous Symposium: Vienna August 2000.
Colloque sur le Cénomanien: Rouen, October 2001
1st meeting on the *Cretaceous System of Russia*, Moscow, February 2002.
1st meeting on *Future Directions in Stratigraphy*, Urbino, June 2002
German *Subkommission für Kreide-Stratigraphie*, Maastricht, September 2002

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

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, and to complete as many GSSPs as possible by that date.
- To communicate the results as widely as possible.

- To develop new directions for the Subcommission as GSSP proposals are completed.

Work Plan

- 2003 Finalize proposals for **Hauterivian**, **Barremian** and **Santonian**
- 2004 Finalize proposals for **Valanginian**, **Albian** and **Campanian**
- 2004 SCS session at 32nd International Geological Congress, Florence
- 2005 Finalize proposals for **Aptian** and **Coniacian**
- 2005 Present results to 7th International Cretaceous Symposium, Neuchâtel, Switzerland.
- 2007 Finalize proposal for **Berriasian** (J/K boundary)

13. SUBMITTED BY:

Name: Professor Peter F Rawson
Position: Chair, SCS
Date: 7 November 2002

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SUBCOMMISSION ON JURASSIC STRATIGRAPHY

ANNUAL REPORT 2002

1. TITLE OF CONSTITUENT BODY

Subcommission on Jurassic Stratigraphy

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 chronostratigraphic scales, through the establishment of multidisciplinary Working Groups;

(b) Coordination of international research on Jurassic environments, through the establishment of Thematic Working Groups, for example on Palaeobiogeography, Palaeoclimate, Sequence Stratigraphy and Tectonics.

In addition the Subcommission is developing communication with a wider public through two initiatives: one concerned with conservation of Jurassic geological sites; the second encouraging liaison with non-professional fossil collectors.

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 palaeontologically 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 East Devon and Dorset Coast (The Jurassic Coast) Site, which is a UNESCO World Heritage Site.

3. ORGANIZATION

The Subcommission is organized by a Bureau consisting of Chairperson, Vice-Chairperson and Secretary, who are all Voting Members of the Subcommission. There are normally seventeen other Voting Members, but with the death of one member during the summer of 2002 a "bye-election" is

currently being held. Each Voting Member has agreed defined areas of responsibility, which are published in the Subcommission Directory.

The objectives of the Subcommission are pursued by Working Groups, both Stratigraphical and Thematic, and each group is organized by one (occasionally two) Conveners who are Voting or Corresponding Members.

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

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

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

The Jurassic Subcommission does not receive financial support from outside IUGS-ICS, except for office support (computer, access to internet services, telephone, etc.) from the host institutions of the Bureau. Specific activities, such as meetings and some Working Groups, sometimes receive small grants to Conveners and Organizers from various sources. For example, the Organizing Committee of the 6th Internal Jurassic Symposium, held in Sicily this year, obtained financial support from various Italian sources, including the Consiglio Nazionale delle Ricerche, the Universities of Torino, Palermo and Urbino. Members obtain individual research or conference grants for activities related to the Subcommission.

5. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

These are mostly informal, through the activities of individual members; for example, Peter Baumgartner is President of Interrad, Geoff Warrington is Secretary of the Triassic Subcommission and Jim Ogg is Secretary of ICS. The Subcommission and the Triassic/Jurassic Boundary Working Group interface with IGCP Project 458 (Triassic-Jurassic Boundary Events), especially through Working Group Convenor Geoff Warrington and IGCP Project Co-leader Joszef Palfy who are both Voting Members of the Subcommission. Voting Member Kevin Page has particular responsibility for Conservation issues and interface with the IUGS Geosites Programme. Several members advise the Management Group of the recently established Unesco World Heritage "Jurassic Coast" Site in East Devon and Dorset (SW England).

6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2002

The main highlight of the year was the highly successful 6th International Symposium on the Jurassic System held in Italy from 12 to 22 September. The scientific sessions were held over three days in Mondello, Sicily, when some 100 oral and 92 poster presentations were given. In addition to general sessions, special thematic sessions were held on Tectonics and Sedimentation; Taphonomy, Facies and Paleoenvironmental Analysis; Jurassic Organisms in Space and Time; Integrated Stratigraphy; Paleoceanography and Paleobiogeography; and Geoconservation. These reflect the changes of emphasis being developed within the Subcommission towards thematic topics. A book of Abstracts, edited by

Luca Martire was printed with the financial support of the Universities of Palermo and Torino. The refereeing and editing of papers submitted is in progress under the supervision of Guido Parisi and the Conference Proceedings will be published in *Revista Italiana di Paleontologia a Stratigrafia*. Half of a fourth day was devoted to business meetings of Working Groups and to an open business meeting of the Subcommission. Task Group Convenors presented up-to-date progress reports and the Subcommission Chairman reported on the ICS meeting in Urbino and on plans for a Special Session at the 32nd IGC in Florence in 2004. A vote was held on the location of the 7th International Jurassic Symposium, which will be held in Poland in 2006. One pre-Symposium fieldtrip, in Western Sicily and four post-Symposium fieldtrips, in Western Sicily (two trips in different areas), Central Apennines and Venetian Alps, were held. An excellent Fieldtrip Guidebook, edited by Massimo Santantonio, was published and contains a vast amount of new, previously unpublished, information on the Jurassic and general geology of Sicily and the other areas visited.

An international project associated with preparations for the Jurassic Symposium was coordinated by Giulio Pavia and Stefano Cresta, with fourteen contributors from six countries. This provides a critical taxonomic revision of the ammonite species of the classical and historically important G.G. Gemmellaro collections of Jurassic ammonites from Sicily, together with modern stratigraphical information. The book, with over 400 pages, and accompanying volume of reproductions of 31 of Gemmellaro's plates was distributed to all participants in the Jurassic Symposium. They are published as *Quaderni del Museo Geologico "G.G. Gemmellaro", Università di Palermo*, no. 6.

- The **Triassic/Jurassic Boundary** Working Group has assessed the relative strengths and weaknesses of the four candidate GSSP sections. However, endemism of the key ammonite faunas has made it impossible so far to establish inter-continental correlations with the requisite precision, so that discussions are still continuing. IGCP Project 458 held the Second Workshop in the Newark Basin, USA, with special emphasis on correlation with non-marine strata.
- The article on the **Sinemurian** GSSP, previously ratified by IUGS, was published in *Episodes* in March 2002.
- The **Pliensbachian** WG proposal for a GSSP at Wine Haven Robin Hood's Bay, Yorkshire, England is now in process of being approved by vote of the Jurassic Subcommission. The full proposal is also being simultaneously submitted to *Eclogae Geologicae Helvetica* and will be published in next year.
- The **Toarcian** WG have abandoned as unsuitable (for reasons of security and access) favored candidate sections in Algeria. The section now being investigated as candidate is Peniche, in western Portugal, which has already been well studied and requires only supplementary information. Another section in Spain has also been proposed.
- The **Aalenian**, **Bajocian** and **Bathonian** Working Group members have mainly been concentrating on preparation of field guides and the Gemmellaro revision volume for the 6th Jurassic Symposium. These have now been completed.
- The scientific aspects of the GSSP proposal for the base of the **Callovian** Stage have been completed, but the main problem to be resolved is the accessibility of the site. If locality details are published too precisely the site risks being irreparably damaged by collectors. However, if the information is not given the proposal risks falling foul of ICS guidelines!
- The **Oxfordian** WG have been seeking new data on the Callovian/Oxfordian boundary sections in Britain to improve Boreal/Tethyan correlations before GSSP proposal can be voted on by the WG members. The fieldwork for this and a Working Group meeting are planned for early next year.

- The results obtained in Skye last year by the **Kimmeridgian** WG were presented at the Jurassic Symposium in Sicily. The problems of Boreal/Tethyan correlations at the most detailed level of ammonite biochronology are close to being resolved. A Working Group meeting in Lyon, with fieldwork on the Mt. Crussol section is planned for early next year.
- The **Tithonian** WG is beginning to make progress with the detailed documentation of key sections in various continents and faunal provinces. Discussions were held during the Jurassic Symposium in Sicily on Kimmeridgian (sensu anglica)/ Volgian/Tithonian correlations, and on the faunal succession of the key ammonite genus Hybonoticeras in the Tethyan Realm.

The Geoconservation WG held a Special Session during the Jurassic Symposium and a business meeting. At the latter the main discussion concerned a proposed statement and guidelines for the conservation of key sites, especially GSSPs. These discussions are continuing with the aim of achieving a balance between competing priorities (protection against access, commercial exploitation against paleontological heritage).

The Liaison WG reported on improved progress in 2002, after the access problems of 2001 caused by foot and mouth disease, on the FACELIFT initiative for the clearing and documentation of key sites in the UK. Several WG members are very involved with this. The Group is strong in UK but has limited membership so far in other countries.

The Paleobiogeography WG has now been established and will build on a Special Session held at the Jurassic Symposium.

With the encouragement of ICS the Jurassic Subcommission proposed a Special Session at the 32nd International Geological Congress, with the title "The Jurassic World (Outside the Park)". This proposal has been accepted by the Scientific Programme Committee.

Chief Products in 2002 include:

(i) The report of the Sinemurian WG on the GSSP, by Gert Bloos and Kevin Page, published in *Episodes* vol. **25**/1, 22-28, March 2002.

(ii) *ISJS Newsletter* **29** (30 pages), edited by Nicol Morton and Paul Bown, was circulated in June 2002 mainly by email to all Voting, Honorary and Corresponding Members and forwarded to other interested workers through national or local networks. This Newsletter is an electronic publication.

(iii) *General Field Trip Guidebook for the 6th International Symposium on the Jurassic System* (320 pages), edited by Massimo Santonio, published by the University of Palermo in September 2002.

(iv) *Abstracts and Program for the 6th International Symposium on the Jurassic System* (211 pages), edited by Luca Martire, printed in September 2002.

(v) *Revision of Jurassic Ammonites of the Gemmellaro Collections* (406 pages), co-ordinated by Giulio Pavia and Stefano Cresta, published as *Quaderni del Museo Geologico "G.G. Gemmellaro", Università di Palermo*, no **6** in September 2002.

(vi) Reprint with revisions of "Sopra Alcune Faune Giuresi e Liasiche della Sicilia by Gaetano Giorgio Gemmellaro" (31 plates), edited by Carolina D'Arpa and Elena Scalone, in September 2002.

7. CHIEF PROBLEMS ENCOUNTERED IN 2002

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. For example, a proposal in Britain to the appropriate

research council (NERC) for a research project on the magnetostratigraphy of the Hettangian, Sinemurian and Pliensbachian of North Somerset and Yorkshire was not supported, even though the sections include one approved GSSP (base Sinemurian) and one candidate GSSP (base Pliensbachian).

8. SUMMARY OF EXPENDITURES IN 2002 (ANCIPATED THROUGH MARCH 2003):

INCOME

Carried forward from 2001		US$1,200	
Allowances for 2002		US$3,000	
	TOTAL		US$4,200

EXPENDITURE

Contribution to travel costs		US$1,000	
Grants allocated to	Kimmeridgian WG	US$ 500	
	Oxfordian WG		US$ 500
	Toarcian WG	US$ 500	
	Morocco Jurassic Symp.	US$ 300	
Provisional allocation towards palaeomag. recon. of Pliensbachian GSSP (to be conf)		US$ 250	
Prov. distribution of Pliensbachian GSSP proposal		US$ 150	
General office expenses		US$ 250	
Website development and costs		US$ 250	
Allocation for preparation and partic. Special Session At IGC Florence 2004, to be carried forward		US$ 500	
	TOTAL		US$4,200

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

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

This will provide a more widely accessible source of information about the Subcommission, including the Newsletter, Working Group activities, details of the Voting Members, with their allocated areas of responsibility, and contact details for all Working Group Convenors and Corresponding Members. Each Working Group will be invited to submit material, including discussion documents, details of GSSP sites, etc. Preliminary work and planning were carried out during 2001 and 2002, but final setting up was delayed by the Chairman's change of address. Development and inclusion of new material are planned for the next years.

(b) GSSP proposals:

A GSSP proposal for the **Pliensbachian** Stage will complete voting procedures next year. The **Callovian** GSSP proposal has been prepared but has not yet been written up. The **Oxfordian** and **Kimmeridgian** WGs plan field and discussion meetings early next year to resolve remaining uncertain details of Boreal/Tethyan correlations. It is likely that each group will present combined GSSP and ASP proposals next year.

The **Toarcian** WG plan a field meeting on the Peniche section, Portugal, to complete already published documentation. The **Tithonian** WG plan a series of informal small meetings (see also *(f)* below). 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 **Triassic/Jurassic boundary** (and Hettangian) WG will continue work on establishing international correlations and on assessing the relative merits of candidate sections.

(c) Other Stage WGs:

The Working Groups who have already submitted GSSP proposals, are now beginning to investigate the refined definition of boundary stratotypes for the Standard Zones, with emphasis on multidisciplinary methods of correlation, and the international refinement of biostratigraphical scales at Subzone and Horizon level.

(d) Thematic Working Groups:

These were established to provide sources of information and consultation to the Stage WG Convenors, and to broaden the range of activities facilitated and supported by the Subcommission, especially into integrated international research on the Jurassic environment. Progress during the first years has been variable, but will be continued during the next year, partly stimulated by planning for the Florence IGC.

(e) 32nd International Geological Congress, Florence 2004

The proposal for a Special Session on "The Jurassic World (Outside the Park)" during the next International Geological Congress having been accepted, the Convenors are planning the programme, topics to be included and possible invited speakers. Calls for oral and/or poster presentations will be sent out at the beginning of the year.

(f) Possible IGCP Project on latest Jurassic/earliest Cretaceous correlations

Following up a suggestion made during the ICS meeting in Urbino, the possibility will be investigated next year of preparing an application for an IGCP Project on correlations between different faunal realms and between marine and non-marine successions in the uppermost Jurassic and lowermost Cretaceous. This would be in collaboration with the Cretaceous Subcommission. Given the well-known problems of biochronological correlation, the Project would be multidisciplinary, integrating all feasible techniques of geological correlation. Non-marine sedimentary environments are widespread during this interval, and include important vertebrate land faunas, so that the emphasis on correlation between marine and non-marine strata is extremely important.

(g) Extension of liaison links with non-professional fossil collectors

The success of setting up the Liaison WG in integrating results obtained by "amateur" fossil collectors (i.e. those not employed within geology) has been seen mainly in Great Britain, with some input in Germany and in France. These will be followed up next year and a special meeting in Italy is also being considered.

Communication Plans

Electronic communication has now been established as the norm within the Subcommission. The main means of communication is through an annual Newsletter reporting the main activities from each of the Working Groups, distributed by email to all Members. National onward distribution networks are being actively encouraged and have been established in several countries. The possibility of introducing additional Newsletters, oriented more to discussion of selected topics, is planned but may be replaced by the possibility of posting these on the website, which will make wider access possible.

The Subcommission plans investigating possibilities of establishing accessible databases containing information such as verified records of fossil taxa.

10. BUDGET AND ICS COMPONENT FOR 2003

(a)	General office expenses		US$ 300
(b)	ISJS Newsletter no 30		US$ 100
(c)	Contribution towards cost of web-site		US$ 250
(d)	Contributions to Stage Working Groups to help development of GSSP proposals		US$2,000
(e)	Support for Jurassic meetings and preliminary preparation of 7th International Jurassic Symposium		US$ 800
(f)	Planning, preparation and participation Special Session on "The Jurassic World: Outside the Park" at 32nd IGC	US$1,500	
(g)	Production and distribution of GSSP proposals		US$ 400
	Total Budget Request		**US$5,350**

Potential Funding Sources

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 College, London, for equipment including computers, email access and telephones. In addition the School of Earth Sciences at Birkbeck College will host the planned web-site of the Jurassic Subcommission as part of the School's web-site within that of Birkbeck College. This will include assistance with setting up and operating the site, for a nominal payment.

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

The Jurassic Subcommission has now made three successful GSSP proposals for Stages and a fourth has started the voting procedures. The relevant Working Groups have made progress in preparing for further proposals. The main difficulty identified has been provinciality of ammonite faunas at the level of detail required, but for most stage boundaries these are well on the way to being resolved.

The most significant results of the Subcommission activities, however, has been the bringing together at regular international Symposia of large numbers of specialists in diverse fields working on Jurassic geology. The field guides, abstracts of communications and edited and refereed proceedings have all been published. These provide accessible detailed up-to-date accounts of our current knowledge about Jurassic geology worldwide. A feature of the last two Symposia (Vancouver 1998 and Mondello 2002) in particular, is the increasingly thematic approaches to Jurassic geology demonstrated with less emphasis on the still-important traditional biostratigraphy. These changes mirror the evolution of priorities in the Subcommission.

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

The future focus of the Subcommission will evolve away from Stage boundary GSSP proposals to further refinement of the chronostratigraphical scale by integration of multidisciplinary methods of correlation. In addition, the Thematic Working Groups can be expected to start demonstrating the results of international collaboration coordinated by the Convenors. The first objective is the Special Session convened by the Jurassic Subcommission at the 32nd International Geological Congress in 2004. This has a deliberate multidisciplinary and thematic approach to understanding the Jurassic World. It will be followed two years later by the 7th International Jurassic Symposium planned for the summer of 2006 in Poland.

Critical Milestones

The regular Jurassic Symposia have always been the main occasions when significant progress in forwarding the objectives of the Subcommission has been achieved. The Symposium in Sicily was no exception, with a particularly valuable field guidebook published. Publication of the Proceedings of the Symposium, planned for next year, will provide further evidence of significant progress in Jurassic geology.

The completion of the program of GSSPs for the Jurassic Stages is well under way, and this "critical milestone" will be achieved well in advance of the 2008 deadline.

With the establishment of new Thematic Working Groups, broadening the range of Subcommission activities and developing a new focus, the Jurassic Subcommission has anticipated the developments planned this year by the International Commission on Stratigraphy. The next milestone in this development within the Subcommission will be the Special Session at the IGC in Florence, 2004, but it is hoped that the costs of attending will not be so high as to limit participation.

Anticipated Results

After the Sicily Symposium it is anticipated that four GSSP proposals (Pliensbachian, Callovian, Oxfordian, Kimmeridgian) will be formally submitted to the Subcommission and then to ICS during 2003.

The Toarcian, Bathonian and Tithonian GSSP proposals can be expected in two years. Timing of the Triassic/Jurassic Boundary GSSP proposal is now more difficult to predict because of endemism of the key ammonite faunas with consequent difficulties of precise correlation.

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10th November 2002.

SUBCOMMISSION ON TRIASSIC STRATIGRAPHY

ANNUAL REPORT 2002

1. TITLE OF CONSTITUENT BODY

Subcommission on Triassic Stratigraphy (STS)

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

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

The objectives satisfy the IUGS mandate of fostering international agreement on nomenclature and classification in stratigraphy; facilitating international co-operation in geological research; improving publication, dissemination, and use of geological information internationally; encouraging new relationships between and among disciplines of science that relate to Triassic geology world-wide; attracting competent students and research workers to the discipline; and fostering an increased awareness among individual scientists world-wide of what related programs are being undertaken.

3. ORGANIZATION

STS is a Subcommission of the Commission on Stratigraphy.

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

These individuals 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. Participation in working groups on the Permian-Triassic, Triassic-Jurassic and Stage boundaries. Publication of a bi-annual STS newsletter *Albertiana* in both hardcopy and as a web release.

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

Support of the Chairman's Institute (GSC Vancouver), and of the Earth Science Sector of Natural Resources Canada. Support through IGCP 467.

5. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

IGCP Project 458: Triassic/ Jurassic Boundary Events. Joint meeting and field excursion planned for May 2003 at the Geological Association of Canada annual meeting in Vancouver, BC, Canada.

IGCP Project 467: Triassic time and trans-Panthalassan correlations. New projected funded by IUGS/UNESCO. This is complementary to STS activities and has similar goals.

Nanpanjiang Basin project: A China-USA-Canada collaboration on an integrated biostratigraphy and chronostratigraphy of Triassic sections in Guizhou and Guangxi Provinces, South China.

Monbusho project: A Japan-New Zealand collaboration of 13 Universities studying Southern High Latitude Radiolarian Faunas.

Secada working group: 15 scientists in 5 countries studying the mid Triassic core from the Secada boring in Bolzano/Bozen, Italy.

6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2002

GSSP Task Group chairs are all in place and have established formal working groups.

With agreement on the base Permian GSSP, work on the **P-T boundary** has now focused on auxiliary non-marine sections. Candidate sections are identified in China and South America.

A new candidate for base **Olenekian** at Chaohu in China has been intensively sampled and results are promising. Good macro- and micro- paleontological successions are under study by Yuri Zacharov and by a student of J. Tong who will visit Canada to complete the study of the conodonts under M. Orchard. A carbon isotope anomaly is newly recorded, whilst magnetostratigraphic and radiometic dating studies are underway. The Chaohu section is set to become the prime GSSP candidate for the I-O boundary.

A field workshop took place in Veszprum, Hungary with the emphasis on Middle Triassic boundaries. Based on the earlier 2000 field meeting and new data presented on the conodonts and magnetostratigraphy, the GSSP for the base **Anisian** was informally agreed to be fixed at the base of "bed 7" at Desli Caira, in Dobrogea, Romania. This corresponds to the appearance of a defining conodont, a significant change in the ammonoid fauna, and the peak of a negative C isotope anomaly. Recent results from this interval in the Nanpanjiang Basin in South China support the synchronicity of these events and also provide a radiometric age for the boundary. The formal proposal is promised for publication in *Albertiana* #28 and should go to vote by the Subcommission next summer.

Also at the Veszprum meeting, a candidate section for the base **Ladinian** was visited at Felsoors. Thereafter, a series of informative papers were presented and the group established a firm schedule for a final decision on the hotly debated GSSP. Competing proposals are required by the Task Group Chair by the end of 2003 and thereafter will be published in *Albertiana* #28. Based on these, a majority opinion will be sought during a meeting planned for September 2003, and in a subsequent formal vote. The decision is expected by the end of 2003.

A multidisciplinary field workshop on base key basal **Carnian** sections (amongst others) was held in Nevada during October 2002. New data should help resolve issues arising from studies at the candidate section of Stuoures, Italy and from Spiti. These three areas represent a shortlist of sections from which a GSSP will likely be chosen.

New data is being processed from Black Bear Ridge, Western Canada that will be crucial in base **Norian** deliberations. Complementary data from candidate sections in Sicily and Slovakia is

published or in press. A symposium on Upper Triassic boundaries is slated for May 2003 and will include a field trip to see the Canadian section, and a similar workshop slated for the IGC in 2004 will be preceded by a similar trip to European sites, particularly in Sicily.

The task force on base **Rhaetian** is newly convened and prospective candidate sections identified in Canada, Austria,? Turkey.

The Nonmarine task force is nearing completion of a monograph to be published by Elsevier (Developments in Palaeontology) on nonmarine Triassic chronology and correlation.

Albertiana **26** was published in early 2002 and will be available on the web during November 2002. This valuable resource identifies all STS members, there contact numbers, and their research activities. The largest issue (#**27**) of the STS newsletter *Albertiana* to date will be published in November 2002.

The STS co-sponsored the international meeting in Hungary with IGCP 467. An 85-page abstract and field guide volume was published.

7. CHIEF PROBLEMS ENCOUNTERED IN 2002

The Shallow Tethys scheduled for August 2003 was postponed leaving the planned STS meeting orphaned. Nevertheless the STS executive and Hungarian colleagues decided to proceed with an independent meeting although the dates had to be reset and the field trip options (which were to include Desli Caira in Romania and Bagolino in Italy) reduced.

Funding problems identified last year continued. *Albertiana* production costs increased as did the pressure for financial subsidy.

8. SUMMARY OF EXPENDITURES IN 2002 (ANCIPATED THROUGH MARCH 2003):

ANTICIPATED EXPENDITURES

Field workshop in Veszprum, Hungary:	$ 825
Field workshop in Nevada, USA:	$ 535
Albertiana production cost subsidy:	$2000
Balance - seed money for (GAC) meeting, May 2003	$ 640
TOTAL	$ 4000

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

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

Post-GAC conference fieldtrip and workshop to Williston Lake northeast British Columbia, 29th May-2nd June, to view base Carnian, base Norian, base Rhaetian, and base Hettangian localities. This will include a visit to one candidate section on a short list of potential boundary GSSP candidates for Carnian-Norian boundary GSSP (Black Bear Ridge).

Publication of proposals on the Olenekian-Anisian and Anisian-Ladinian boundary GSSP candidates in *Albertiana* #28, Spring 2003.

Co-sponsoring of meeting in Italy on "Triassic geochronology and cyclostratigraphy – a field symposium", September 11th -15th 2003. This will focus on Secada core research and Middle Triassic time scales.

Formal votes on O-A, and A-L boundary GSSPs in Fall/Winter 2003.

Special Session/ Field Workshop on the Lower-Middle Triassic of the U.S.A. - meeting with the Geological Society of America, Seattle, 2-5 November, 2003.

The *Albertiana* web-site is continuing to expand to include more past issues as well as other useful information.

10. BUDGET AND ICS COMPONENT FOR 2003

(a)	General office expenses	100US$
(b)	Subsidy to *Albertiana* #28, ?#29	2,000US$
(c)	Contribution towards cost of web-site	400US$
(d)	Contributions to GSSP Task Groups	1,000US$
(e)	Support for meetings	2,000US$
	TOTAL 2003 BUDGET REQUEST	**5,500**US$ (thru Mar, 2004)

Potential funding sources outside IUGS

IGCP Project 467, *"Triassic time and trans-Panthalassan correlation".*

The department of Geosciences at the University of Utrecht will continue to subsidize the production of Albertiana and will host the STS web-site.

Support to the Chair from the Earth Science Sector of Natural Resources Canada through a 'Pathways' project on *"Triassic time and correlation*", and general support for equipment including computers, email access and telephones.

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.

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

See Accomplishments in 2002 (above) for additional details.

- Permian-Triassic boundary in China agreed and ratified.
- Induan-Olenekian boundary -- Working group established, 2 candidates identified and preliminary descriptions presented.
- 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.
- Anisian-Ladinian boundary -- Additional work done on 2 competing candidates in Italy and Hungary. Schedule for choice of base-Ladinian was agreed.
- Ladinian-Carnian boundary -- Field workshop in Italy viewed Ladinian-Carnian boundary candidate. and published of a comprehensive volume on its character and attributes.
- Carnian-Norian boundary -- New working group established. Data from 2 candidate sections in Canada and Sicily published.

- Norian-Rhaetian boundary -- New working group established. Non-marine auxiliary GSSP sections identified.

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

Meeting/field workshop schedule with themes and anticipated results.

- Vancouver, Canada – May 25th -June 2nd , 2003. **Upper Triassic** GSSP datums.
- Secada, Italy - September 11th -15th, 2003. **Middle Triassic** GSSP decisions.
- Florence, Italy – August 20th –28th , 2004 et seq. **Upper Triassic** GSSP decisions.
- Anhui-Guizhou, China – 2005. Base **Olenekian** GSSP workshop, decision.
- New Mexico, USA – 2007. Triassic GSSP wrap-up.

13. SUBMITTED BY:

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5th November 2002

APPENDICES

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

Vice Chairman: Y. Zakharov, Russian Academy of Sciences, Far East branch, Vladivostock, Russia: Russian Academy of Sciences, Prospect Stoletiya Vladivostoka 139, Vladivostok 22, 690022, Russia, e-mail: fegi@online.marine.su

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SUBCOMMISSION ON PERMIAN STRATIGRAPHY

ANNUAL REPORT 2002

1. TITLE OF CONSTITUENT BODY

Subcommission on Permian Stratigraphy

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

Mission Statement and Goals

The Subcommission'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 Subcommission 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 Subcommission has an Executive consisting of a Chair, two Vice-Chairs, and Secretary, who are all Voting Members of the Subcommission. There are sixteen total Voting Members. The objectives of the Subcommission 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, Transitional biotas as gateways for global correlation. The Subcommission also supports a special project titled "The Permian: from glaciation to global warming to mass extinction"

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. INTERFACES 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 2002

The proposal for the GSSP of the **Lopingian** pass the working group by a 92% favorable vote and is now being readied for the vote of the full subcommission.

Planning and funding for a January 2003, **Cisuralian** Working Group Meeting in Boise was a major accomplishment and will include Russian, American and Canadian participants.

Chief products in 2002 include:

(i) Publication and distribution of some 300 copies of the The Guadalupian Symposium, *Smithsonain Contribution to Earth Sciences*, number 32, 415 p.

(ii) Two major publications submitted to journals and through review on establishing the detailed evolution on which the two stages of the **Lopingian** (Upper Permian) will be based. These articles are: Mei, Henderson and Cao, Conodont population approach to defining the base of the Changhsingian Stage, Lopingian Series, Permian, in a special volume of the Geological Society, London; and Lambert, Wardlaw, Nestell and Nestell, Latest Guadalupian (Middle Permian) conodonts and foraminifers from West Texas, in *Micropaleontology*.

(iii) SPS Newsletters 39 and 40 were produced in 2002 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).

7. CHIEF PROBLEMS ENCOUNTERED IN 2002

None.

8. SUMMARY OF EXPENDITURES IN 2002 (ANCIPATED THROUGH MARCH 2003):

INCOME	
Donations	$ 1,000
Boise State University support	2,000
University of Calgary support	1,000
U.S Geological Survey	10,000
ICS	1,300
TOTAL	15,300
EXPENDITURE	
Publication of *Permophiles*	2,000
Support for travel for international meetings and field work	10,300
Publication costs other than the newsletter	3,000
TOTAL	15,300

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

(a) Formal vote on the Lopingian GSSP by the Subcommission.
(b) Submittal of the formal proposal for the Changhsingian GSSP
(c) Submittal of the formal proposal for the Sakmarian GSSP
(d) Development at the Cisuralian Working Group Meeting of viable proposals for the Artinskian and Kungurian and a proposal timeline.
(e) Produce two issues of *Permophiles*
(f) Conduct a Permian Workshop and Annual Business Meeting at the International Congress on the Carboniferous and Permian Stratigraphy (ICCP) at Utrecht this summer.

10. BUDGET AND ICS COMPONENT FOR 2003

Cisuralian Working Group Meeting, Boise	$4,000
Lopingian Working Group Meeting, Nanjing	4,000
Workshop and annual Meeting at ICCP, Utrecht	3,000
Publications (Newsletter, targeted articles of scientific need)	4,000
Internet upkeep	1,000
TOTAL 2003 BUDGET	16,000
TOTAL BUDGET REQUEST (ICS)	***1,000***

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 Subcommission. *Permophiles* has become an internationally respected newsletter/journal.

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

Finish the establishment of all the GSSPs of the constituent stages of the Permian.

2003 Formal completion of the Lopingian GSSP.
2004 Formal completion of the Sakmarian and Changhsingian GSSPs.
2005 Formal completion of the Artinskian GSSP
2006 Formal completion of the Kungurian GSSP

13. SUBMITTED BY:

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Dr. Yugan Jin, China
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SUBCOMMISSION ON CARBONIFEROUS STRATIGRAPHY

ANNUAL REPORT 2002

1. TITLE OF CONSTITUENT BODY

Subcommission on Carboniferous Stratigraphy (SCCS)

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 select the best stage and series boundaries within the two Carboniferous subsystems in order to facilitate global correlation within the system, and to further refine other methods of correlation so that the successions dominated by endemic cold-water biotas can be correlated with the pan-tropical standard succession.

This fits the IUGS science policy goals of establishing internationally agreed-upon GSSP-defined chronostratigraphic units that will facilitate understanding the development of the earth during Carboniferous time.

3. ORGANIZATION

SCCS is a subcommission of the International Commission on Stratigraphy (ICS). Current Chair is Philip H. Heckel (USA); Secretary is David M. Work (USA); Vice-Chair is Geoff Clayton (Ireland). There are 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.

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

*Task Group to establish a boundary close to the **Tournaisian-Visean Boundary*** [within the lower part of the Mississippian Subsystem] chaired by George Sevastopulo (Ireland).

*Task Group to establish a boundary close to the **Visean-Serpukhovian Boundary*** [within the upper part of the Mississippian Subsystem], chaired by Barry Richards (Canada), initiated in 2002.

*Task Group to establish a boundary close to the **Bashkirian-Moscovian Boundary*** [within the lower part of the Pennsylvanian Subsystem] chaired by John Groves (USA), initiated in 2002.

*Task Group to establish a boundary close to the **Moscovian-Kasimovian Boundary*** [above the middle of the Pennsylvanian Subsystem, and which is also close to the Desmoinesian-Missourian boundary], chaired by Elisa Villa (Spain). This group is also looking at potential

boundaries close to the ***Kasimovian-Gzhelian*** [and Missourian-Virgilian] Boundary in the upper part of the Pennsylvanian Subsystem.

Project Group on Comparative Angara and Gondwana Biostratigraphy, chaired by Marina Durante (Russia).

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

The SCCS receives no formal financial support outside of IUGS/ICS allocations, and is grateful for the regular grant of $800 and the special supplement of $500 in 2002. The SCCS does receive small voluntary personal contributions from some of its members. 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.

6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2002

We continue to notify journals of international distribution that the two basic subdivisions of the Carboniferous System are now officially designated as the Mississippian Subsystem and the Pennsylvanian Subsystem, rather than Lower and Upper Carboniferous (used in many parts of the world), which are ambiguous terms from one part of the world to another.

We have terminated three of the exploratory Project Groups and replaced them with two new Task Groups, one dealing with establishing a boundary close to the Visean-Serpukhovian boundary [within the Mississippian Subsystem], and the other dealing with establishing a boundary close to the Bashkirian-Moscovian boundary [within the Pennsylvanian Subsystem]. **The SCCS now has functioning Task Groups dealing with all the likely Stage and Series boundaries to be recognized within both subsystems of the Carboniferous**.

Summary of Task Group Reports

The **Task Group on the Tournaisian-Visean boundary**, chaired by George Sevastopulo, published a progress report in the 2002 Newsletter on Carboniferous Stratigraphy (v. 20, p. 6-7) outlining the distribution of stratigraphically important taxa of conodonts and foraminifers from the Pengchong section in southwest China.

The formal ballot submitted to the Voting Members of the SCCS in early 2002 (as reported in the same Newsletter, p. 3) overwhelmingly approved the biostratigraphic criterion for the base of the Viséan utilizing the *Eoparastaffella* lineage, as proposed by the Task Group.

Additional samples collected during a field meeting in China in November 2001 provide even better microfaunal material within the critical uppermost Tournaisian and Visean boundary interval. The *Eoparastaffella* population is very rich, and new excellent specimens have been obtained from the boundary beds. A complete atlas of the foraminifers from the Pengchong section has now been prepared and will constitute the basis for future publications. Additional conodont samples from the Pengchong section and a laterally equivalent platform section are under study by S. Tian of the Chinese Institute of Geology. Very rare allochthonous brachiopods and corals have been observed. The corals just below the boundary have been identified by E. Poty (University of Liège, Belgium) as *Amygdalophyllum* cf. *sudeticum*; *Amygdalophyllum* appears in the latest Tournaisian of Belgium and is very common in the Avins Limestone.

A field meeting will be held early in December this year in Guangxi with G. Sevastopulo, H. Hou, L. Hance, F.X. Devuyst and X.H. Wu. Data from the different parties will be gathered, regional correlations will be addressed and next steps in the proposal of the stratotype will be planned in view of the next SCCS general meeting in Utrecht in August 2003.

The **Task Group on a GSSP close to the Moscovian-Kasimovian boundary**, chaired by Elisa Villa, continued studies on several potential levels of correlation within the interval from the uppermost Moscovian (upper Desmoinesian) to the lower Gzhelian (lower Virgilian) in the Pennsylvanian Subsystem. Main lines of investigation were summarized in the 2002 *Carboniferous Newsletter* (v. 20, p. 8-9). A brief summary and recent update follows:

Fusulinoidean faunas show strong provincialism during the interval analysed, hampering their use for long distance correlation. However, some episodes of faunal dispersal may exist. Two remarkable events are: 1) the appearance of the Eurasian genus *Protriticites* in western USA (Wahlman and others, 1997, Wahlman, 1999) in the mid-upper Desmoinesian, and 2) the wider distribution in Eurasia of *Rauserites rossicus* (Villa and others, in press). The western USA *Protriticites* are presently being investigated to ascertain if they belong to the same lineages as the Eurasian ones. In the case of *Rauserites rossicus,* its first appearance could have significance for correlating the lower Gzhelian within Eurasia, but it cannot be used for intercontinental correlation.

Conodont faunas are being intensively investigated in several relevant areas, with new data from the North American Midcontinent and Paradox Basin, the Cantabrian Zone of Spain, and the Moscow Basin, Donets Basin and South Urals in Eurasia. A summary of the complete revised Pennsylvanian conodont zonation for the Midcontinent was presented by task group members at the Pander Symposium and at the ECOS VIII meeting in Toulouse, France (Lambert and others, 2002, and Barrick and others, 2002, respectively). Ritter and others (2002) used conodont faunas to correlate several major midcontinent cyclothems with Paradox Basin cycles in North America. This paper also documents the occurrence of the fusulinoidean *Protriticite*s in the Honaker Trail section as approximately equivalent to the Lower Pawnee cyclothem of the midcontinent, the third major cyclothem [but sixth marine unit] below the base of the Missourian Stage. This is also below the first appearance of New Genus S, which Lambert and others (2001) used to name the highest idiognathodontid conodont zone of the Desmoinesian.

Other relevant conodont information concerns the Las Llacerias section in the Cantabrian Mountains. Carlos Méndez reports a significant finding of *Gondolella pohli*, which suggests correlation of part of the upper Myachkovian of Eurasia with the late middle Desmoinesian of North America. Higher in this section, an isolated specimen of *Idiognathodus eccentricus* in the upper part

of the *Protriticites* Zone suggests the correlation of a level within the upper Kreviakinian with the lower Missourian.

Aleksander Alekseev (Moscow State University) reported finding *Idiognathodus fischeri* sp. nov. in limestone N3/2 of the Kalinovo section in the Donets Basin, suggesting the correlation of this level with the upper part of the Suvorovo Formation (lowermost Kasimovian) of the Moscow Basin. Alekseev and his group also investigated the distribution of fusulinoideans and conodonts in the Dalniy Tyulkas succession in the South Urals [Bashkiria, Russia], and correlated this section with the Moscow Basin succession, based on occurrence of *Streptognathodus makhlinae*, a taxon characteristic of upper Krevyakinian strata in the Moscow Basin, overlain by strata containing *Idiognathodus sagittalis*, a form occurring in the Khamovnikian Neverovo Formation of the Moscow Basin, which also has been recognized in the Donets Basin, Spain, and American Midcontinent.

During August 2002, the Task Group held a meeting in Ufa, Bashkiria, where Alekseev and colleagues, N.V. Goreva, E.I. Kulagina, O.L. Kossovaya, and A.N. Reimers, led a field-trip to the Dalniy Tyulkas sections in the South Urals, to begin evaluation of their potential as a candidate for a GSSP for the Moscovian-Kasimovian boundary. The poorly exposed critical portion has been recently trenched and sampled by the Moscow group. Preliminary results show a possible transition from Moscovian to Kasimovian conodonts involving *I. sagittalis*. Werner Buggisch of University of Erlangen collected closely spaced samples for stable C and O isotope analysis, and recent Moscow State University Ph.D. graduate Pavel Kabanov has started a detailed study of the sedimentary petrology and sequence stratigraphy of this succession in order to provide a complete analysis of the depositional environments.

At the meeting in Ufa, Alekseev indicated that the conodont lineage that includes *I. sagittalis* now appears to hold more promise for providing an evolutionary event upon which a GSSP might be based than previously considered older lineages. 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, which is based on the first appearance of *I. eccentricus*, a taxon that is related to the *I. sagittalis* lineage. Although fusulinid worker V. Davydov expressed a desire to retain the traditional Moscovian-Kasimovian boundary and define it on an evolutionary event in a fusulinid lineage, fusulinid worker S. Remizova expressed support for a younger boundary near the first appearance of the fusulinid *Montiparus*, because that genus is more easily recognized than those at the traditional base of the Kasimovian. Remizova's opinion has been strongly supported by fusulinid workers [and SCCS members] Elisa Villa and Katsumi Ueno [both unable to attend the conference], who believe that it would be impossible to achieve a readily recognized boundary definition based on fusulinids at the traditional boundary. Although it appears promising that an event in the *I. sagittalis* lineage might be identified to define the Moscovian-Kasimovian boundary, the taxonomy of this apparently widespread group of morphotypes that includes *I. sagitallis*, *I. eccentricus*, its ancestor *I. sulciferus*, and their relatives must be worked out among the European and American workers. To achieve this aim, American conodont expert Jim Barrick is pursuing funding that will allow him to attend a meeting with Russian and Ukrainian conodont workers in Moscow in mid-2003 in order to work on the taxonomy of the morphotypes, and perhaps to delineate an event that can be identified in Russia, the Ukraine, the USA, and other parts of the world where marine rocks exist across this boundary.

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Ritter, S. M., Barrick, J. E., and Skinner, M. R. (2002). Conodont sequence biostratigraphy of the Hermosa Group (Pennsylvanian) at Honaker Trail, Paradox Basin, Utah. Journal of Paleontology, 76: 495-517.

Villa, E., Merino-Tomé, O., Bahamonde, J. R., and Ueno, K. (in press). Fusulinoideans from the Puentellés Formation (Upper Carboniferous, Spain): discussion on phylogeny, paleoecology and biogeography. Rivista Italiana di Paleontologia e Stratigrafia, Milano.

Wahlman, G. P. (1999). *Protriticites* and associated fusulinacean faunas in Desmoinesian (Pennsylvanian) of western USA. International Congress on the Carboniferous- Permian, Calgary, Programme with Abstracts, p. 152.

Wahlman, G. P., Verville, G. J., and Sanderson, G. A. (1997). Biostratigraphic significance of the fusulinacean *Protriticites* in the Desmoinesian (Pennsylvanian) of the Rocky Mountains, Western U.S.A., *in* Ross, C. A., Ross, J. R. P. and Brenckle, P. L. (eds.), Late Paleozoic Foraminifera; their biostratigraphy, evolution, and paleoecology, and the Mid-Carboniferous boundary: Cushman Foundation for Foraminiferal Research, Special Publication 36, p. 163-168.

The **Task Group to establish a boundary close to the Visean-Serpukhovian boundary**, chaired by Barry Richards of Canada, now has a membership of 18 experts with global distribution and representing a wide range of expertise, including chemo- and magnetostratigraphy in addition to the classic fossil groups of biostratigraphic significance. More members may be added. Richards has asked for detailed written input on possible fossil lineages, fossil or other events that might be used to define the boundary, and sedimentary basins where a GSSP for the boundary might be located, so that he can present progress reports in a session and workshop at the upcoming International Carboniferous Congress in August 2003.

The **Task Group to establish a boundary close to the Bashkirian-Moscovian boundary**, chaired by John Groves of USA, now has a membership of 18 experts with global distribution and representing a wide range of expertise, including chemostratigraphy in addition to the classic fossil groups of biostratigraphic significance. Groves has asked for detailed written input on possible fossil lineages, fossil or other events that might be used to define the boundary, and sedimentary basins where a GSSP for the boundary might be located, so that he can present progress reports in a session and workshop at the upcoming International Carboniferous Congress in August 2003.

The **Project Group on Comparative Angara and Gondwana Biostratigraphy**, chaired by Marina Durante of Russia, is hampered by lack of funds for travel, but is focusing on stratigraphy of the Angara region, particularly the great cooling event near the top of the Visean. A summary article on the current status of Angaran stratigraphy appears in this year's *Carboniferous Newsletter* [v. 20, p. 23-26].

CHIEF PRODUCTS IN 2002 (e.g. publications, proceedings):

Newsletter on Carboniferous Stratigraphy, Volume 20, published July 2002. Its 58 pages contain reports of Working Groups for 2001, and 12 articles on various topics including: Observations on Pennsylvanian radiometric dating in North America and correlation with Europe; Stages of the Carboniferous System; Correlation of the Visean-Serpukhovian boundary within Russia and possible boundary markers; Microfossil subdivision of the Bashkirian-Moscovian boundary in the South Urals; Biostratigraphy of the Carboniferous of Angaraland; Sea-level curve for the lower and middle Desmoinesian (upper Moscovian) Cherokee Group in eastern Oklahoma; Pennsylvanian conodont zonation in Guizhou, China; Late Pennsylvanian-early Permian conodont-bearing volcanic ashes in the southern Urals; the latest Pennsylvanian 'Bursumian Stage' of North America; the Carboniferous-Permian transition in New Mexico; Chemotaxonomic signatures in Pennsylvanian pteridophylls; and Database management of fossil collections in Nova Scotia. This newsletter is a very valuable product because it summarizes briefly in a timely fashion certain ongoing work in many parts of the world, most of which is very informative on topics critical to the mission of the SCCS and much of which will not be published very soon or in readily accessible literature. I have found it invaluable in keeping up with current trends in research covering the entire Carboniferous. Apparently others have also found it valuable because more workers have asked to become corresponding members, and more significantly, libraries have asked to receive current and previous volumes, specifically including those of the U.S. Geological Survey, the Alabama Geological Survey, the universities of Iowa and Illinois, the Natural History Museum in London, and the National Natural History Museum and Paleobotanical Laboratory in the Netherlands.

Stratigraphy and Biostratigraphy of the Mississippian Subsystem (Carboniferous System) in its Type Region, the Mississippi River Valley of Illinois, Missouri, and Iowa [108 pp.] published September 2001 as the guidebook for the field trip associated with the SCCS meeting in St. Louis, is now being updated and slightly revised for more accessible publication in late 2002 or early 2003 as an open-file report of the Illinois State Geological Survey. This guidebook summarizes the basic lithostratigraphy of the type Mississippian, and most importantly, it summarizes the immense amount of biostratigraphic information collected and analyzed during the 1970s by Paul Brenckle and Richard Lane while supported by Amoco Production Company, which provided a significant data base for correcting some misconceptions about global correlation of the regional American subdivisions. This guidebook provides a data base that should enhance selection of global boundaries within that subsystem. In addition to articles directly related to the field trip, it includes a summary of current knowledge on the Mississippian succession in Iowa, which contains some enigmatic units that only now are becoming better understood.

7. CHIEF PROBLEMS ENCOUNTERED IN 2002

No serious problems other than declining voluntary support for Newsletter expenses.

8. SUMMARY OF EXPENDITURES IN 2002 (ANCIPATED THROUGH MARCH 2003):

STATEMENT OF OPERATING ACCOUNTS FOR 2001/2002, Prepared by David Work, Secretary

INCOME (Oct. 31, 2001 – Oct. 31, 2002)		
IUGS-ICS Grant 2002	$800.00	
One-time ICS supplement**	500.00**	
2001 SCCS Field Trip (surplus)**	773.42**	
Donations from Members	125.00	
Interest	1.70	
TOTAL INCOME	**$2200.12**	
EXPENDITURE		
Newsletter 20 (printing)		$1075.92*
Postage for bulk mailings		526.92
Mailing/Office Supplies		139.71
Bank Charges		199.84
TOTAL EXPENDITURE		**$1942.39**
BALANCE SHEET (2001 – 2002)		
Funds carried forward from 2000–2001		$1892.84
PLUS Income 2001–2002		2200.12
LESS Expenditure 2001–2002		-1942.39
CREDIT balance carried forward to 2003	**$2150.57**	

*Specially negotiated rate of <$0.04/page in Cincinnati.

**See commentary on proposed budget in section # 15 below.

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

All work in the SCCS is now focused on the XV International Congress on Carboniferous-Permian Stratigraphy, which will be held in Utrecht, The Netherlands in August 2003. I am organizing a day-long Carboniferous Workshop at which all the Task Groups dealing with all the remaining undefined stage/series boundaries within the system will meet informally to exchange data and ideas, with microscopes available for comparative study of microfossils, along with layout space and projection equipment. This is the type of work I have observed in the Task Group to which I belong that has led to the most progress in selection of boundaries. Rich Lane is organizing a formal session on paleogeography of the stage boundary intervals and its effects on fossil distribution, at which all the Task Group chairs will summarize the current status of this knowledge. Below is a summary for each Group:

- Tournaisian-Visean Boundary: A field meeting will be held early in December 2002 in Guangxi, China, among G. Sevastopulo, H. Hou, L. Hance, F.X. Devuyst and X.H. Wu. Data from the different parties will be gathered to address regional correlations and plan the next steps in the proposal of the stratotype. I am optimistic that they will present at least a preliminary

proposal for a global GSSP in south China [Pengchong], at the next SCCS general meeting in Utrecht in August 2003.

- Visean-Serpukhovian Boundary: This will be the first meeting of this Group, where all the information requested by the chair from the members will be summarized and discussed [see section # 7 above]. I believe that rapid progress will now be made on defining this boundary.
- Bashkirian-Moscovian Boundary: This will be the first meeting of this Group, where all the information requested by the chair from the members will be summarized and discussed [see section # 7 above]. I believe that rapid progress will now be made on defining this boundary.
- Moscovian-Kasimovian Boundary: American conodont expert J.E. Barrick is seeking NATO funding to visit Moscow this coming June to meet with Russian and Ukrainian colleagues in order to attempt to work out the taxonomy of the group of morphotypes that includes the lineage within which the Desmoinesian-Missourian regional boundary has been chosen in North America, and upon which the Russian experts believe a global Moscovian-Kasimovian Boundary might be based. I am hopeful that they can delineate an event in a lineage that can be identified on both continents. If successful, critical progress can be made at the Utrecht Congress.
- Kasimovian-Gzhelian Boundary: This anticipated meeting of experts in Moscow will also include examination of conodont morphotypes from the two continents across this boundary as well, with hope for further progress at the Utrecht Congress.

I also plan to continue to encourage movement toward consensus on competing suggestions for series and stage names and classification, as initiated by the two articles on the subject in the 2001 Newsletter and continued in the 2002 Newsletter.

I am remaining in contact with the radiometric dating laboratory directed by E.T. Rasbury at State University of New York at Stony Brook, and with Manfred Menning of Geoforschungs Zentrum in Potsdam, Germany, who continues to compile and evaluate the entire range of Carboniferous radiometric dating.

The definite product for 2003 will be volume 21 of the *Newsletter on Carboniferous Stratigraphy*, which will summarize progress of the various working and project groups in the previous 12 months, and present current views and brief summaries of current research efforts of both the voting and nonvoting members of the Subcommission on a variety of topics dealing with Carboniferous stratigraphy.

Communication Plans:

Most written communications available to the voting membership and the membership in general, takes place through the Newsletter on Carboniferous Stratigraphy, which is published annually in July. Particularly significant, longer stratigraphic and biostratigraphic contributions typically are submitted for publication in such journals as *Episodes*, *Newsletters in Stratigraphy*, *Journal of Paleontology*, etc.

10. BUDGET AND ICS COMPONENT FOR 2003

PROJECTED EXPENSES

Postage for bulk mailing of informational letter early in year			$200
Newsletter printing (est. 400 copies @ 70 pages at commercial rates [~0.06*])		$1680*	
Supplies and postage for bulk mailing of Newsletter to various areas		$600	
Bank charges for international account		$200	
TOTAL PROJECTED EXPENSES		$2680	

INCOME

Carryover (from CREDIT balance in section # 10 above)**	[$875**]	$2150	
Estimated donations		$100	
TOTAL INCOME		$2250	

BALANCE

Estimated deficit from above**	[($1705)**]	($430)	
BUDGET REQUEST FROM ICS for 2003		**$1000**	

*This is estimated at normal commercial rate of ~$0.06/page because Secretary-Editor D.M. Work just moved to Augusta, Maine, and may not be able to negotiate a special rate as he did in 2002.
**Because the carryover includes 2 items that are 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, for a total of $1275: see section # 10 above], the deficit would have been $1705 under ordinary circumstances. Therefore I am requesting more than what might appear necessary in order to accommodate anticipated Newsletter expenses for future years.

No direct funding sources for SCCS exist beyond voluntary donations from some SCCS members, which fluctuate from year to year, and have recently diminished.

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

This summary is based largely on information derived from the Working (Task) and Project Group reports in volumes 16-20 of the Newsletter on Carboniferous Stratigraphy [1998-2002].

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.**

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 most recent 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 is currently

going on that hopefully soon will finalize the choice of the section at which the GSSP will be selected.

The status of current work was uncertain on the next higher boundary in the Mississippian, both around the Visean V3a-V3b level and the Visean-Namurian/Serpukhovian level, 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 quite 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 has been selected and work started for presentation and discussion at the Utrecht Congress in 2003.**

Work on characterization and subdivision of the type Bashkirian [the lower subdivision of the Pennsylvanian Subsystem] in the southern Urals was reported extensively in 1997 and 1998, and briefly in 1999 and 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. **We have now established a Task Group on a Boundary close to the existing Bashkirian-Moscovian Boundary in 2002, for which membership has been selected and work started for presentation and discussion at the Utrecht Congress in 2003.**

Work on the Moscovian-Kasimovian boundary [essentially between the middle and upper Pennsylvanian] has been extensively reported in all 5 Newsletters. **Much new work has been stimulated on both fusulinids 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 the South Urals region of Russia in 2002**. Fusulinid workers have recognized problems of provincialism in much of the Kasimovian part of the succession in Eurasia. Conodont workers are in the process of clearing up the serious taxonomic problems that have stymied progress within that group, and also have recognized more provincialism than was once thought to exist between Eurasia and North America during the Kasimovian/Missourian Epoch of time.

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, 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 marine biostratigraphy is lacking.

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

This is necessarily brief and based only on trends that I perceive now within the SCCS. I will certainly encourage all members to maintain progress on researching and selecting GSSP boundaries

The Tournaisian-Visean Boundary GSSP should be selected within the next two years, now that the faunal definition has been approved. We are awaiting a proposal on a GSSP as soon as field work by members of the Task Group on the Pengchong section in south China is completed.

The new Visean-Serpukhovian Boundary Task Group appears to be off to a good start in the planning stages, and I look forward to the progress they report at the Utrecht Congress in August 2003.

The new Bashkirian-Moscovian Boundary Task Group appears to be off to a good start in the planning stages, and I look forward to the progress they report at the Utrecht Congress in August 2003.

The Moscovian-Kasimovian Boundary Task Group [which is also dealing with the Kasimovian-Gzhelian Boundary] will be able to move ahead once the conodont taxonomy is clarified enough to select a correlatable event within an evolutionary lineage that can be identified in as many of the most complete successions of this age (South Urals, Midcontinent North America, Donets Basin, northern Spain) as possible.

I am hopeful that through reasoned and pragmatic discussion, an acceptable series and stage subdivision will be achieved within the Carboniferous System and its two Subsystems in a few years.

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 may provide the basis for correlating these boundaries into the northern-hemisphere Angara region and the southern-hemisphere Gondwana region, where the pan-tropical biotas are replaced by cold-climate endemic communities.

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

13. SUBMITTED BY:

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SUBCOMMISSION ON CARBONIFEROUS STRATIGRAPHY (SCCS)
OFFICERS AND VOTING MEMBERS 2000-2004

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SUBCOMMISSION ON DEVONIAN STRATIGRAPHY

ANNUAL REPORT 2002

1. TITLE OF CONSTITUENT BODY

Subcommission on Devonian Stratigraphy

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

Mission Statement

SDS stimulates and coordinates scientific research directed towards the understanding, on a global scale, of the history of the Earth during Devonian times. It basically pursues establishment of an internationally agreed time framework which is as fine as possible and results from multidisciplinary research programs.

Goals

All Devonian stages have been defined by GSSPs and ratified by IUGS. However, some Devonian stages are much longer than in other systems, e.g. Emsian, Famennian. The time resolution of the standard Devonian Stratigraphic scale can be improved by introducing substages. Devonian substages are already widely used but without any formal definition achieved by international consensus. Definition of substages, when appropriate, will be based on major physical and faunal overturns that took place within the defined Devonian stages, e.g. Daleje, Taghanic events. They are mostly related to sealevel changes that can be globally correlated in different facies using bio-, magneto-, chemo- and sequence stratigraphic methods. Definition of substages will be substantiated by recognition of the lower boundary in a series of reference sections situated on different continents and representing the important Devonian environments. The ultimate aim is to agree on a twofold subdivision of the Emsian, a twofold / threefold subdivision of the Givetian, a threefold subdivision of the Frasnian and a threefold / fourfold subdivision of the Famennian.

3. ORGANIZATION

a. Executive body

Chairman: P. Bultynck (Belgium)
Vice Chairman: R. Crick (U.S.A.)
Secretary: T. Becker (Germany)

b. Other voting members

I. Chlupac (Czech Republic)
A. El Hassani, new member (Morocco)
R. Feist (France)
J. Garcia-Alcalde (Spain)
Hou Hong Fei (P.R. China)
M. Hünicken (Argentina)
W.T. Kirchgasser (U.S.A.)
G. Klapper (U.S.A.)
V. Menner (Russia)
P. Morzadec (France)
J.B. Richardson (United Kingdom)
C. Sandberg (U.S.A.)

M. Streel (Belgium)
J. Talent (Australia)
S. Turner (Australia)
T. Uyeno (Canada)
K. Weddige (Germany)
E.A. Yolkin (Russia)
Zou Han (P.R. China)

SDS has lost this year two eminent members and former SDS chairmen : M. House (13.08.02) and W. Ziegler (08.08.02).

c. Corresponding members

Ninety

d. Working groups

Working group for subdivision of the Emsian ; leader : R. Mawson (Australia).
Working group for subdivision of the Givetian ; leader : P. Bultynck (Belgium).
Working group for subdivision of the Frasnian ; leader : D.J. Over (U.S.A.).
Working group for subdivision of the Famennian ; leader : Th. Becker (Germany).

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

Financial support from national foundations / institutes for attending SDS meetings.

5. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

IGCP 421 North Gondwanan Mid-Paleozoic Biodynamics.
Many SDS members are active in this project. The two leaders of the project are voting SDS members. IGCP 421 and SDS meet once a year.

6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2002

The annual SDS meeting (24.06.02) was hosted by the Eight International Conodont Symposium Held in Europe (ECOS VIII – 22 to 25.06.02, Toulouse-Albi). The meeting was attended by about 50 people, including voting members, corresponding members and participants of ECOS VIII. The scientific discussions mainly dealt with the subdivision of the Givetian, Frasnian and Famennian. Nine documents have been presented and discussed, some have been included in the Abstract volume of ECOS VIII (Strata, Serie 1, vol. 12, Univ. Paul-Sabatier-Toulouse, 110 pp.) :

- C. VER STRAETEN : K-bentonites, ash bed preservation and implications for Lower to Middle Devonian volcanism, eastern North America.
- R.T. BECKER & S.Z. ABOUSSALAM : The base of the *hermanni* Zone as the base of an upper Givetian substage.
- P. BULTYNCK & S. GOUWY : Towards a standardization of global Givetian substages.
- M. PIECHA & E.S. SCHINDLER : Frasnian and Famennian subdivisions-results of German Late Devonian Working Group sessions 2001.

- I. SCHÜLKE, D. KORN, A. POPP & W. ZIEGLER : Potential reference section for the Early / Middle Famennian boundary at the Beringhauser Tunnel (Rheinisches Schiefergebirge, NW Germany).
- H. TRAGELEHN & HARTENFELS : Köstenhof quarry (Frankenwald, Bavaria) – a potential reference section for the Early / Middle and the Middle / Late Famennian boundary.
- R.T. BECKER : Famennian ammonoid zones of the eastern Anti-Atlas – implications for the substage subdivision.
- M. STREEL *et al*. : Biostratigraphic correlation at the late or/and latest Famennian from Western, Central and Eastern European sections. State of the art.
- J.P. NICOLLIN & D. BRICE : Stratigraphic value of some Strunian (Devonian, Latest Famennian) brachiopods.

SDS participated in the **International Symposium on the geology of the Devonian System** held in Syktyvkar (Komi Republic, Russia) and organized by the Institute of Geology of Ural Division of RAS. It mainly dealt with the Devonian of Timan-Pechora area and the Urals. A volume (333 pp.) with 220 abstracts was edited. From the discussions with the Russian Devonian specialists it emerged that most of them are still using the former Russian Devonian stage boundaries.

SDS organized a **formal vote** on the number of **Emsian** and **Frasnian** substages. Results (voting members):

Lower and Upper Emsian : 11 in favour ; 1 abstention ; 7 not voted ;
Lower, Middle and Upper Frasnian : 10 in favour ; 2 abstention ; 7 not voted.

SDS organized a **straw poll** among voting and corresponding members on the number of **Famennian** substages. Results :

three Famennian substages : 49 % ;
four Famennian substages : 51 %
many members didn’t answer.

8. SUMMARY OF EXPENDITURES IN 2002 (ANCIPATED THROUGH MARCH 2003):

8.1 Through October

	US $
Financial participation in organization Toulouse Meeting	300
Financial support for 1 SDS member to attend Toulouse meeting (Sarah Aboussalam)	300
Secretary expenses	300
Bank commission	15
Total :	915

8.2 Projection through April 2003

	US $
Newsletter 2002	400
Participation in traveling costs chairman Brussels-Münster for discussion with secretary on 2003 program	50
Total :	450
Total 8.1 + 8.2 :	1 365
Budget available for 2002 :	1 365.58

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

It is expected that SDS will come to a consensus on the number of substages for the Givetian (2 or 3) and for the Famennian (3 or 4) and conduct a final discussion on the boundary levels for the substages of the Emsian, Givetian, Frasnian and Famennian.

10. BUDGET AND ICS COMPONENT FOR 2003

It would be unrealistic to expect funding for the SDS as a subcommission from outside IUGS / ICS. It is possible to get individual traveling funding from scientific foundations or institutes.

ICS component requested :

	US $
Financial support for SDS members to attend the annual meeting	1 200
Financial support for organization of the meeting	600
Secretary expenses	300
Contribution to Newsletter n°20	400
Total :	2 500

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

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).

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

The objectives and work plan are limited to this period because it is expected to achieve the substage programme by the end of 2004. Moreover at that time the present Executive body will have served 8 years.

2003: see Work Plan for Next Year
2004: SDS will organize a session on "High-resolution stratigraphy for the subdivision of the Devonian stages" within the General Symposium "Stratigraphy" of the 32nd International Geological Congress to be held in Florence (Augustus 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 programme 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.

13. SUBMITTED BY:

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SUBCOMMISSION ON SILURIAN STRATIGRAPHY

ANNUAL REPORT 2002

1. TITLE OF CONSTITUENT BODY

Subcommission on Silurian Stratigraphy (SSS)

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

a) Elaboration and improvement of the standard global stratigraphical (SGS) scale for the Silurian System, including definition of boundaries and the selection of Global Stratotype Sections and Points (GSSP) under IUGS guidelines.
b) Refinement of international correlation within the Silurian System, with particular emphasis on development of a generalized scheme of zonal fossils (left-hand column) for global applications.
c) Stimulation of research and international cooperation, with particular emphasis on the coordination of working groups focused on various zonal fossils such as graptolites, conodonts, chitinozoans, etc.
d) Evaluation and integration of new approaches to the correlation of Silurian strata on a global scale.

Summary table of Silurian subdivisions

Source: Holland, C.H. and Bassett, M.G. (1989). *A Global Standard for the Silurian System*, National Museum of Wales, Geological Series No. 9, p. 24.

SYSTEM		*Series*	Stages
SILURIAN	Upper	***Pridoli***	(no subdivisions)
		Ludlow	Ludfordian
			Gorstian
	Lower	***Wenlock***	Homerian
			Sheinwoodian
		Llandovery	Telychian
			Aeronian
			Rhuddanian

No changes or additions to this scheme have been made during the last seven years. As recently as the last biennial meeting of the SSS in Spain in 1998, the membership confirmed its majority support for the status quo. New officers of the subcommission did not take the decision to reopen nominclatural questions after July 2000 at the biennial meeting of the SSS in Australia, July 2000. However, they did agree that some boundary stratotypes required re-examination (see below).

3. ORGANIZATION

The SSS is a subcommission of the International Commission on Stratigraphy, consisting of 15 Voting and 48 Corresponding members. Voting members are selected to achieve regional representation and a balanced stratigraphic expertise. Corresponding membership is open to all individuals demonstrating a commitment to scholarship in Silurian stratigraphy.

Officers:

Chairman: Rong Jia-yu (Nanjing Institute of Geology and Palaeontology, Academia Sinica, Nanjing 210008, People's Republic of China).

Vice-chairman: Tatjana N. Koren (All Russian Geological Research Institute –VSEGEI, Sredny pr. 74, 199026, St. Petersburg, Russia).

Secretary: Michael J. Melchin (Department of Geology, St. Francis Xavier University, P.O. Box 5000, Antigonish, Nova Scotia B2G 2W5, Canada).

The SSS Treasury is maintained as a separate organizational account at St. Francis Xavier University.

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

Membership in the SSS is represented by specialists from 29 countries and from all continents except Antarctica. Most of the major regions of the world with extensive exposures of Silurian strata are covered, especially Eurasia, North America, South America, Australia, and Africa.

The 3rd and 2nd International Symposia on the Silurian System (convened in Rochester, N.Y. in August 1996 and in Orange, New South Wales (Australia) in July 2000 under sponsorship of the SSS) enjoyed significant financial support from educational institutions, private science foundations, and corporate sponsors. Institutional support will also be provided for the upcoming Silurian Field Meeting in Argentina (August, 2003). Ongoing grant support exists for symposia publications through the cooperation of the New York State Museum (Albany) and the Australian Museum (Sydney).

Substantial national-based support was contributed for other SSS field meetings in Australia (2000), Spain and Portugal (1998) Austria (1994), the Czech Republic (1992), Estonia (1990), Australia (1986), the Ukraine (1983), Norway (1982), Canada (1981), and the United Kingdom (1979, 1989).

5. INTERFACE WITH OTHER INTERNATIONAL PROJECTS

SSS members are very active in the IPA international research groups on graptolites, brachiopods, conodonts, chitinozoans, and vertebrates. In addition, there is considerable overlap of the activities of many SSS members with the Subcommission on Ordovician Stratigraphy, particularly regarding the events surrounding the Late Ordovician mass extinction event and subsequent biotic recovery. The 2003 SSS field conference is being held in connection with the International Graptolite Conference and an International Symposium on the Ordovician System in Argentina. Several of the field trips at that conference are planned to encompass the interests of all

three of the groups meeting at that conference. In addition, a joint working group of the Ordovician and Silurian Subcommissions is currently working toward a restudy of the GSSP for the base of the Silurian System

6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2002

The tenth issue of *Silurian Times* - the official newsletter of the Silurian Subcommission (edited by Secretary Mike Melchin) was circulated in April 2002 to all subcommission members, as well as a broad constituency of Silurian researchers around the world. This is the second 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. 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.

A decision was made that some the GSSPs of the Silurian System should be re-examined in light of the experience that researchers have had in using these GSSPs as well as new information that had become available since they were established. This decision was based on discussions that took place at the most recent meeting of the SSS in Australia (July 2000), and subsequently received the support of the majority of titular members. It was also decided that initially two stratotypes should be restudied, possibly with others to follow. The two that are being restudied are the Base of Silurian and Base of Wenlock. Full discussions of the rationale for conducting these restudies can be found in the *Silurian Times* web site at: *http://iago.stfx.ca/people/mmelchin/os-gssp9.htm* and: *http://iago.stfx.ca/people/mmelchin/lw-gssp9.HTM*.

Two SSS titular members have been asked to organize new boundary restudy working groups: Mike Melchin (Canada) for the Base of Silurian; and David Loydell (UK) for the Base of Wenlock. They have been given the mandate to organize a working group with broad representation internationally as well as among researchers in the various biostratigraphic and stratigraphic fields that bear upon problems of international correlation. The process of forming these working groups has begun. The working group for the **Base of the Silurian** will be meeting at the Silurian Subcommission Field Meeting in Argentina to discuss progress on research on the project. The working group on the **Base of the Wenlock** has tentatively adjourned its work until more work can be completed on the biostratigraphy of the current stratotype and/or other candidate sections are proposed.

New York State Museum Bulletin 493 (Title: "*Silurian Lands and Seas---Paleogeography Outside of Laurntia*" is now at the printer. Release is promised before the end of December 2002. 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. The editors believe that Bulletin 493 will reach the same international audience (and sales) that Bulletin 491 has achieved. 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.

The first and second circulars for the next field meeting of the SSS, in Argentina in 2003, in connection with an Internation Symposium on the Ordovician System and an Internation Graptolite Conference, were distributed in 2002. Field trips itineraries are planned to include many well-known Silurian localities in the Argentine Precordillera. Mike Melchin has been asked to serve as Technical Programme Co-ordinator for the in-house portion of the Silurian Field Meeting, with assistance from Argentine colleagues. Information pertaining to this conference can be found at: *http://iago.stfx.ca/people/mmelchin/isos-igc-sss1.HTM*.

7. CHIEF PROBLEMS ENCOUNTERED IN 2002

None.

8. SUMMARY OF EXPENDITURES IN 2002 (ANCIPATED THROUGH MARCH 2003):

Income (U.S. dollars)

1. Carryover from 2000	22.27	
2. 2001 ICS subvention	200.00	
Total operating funds		$222.27

Expenditures

1. Production & mailing of newsletter	35.00	
2. Purchase of software (Adobe Acrobat, full version) for archival storage and deliver of Silurian Times	100.00	
(total cost was $220.00, the remainder was paid from M. Melchin's research funds)		
3. Student technical assistant for archival storage and delivery of Silurian Times (10 hrs @ $8/hr)	80.00	
Total expenditures for 2001		$215.00
Net balance at the end of 2000		$7.27

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

As noted above, the boundary working groups were established to restudy the GSSPs at the Base of Silurian and Base of Wenlock. As noted above, the working group on the base of the Wenlock has tentatively adjourned its work until more work can be completed on the biostratigraphy of the current stratotype and/or other candidate sections are proposed.

In the case of the base of the Silurian the current GSSP is being restudied to see if it adequately serves its purpose of providing a precise frame of reference for workers taking a variety of approaches in stratigraphic correlation. These studies will particularly consider information that has come to light since the establishment of these GSSPs. If such study finds that the current GSSP does provide an adequately precise and useful point of reference for international correlation, then the task of seeking an alternative GSSP will be undertaken. One such alternative section has already been proposed, the Wangjiawan section in the Yichang area of China. Progress on the restudy of the

current GSSP and also new data on the proposed alternative candidate will be presented at the SSS field meeting in August in Argentina.

In addition to the work on GSSPs, the SSS executive is also concerned with the relative scarcity of reliable geochronological dates that are biostratigraphically well constrained within the Silurian System. At the present time, a small group of Ordovician and Silurian workers are compiling all available data on radiometric dates applicable to the calibration of the Silurian time scale as part of the production of the next edition of *The Geologic Time Scale* for Cambridge University Press. They have also been developing new means of integrating biostratigraphic and geochronologic data into a composite, linear time scale. Once this work has been completed, the SSS executive will consider ways to improve the situation by encouraging its members to collaborate in projects that provide new calibrations for Silurian time. This will also be one consideration of the working groups restudying GSSPs.

Publication of "*Silurian Lands and Continental Margins, Exclusive of North America*" by the end of 2002 will permit work to begin on the third volume from the James Hall Symposium, "Silurian Lands and Continental Margins of North America".

The secretary plans to provide web-based archival access to previous issues of *Silurian Times*, once the new issue is released early in 2003. The plan is to have these available as PDF downloads from the *Silurian Times* web site. Technical difficulties in delayed this process.

10. BUDGET AND ICS COMPONENT FOR 2003

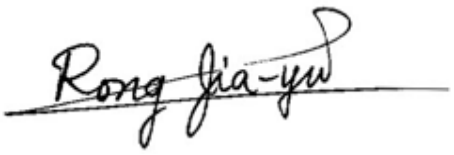
1. Airfare for SSS Chair to attend the SSS Field Meeting (Nanjing, China to San Juan, Argentina) requesting	2000.00
2. Airfare for SSS Vice-Chair to attend the SSS Field Meeting (St. Petersburg, Russian to San Juan, Argentina)	2000.00
Total Budget for 2002	$4000.00

ALLOTMENT REQUESTED FROM ICS FOR 2003 - $4000.00

13. SUBMITTED BY:

Name of Chairperson: Rong Jia-yu

Signature of Chairperson:



Date: December 2, 2002

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Titular members SSS

Rong, Chairman (China)
Koren, Vice-chairman (Russia)
Melchin (Secretary)
C.E. Brett (USA)
M.V. Caputo (Brazil)
L.R.M. Cocks (UK)
J.S. Jell (Australia)
M.E. Johnson (USA)
D. Kaljo (Estonia)
J. Kríž (Czech Republic)
A. Le Hérissé (France)
A.C. Lenz (Canada)
D.K. Loydell (UK)
E. Serpagli (Italy)
J. Verniers (Belgium)

Corresponding members SSS

Aldridge (UK)
Antoskhina (Russia)
Baarli (USA)
Barnes (Canada)
Bassett (UK)
Berry (US)
Bjerreskov (Denmark)
Bleick (France)
Bogolepova (Russia)
Boucot (US)
Chen (China)
Chlupac (Czech Rep.)
Dufka (Czech Rep.)
Einasto (Estonia)
Ferretti (Italy)
Fu (China)
Geng (China)
Gutierrez-Marco (Spain)
Holland (Ireland)
Jeppsson (Sweden)
Jin (China)
Kozlowska-Dawidzuik (Poland)
Larsson (Sweden)
Laufeld (Sweden)
Lawson (UK)
Legrand (France)
Lesperance (Canada)
Mannik (Estonia)
Marsss (estonia)
Musteikis (Lithuania)
Nestor (Estonia)
Norford (Canada)
Paris (France)
Peralta (Argentina)
Picarra (Portugal)
Predtechensky (Russia)
Rickards (UK)
Robardet (France)
Schonlaub (Austria)
Sennikov (Russia)
Simpson (Australia)
Storch (Czech Rep.)
Strusz (Australia)
Su (China)
Teller (Poland)
Tesakov (Russia)
Walliser (Germany)
Yolkin (Russia)
Wang (China)
Zhang (China)

SUBCOMMISSION ON ORDOVICIAN STRATIGRAPHY

ANNUAL REPORT 2002

1. TITLE OF CONSTITUENT BODY

Subcommission on Ordovician Stratigraphy (SOS)

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

The Subcommission promotes international cooperation in Ordovician Stratigraphy. Specific objectives are:

- 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.
- 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).
- 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.
- 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

a. Subcommission Executive
   Chairperson, S.C. Finney (U.S.A.)
   Vice-chairperson, Chen Xu (P.R. China)
   Secretary, G.L. Albanesi (Argentina)
   17 other Voting Members
   92 Corresponding Members

b. GOES Program - research committee
   Secretary, W.B. N. Berry (U.S.A.)
   4 other members

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 Subcommission members (voting and corresponding) have been supported in part by IGCP 410. 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

The membership of the Subcommission both geographically and in terms of research interests effectively reflects available expertise in aspects of Ordovician stratigraphy.

The Subcommission has no formal links with other global projects, though some individual Ordovician workers are members of IGCP projects, most notably the following:

Project 386: Response of the Ocean/Atmosphere System to Past Global Changes
Project 410: The Great Ordovician Biodiversification Event

6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2002

a. The GSSP for the **base of the Second Stage**, yet to be named, for the Ordovician System (upper stage of Lower Ordovician Series) - the base of the *Tetragraptus approximatus* graptolite Zone in the Diabasbrottet section in southern Sweden - was approved by the International Commission on Stratigraphy and ratified by the IUGS executive.
b. The GSSP for the **base of the Upper Ordovician** Series and the **Third Stage** (lower stage of Upper Ordovician Series, yet to be named) - the base of the *Nemagraptus gracilis* graptolite Zone in the Fågelsång section in Sweden - was approved by the International Commission on Stratigraphy and ratified by the IUGS executive.
c. With the help of the Ordovician Stratigraphy Discussion Group website (http://seis.natsci.csulb.edu/ordstrat2/default.htm) discussion continued on the GSSP for the **base of the Middle Ordovician** Series. The web site proved invaluable in facilitating discussion and making important progress. Two GSSP proposals have been received the FAD of the conodont *Protoprioniodus aranda* in the Niquivil section in Argentina, and the FAD of the conodont *Baltoniodus triangularis* in the Huanghuachang section, China. Study of large, diverse conodont collections from the Ibex section in Utah, USA, indicate that the Ibex section is a potential stratotype where the base of the Middle Ordovician Series can be defined on both conodonts and trilobites. New studies of graptolite, conodont, and trilobite faunas in sections in western Newfoundland may prove fruitful in the search for a GSSP, and additional work is being carried out on the Niquivil section.
d. A general interest Friends of the Ordovician meeting was attended by 20 participants of the Annual Meeting of the Geological Society of America, Denver, Colorado, November 2002.
e. *Ordovician News No. 19* was published and distributed electronically in June 2002.

7. CHIEF PROBLEMS ENCOUNTERED IN 2002

The lack of travel support limited the participation of Voting Members from outside North America in Subcommission activities at the Annual Meeting of the Geological Society of America and will limit the number of Voting Members who can participate in future field meetings to evaluate potential stratotype sections.

8. SUMMARY OF EXPENDITURES IN 2002 (ANCIPATED THROUGH MARCH 2003):

Allocations	
Annual Budget from ICS	$3500
Surplus from 2001	$175
Total	$3675
Expenditures	
Ordovician News No. 19 (printing & postage)	$415
Room Rental for Subcommission Business Meeting at GSA	$75
Bank fees	$12
Secretarial expenses (postage, internet access for Albanesi)	$300
Support additional work on conodont biostratigraphy of candidate GSSP (Niquivil section, Argentina) by G. Albanesi	$500
Support additional work on conodont biostratigraphy of candidatae GSSP (Ibex, Utah, USA) by R. Ethington	$500
Air fare to Copenhagen for Chair to attend GSSP dedication ceremonies in Sweden in Spring 2003	$800
Travel subsidies for 2-3 Voting members to visit candidate stratotype section for base of Middle Ordovician Series, Huanghuachang section, China, Spring 2003	$1073
Total	$3675

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

a. *Ordovician News, No. 20*, assembled by G.L. Albanesi, will be published in the Spring 2003 and posted on the Subcommission's website.

b. The 9th International Symposium on the Ordovician System will be held in San Juan, Argentina, 18-21 August 2003. It will be held jointly with the 7th International Graptolite Conference, and a Field Meeting of the Subcommission on Silurian Stratigraphy. This meeting will include pre- and post-meeting field excursions to the Argentine Precordillera and the Cordillera Oriental, as well as other short excursions. The Niquivil section (a candidate GSSP - base of Middle Ordovician Series) will be visited and evaluated. Business Meetings will be devoted to 1) extensive discussion and evaluation of candidate sections and biohorizons for the two GSSPs still to be determined, 2) selection of new Voting members and retirements among existing membership, 3) the future mission of the Ordovician Subcommission, once all GSSPs have been selected, 4) the activities of the Ordovician Subcommission at the 32nd

IGC, in particular the symposium session "Global Ordovician Earth System," and 5) selection of the site and organizers of the 10th ISOS scheduled for 2007.

c. A goal is to select GSSPs for base of Middle Ordovician Series and for base of upper stage of Upper Ordovician Series, and then to formally name all un-named stages. Whether this can be attained in 2003 is unknown; however, this will remain the primary focus of the Subcommission until it is completed.

d. Article on Diabasbrottet GSSP will be submitted to *Episodes*, with a note that Fågelsång GSSP was published earlier in *Episodes*.

e. Dedication ceremonies for the Diabasbrottet and Fågelsång GSSPs in Spring 2003.

10. BUDGET AND ICS COMPONENT FOR 2003

Requested Allocation	$3950
Anticipated Expenses	
Ordovician News No. 20	$200
Administrative Expenses (copying, postage, telephone)	$250
Travel Subsidy for Voting members with limited travel support to attend 9th ISOS	$1500
Travel Subsidy for Chair, Secretary, and at least two voting members to visit and evaluate those candidate stratotype sections judged to be the best available following discussions at the 9th ISOS	$2000

California State University at Long Beach will support the Chair's travel expenses to the 9th ISOS in San Juan, Argentina. Following discussion of candidate GSSPs at the San Juan meeting, the need to visit the best sections is anticipated for final evaluation before proceeding to formal voting.

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

a. Approval, ratification, and dedication of the Green Point GSSP for the base of the Ordovician System.

b. Approval, ratification, and dedication of the Huangnitang GSSP for the base of the Darriwilian Stage (upper stage of Middle Ordovician Series).

c. Approval and ratification of the Diabasbrottet and Fågelsång GSSPs for the bases of the upper stage of the Lower Ordovician Series and the Upper Ordovician Series, respectively.

d. Significant progress on definition of series and stages for the Ordovician System with only two GSSPs remaining to be selected and approved by the Subcommission.

e. With publication in 2000 of *A Revised Correlation of Ordovician Rocks in the British Isles*, correlation charts have been completed for Ordovician rocks on all continents.

f. 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.

g. Organization of the 9th International Symposium on the Ordovician System in San Juan, Argentina, scheduled for August 2003, in conjunction with the 7th International Graptolite Conference and a Field Meeting of the Subcommission on Silurian Stratigraphy.

h. Publication of *Ordovician News* nos. 15-19 and the posting of nos. 16-19 on the Subcommission's web site.

i. 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.

j. 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.

k. 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."

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 WOGOGOB 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 (2003-2007)

a. Approval and ratification of GSSPs remaining to complete subdivision of Ordovician System with goal of completion and dedication by 2004.

b. 9th International Symposium on Ordovician System to be held in Argentina in August 2003.

c. Sponsorship of "Global Ordovician Earth Systems" symposium at 32nd International Geological Congress in 2004.

d. Redirection of Subcommission's focus to interdisciplinary investigation of the global Ordovician Earth system.

13. SUBMITTED BY:

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November 17, 2002

SUBCOMMISSION ON CAMBRIAN STRATIGRAPHY

ANNUAL REPORT 2002

1. TITLE OF CONSTITUENT BODY

Subcommission on Cambrian Stratigraphy.

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

a. To complete and publish regional correlation charts for the Cambrian System.

b. To develop a global stage-level chronostratigraphic classification of the Cambrian System. The Cambrian System is currently without formally agreed international stages. 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*.

The objectives of the International Subcommission on Cambrian Stratigraphy reflect a purely scientific approach to problems and methods of stratigraphy (biostratigraphy, lithostratigraphy, chronostratigraphy, sequence stratigraphy, chemostratigraphy, etc.), regional, intercontinental and global correlation as well as sedimentology and reconstruction of environmental conditions during the Cambrian. These problems are of world-wide significance, and their solution requires international and interdisciplinary cooperation so that the goals of the ISCS are consistent with the IUGS science policy.

3. ORGANIZATION

- Chairman, J. H. Shergold
- First Vice Chairman, E. Landing
- Second Vice Chairman, A. Yu. Zhuravlev
- Secretary, G. Geyer
- Past Chairman, M. D. Brasier

The ISCS executive has been re-elected unanimously for a second term following the 31st International Geological Congress in August 2000.

- Voting Members (19), see separate list
- Honorary Members (9), see separate list
- Corresponding Members (91), see separate list

The ISCS's voting members were selected to maintain a balance between regional experience and the expertise of various stratigraphic and paleontologic disciplines. Expertise is supplemented by corresponding members from individual countries or regions. Corresponding members are encouraged to communicate with ISCS working groups and the ISCS executive to actively participate in the development of a global stage-level chronostratigraphic classification of the Cambrian System.

Six Working Groups of the ISCS existed in 2002:

- The *Cambrian Subdivision Working Group* makes recommendations for global stage subdivisions.
- The *Regional Correlation Charts Working Group* is active in production of regional correlation charts for the Cambrian System.
- *Working Group on a* Glyptagnostus reticulatus *level GSSP*
- *Working Group on a* Cordylodus proavus *level GSSP*
- *Working Group on a* Acidusus atavus *level GSSP*
- *Working Group on the Yangtze Platform*

Seven additional ISCS Working Groups await formal ratification by the Voting Members:

- *Working Group on a* Ptychagnostus punctuosus *level GSSP*
- *Working Group on a* Oryctocephalus indicus *level GSSP*.
- *Working Group on Isotope Stratigraphy and Radiometric Dating*
- *Working Group on Dynamic Lithostratigraphy*

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.

The list of Corresponding Members indicates the geographically widespread interest in the activities steered by the *International Subcommission of Cambrian Stratigraphy* and the necessary amount of support. The *Institute for Cambrian Studies* supplied about US$ 7000 in grants-in-aid over the past decade to individual Subcommission members working on correlation charts and for support of the Third International Symposium on the Cambrian System in Novosibirsk in 1990 as well as the 5th International Field Conference on Cambrian subdivisions and the official meeting of the *Cambrian Stage Subdivision Working Group* in 1999.

5. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

The ISCS is traditionally affiliated with I.G.C.P. projects, particularly the following:

Project 376 (Laurentian-Gondwana Connections Before Pangea); and

Project 410 (The Great Ordovician Biodiversification Event; ranges from latest Cambrian to early Silurian).

Past projects include:

Project 29 (Working Group on the Precambrian-Cambrian Boundary)
Project 156 (Proterozoic and Cambrian Phosphorites)
Project 303 (Working Group on Precambrian-Cambrian Event Stratigraphy)
Project 319 (Global Paleogeography of Late Precambrian and Early Paleozoic)
Project 366 (Ecological Aspects of the Cambrian Radiation; until end of 1997).

The ISCS Chairman is a voting member of the *Cambrian-Ordovician Boundary Working Group* and *Cambrian Correlation Charts Working Group* coordinator.

6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2002

6.1 Regional correlation charts

Regional correlation charts were not published in 2002, but 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.

Preliminary works on the correlation chart on Laurentia have been accomplished. Other planned volumes include the correlation chart on Avalonia and on the Middle East.

Regional correlation charts published in previous years include:

The Cambrian System in the Near and Middle East 1983. R. Wolfart, compiler. J. H. Shergold and A. R. Palmer, eds. IUGS Publication 15, 72 pp.

The Cambrian System in Australia, Antarctica and New Zealand 1985. J. H. Shergold, J. B. Jago, R. A. Cooper, and J. H. Laurie, compilers. J. H. Shergold and A. R. Palmer, eds. IUGS Publication 19, 85 pp.

The Cambrian System in East Asia 1988. W. T. Chang, compiler. J. H. Shergold and A. R. Palmer, eds. IUGS Publication 24, 81 pp.

The Cambrian System on the East European Platform 1990. K. Mens, J. Bergström, and K. Lendzion, compilers. J. H. Shergold, A. Yu. Rozanov, and A. R. Palmer, eds. IUGS Publication 25, 73 pp.

The Cambrian System on the Siberian Platform 1991. V. A. Astashkin, T. Pegel', Yu. Shabanov, S. Sukhov, V. Sundukov, L. N. Repina, A. Yu. Rozanov, and A. Yu. Zhuravlev, compilers. J. H. Shergold, A. Yu. Rozanov, and A. R. Palmer, eds. IUGS Publication 27, 133 pp.

The Cambrian System of the Foldbelts of Russia and Mongolia 1995. V. A. Astashkin, T. Pegel', L. N. Repina, G. A. Belyaeva, N. V. Esakova, A. Yu. Rozanov, A. Yu. Zhuravlev, D. V. Osadchaya, and N. N. Pakhomov, compilers. A. R. Palmer, J. H. Shergold and A. Yu. Zhuravlev, eds. IUGS Publication No. 32, 132 pp.

6.2 Cambrian Working Groups

The major focus of activities in 2002 on the *Cambrian Global Subdivision Project* (CGSP) led to further progress on this field. A first phase served a general reconnaissance during

international field conferences of the *Cambrian Subdivision Working Group* in Morocco (1995), Spain (1996), eastern Canada (1997), Sweden (1998), the Great Basin area, U.S.A. (1999), Argentina (2000) and South China (2001). The scientific meetings focused on Cambrian global correlation levels and possible chronostratigraphic units.

G. Geyer and J. H. Shergold reviewed potential correlation (presented with explanatory remarks in *Episodes* issue 23 (3) (September 2000), p. 188-195; together with a comprehensive correlation table, assembled by G. Geyer, J. H. Shergold and S. Peng. Reviewed horizons included the lowest local occurrences of:

- *Cordylodus proavus*
- *Irvingella*
- *Glyptagnostus reticulatus*
- *Glyptagnostus stolidotus*
- *Agnostus pisiformis*
- *Leiopyge laevigata*
- *Ptychagnostus punctuosus*
- *Acidusus atavus*
- *Ptychagnostus gibbus*
- *Eliasum-Cristallium* assemblage
- *Oryctocephalus indicus*
- *Protolenus-Hamatolenus-Cobboldites-Orytocara* assemblage
- *Hebediscus attleborensis-Calodiscus-Serrodiscus-Triangulaspis* assemblage
- First occurrence of trilobites
- Sub-trilobitic Small Shelly Fossils

These activities of the CGSP Working Group are to a progressive agreement on a number of major chronostratigraphic levels in the Cambrian. The majority of the Voting Members attested a suitability for the reviewed levels for interprovincial and intercontinental correlation and their suitability as a stage- or series-boundary for the horizons in the younger part of the Middle Cambrian and the Upper Cambrian. A sixty percent plus majority of support was attained only by the *Cordylodus proavus*, the *G. reticulatus*, the *Pt. punctuosus*, *A. atavus*, the *Pt. gibbus*, and *O. indicus* levels, which indicated that only these horizons should be taken into consideration for closer examination as potential GSSPs.

Discussions on procedural matters about the way to arrive at Cambrian subdivisions followed led to a formal decison of the ISCS Voting Members that the way to arrive at Cambrian subdivisions should commence with the *selection of horizons* which allow a precise interprovincial and intercontinental correlation and which are suitable to define the bases of Cambrian subdivisions. Working Groups should then search for the *best sections* in which these levels might be found to establish a GSSP.

The clear majority support for defining the first Cambrian GSSP at the level of *Glyptagnostus reticulatus* and a similarly large agreement on the *Acidusus atavus* and the *Ptychagnostus gibbus* level as suitable for global subdivision suggested the installation of Working Groups. Other horizons that received a positive review are *Cordylodus proavus* level and the newly discussed *Oryctocephalus indicus* level.

A refined subdivision, however, can only be achieved with refined knowledge. The necessary next step was to commence assessment of suitable sections. Accordingly, the ISCS executive proposed to establish Working Groups for careful examination of candidate sections in respect to requirements to be satisfied. Those Working Groups on GSSPs include:

- Working Group on a *Cordylodus proavus* level GSSP
- Working Group on a *Glyptagnostus reticulatus* level GSSP
- Working Group on a *Ptychagnostus punctuosus* level GSSP
- Working Group on a *Acidusus atavus* level GSSP
- Working Group on a *Oryctocephalus indicus* level GSSP

In March 2001, the Voting Members and Honorary Members were asked to vote or, respectively, to offer their opinion about the FAD of *Glyptagnostus reticulatus* to define a Late Cambrian GSSP. All respondants agreed that the FAD of *Glyptagnostus reticulatus* should define the base of a global Late Cambrian stage, so that a *Working Group on a* Glyptagnostus reticulatus *level GSSP* was formally established, and experienced members asked to form a *Working Group on the G. reticulatus level*. A preliminary rating of the momentarily best known sections with diverse faunas that include the *G. reticulatus* level favored sections in Siberia, Southcentral China, Kazakhstan, Australia, and Laurentia.

An examination of potential GSSPs took place during the field excursions of the *China 2001* conference, when the occurrence of *Glyptagnostus reticulatus* and the rock successions were studied at the Wa'ergang, Wangcun and Paibi sections in Hunan, accompanied with examination of various aspects critical for the value of these sections for international correlation. The scientific session offered contribution to the *G. reticulatus* level issue. Coupled with South China 2001 were field activities of the Working Group on a *Glyptagnostus reticulatus* level GSSP.

Discussions during the *South China 2001* conference showed that only the Hunan sections and the sections in the Maly Karatau were generally regarded as suitable for a GSSP. Dr. G. Ergaliev was asked to assemble a required data set. A multi-person team (with Peng Shanchi, Nanjing, Loren E. Babcock, Columbus, OH, Richard A. Robison, Lawrence, KS, Lin Huanling, Nanjing, Margaret N. Rees, Las Vegas, NV, and Matthew R. Saltzman, Columbus, OH) performed additional studies in the Paibi section, Hunan, and submitted a formal proposal for a GSSP in this section to the *International Subcommission on Cambrian Stratigraphy* by January 2002.

This "Proposed Global Standard Stratotype-Section and Point for the Paibian Stage and Furongian Series" proposed the base of the first calcilutite layer containing the cosmopolitan agnostoid trilobite *Glyptagnostus reticulatus* in the Huaqiao Formation in the Paibi section (Peng et al., 2001a) as the base of a newly established **Paibian Stage** and of the equally new **Furongian Series** (as a synonym of the revised Upper Cambrian). The FAD of *G. reticulatus* in the Paibi section corresponds to a position 369.06 m above the base of the Huaqiao Formation according to the measured section of Peng et al. (2001b). This base of the Paibian Stage and Furongian Series corresponds to the base of the Waergangian Stage and Hunanian Series as used in South China (Peng, 1999; Peng et al., 1999, 2000a; Peng & Babcock, 2001).

The Paibian GSSP was the subject of a ballot by the Subcommission held in February-March 2002. Results of the ballot are as follows:

Name	**Vote**
J. H. Shergold (France)	Yes
G. Geyer (Germany)	Yes
P. Ahlberg (Sweden)	Yes
J. J. Álvaro (France)	Yes
L. Babcock (U.S.A.)	Yes
M. D. Brasier (U.K.)	No response
D. K. Choi (Korea)	Yes

G. Kh. Ergaliev (Kazakhstan)	Abstain
J. B. Jago (Australia)	Yes
V. V. Khomentovsky (Russia)	No response
P. D. Kruse (Australia)	Yes
E. Landing (U.S.A.)	No
E. Liñán (Spain)	Yes
M. Moczydłowska-Vidal (Sweden)	Yes
Peng Shanchi (China)	Yes
A. Yu. Rozanov (Russia)	No
S. R. Westrop (U.S.A.)	Yes
Xiang Liwen (China)	Yes
A. Yu. Zhuravlev (Russia)	Yes

In summary, from the 19 Voting Members 17 responses were received. There were 14 votes in favor, two against, and one abstain, which adds to a 82,4 percent agreement and thus the approval of the proposal.

The were four votes which expressed discomfort with the proposal, the criticism concentrating on an absence of a second candidate and the definition based on the occurrence aof a single species.

The proposal ("The Global boundary Stratotype Section and Point (GSSP) for the base of the Paibian Stage and Furongian Series (= uppermost series of the Cambrian) is defined at 369.06 m above the base of the Huaqiao Formation, Paibi section, NW Hunan province, south China. This level, which coincides with the lowest occurrence of the agnostoid trilobite *Glyptagnostus reticulatus* and is near the base of a large positive carbon-isotope excursion."), was submitted to the *International Commission on Stratigraphy* for ratification and was indeed ratified by the ICS on the meeting in Urbino, Italy, mid-June2002.

The clear majority support for defining the Cambrian GSSP at the level of *Ptychagnostus* (or *Acidusus) atavus* and the *Cordylodus proavus* level required a ballot for an approval of formal WGs. In June 2002, the Voting Members and Honorary Members were asked to vote or, respectively, to offer their opinion about the FAD of *Ptychagnostus* (or *Acidusus) atavus* and *Cordylodus proavus* to define a GSSP. The results are as follows:

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

From the 19 Voting Members, 18 responses were received. Seventeen of them agreed that the FAD of *Ptychagnostus* (or *Acidusus) atavus* should define the base of a global Cambrian stage, D. K. Choi abstained stating that he is not familiar enough with the problem to decide. There is a 60+ percent majority in favor for a *Working Group on a* Ptychagnostus (*or* Acidusus) atavus *level GSSP,* so that such a WG is formally established.

Attached to the ballot were two Questionnaires. One of them asked for suggestions of experienced members to form a *Working Group on the* Ptychagnostus/Acidusus atavus *level*. Suggested members of such a WG are (in loose order and without ranking)

> R. A. Robison*, L. E. Babcock*, Shanchi Peng*, G. Kh. Ergaliev*, J.B.Jago*, A. R. Palmer, B. Pratt, J. H. Shergold*, T. Pegel'*, L. Peregoedov, P. Ahlberg*, J. Laurie*, G. Geyer*, S. Westrop*, J. Adrain, L. McCollum*, M. Moczydłowska*, Zhu, D. K. Choi*, Sun Xiaowen, Zhang Wentang, E. Liñán, E. B. Naymark, and T. Yu. Tolmacheva. *[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 *Ptychagnostus/Acidusus atavus* level. The sections include Laurentia (Drum Mountain, Utah), Baltica, Siberia, Kazakhstan (Kirshabakty, Maly Karatau), Southcentral China (Wangcun section, Hunan), Vietnam, and Australia.

Laurentia	8	3	1		
Baltica	1	3	4	3	
Siberia		2	6	3	
Kazakhstan	1	5	4	2	
Southcentral China	3	4	4		
Vietnam				5	2
Australia	1	5	2	2	1

The numbers of ratings are less than the numbers of replies because some VMs did not rate, or rate all sections because of a lack of knowledge. Some of the section received an amazing wide range in the rating. This is only partly explained by concerns about the accessability (particularly addressed for Kazakhstan and Siberia) and which produced a downranking as explained in some replies.

A multi-person team (including L. E. Babcock, Columbus, OH, R. A. Robison, Lawrence, KS, and M. R. Saltzman, Columbus, OH) already started to perform additional studies in the Drum Mountain section, western Utah, United States, one of the prime candidate for such a GSSP. First results from these studies were presented by L. E. Babcock on the 7th *Conference of the Cambrian Subdivision Working Group* in Caunes-Minervois in September 2002.

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

From the 19 Voting Members, 18 responses were received until today. All of them agreed that the FAD of *Cordylodus proavus* should define the base of a global Late Cambrian stage so that there is a 60+ percent majority in favor for a *Working Group on a* Cordylodus proavus *level GSSP* and such a WG is now formally established.

Attached to the ballot were two Questionnaires. One of them asked for suggestions of experienced members to form a *Working Group on the* Cordylodus proavus *level*. Suggested members of such a WG are (in loose order and without ranking)

> E. Landing*, C. Barnes*, R. S. Nicoll*, J. E. Repetski*, J. H. Shergold*, J. Miller*, G. S. Nowlan*, Dong X.*, O. Bordonaro, Peng S.*, S. Bergström*, P. Ahlberg*, S. Dubinina*, R. Ripperdan, G. Geyer, and K. Müller. *[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 *Cordylodus proavus* level. Suggested candidate sections include northwestern Argentina, the Great Basin (Ibex Range, base of Skullrockian), the Black Mountain in Australia, China (Xiaoyanqiao, Jilin Province, Northeast China, Kazakhstan, and Canada (Northwest Territory).

Argentina	1		3	5	

Great Basin	6	4			
Australia	1	7	1	1	
North China	2	7		1	
Kazakhstan	1	3	2	1	
N.W.T., Canada		2	3	2	

The numbers of ratings are less than the numbers of replies because some VMs did not rate, or not rate all sections because of a lack of knowledge.

A major concern in three of the replies was that the resulting unit will be rather "thin", or short. ISCS Vice-Chairman Ed Landing added important general remarks (or provisos) about an uncritical use of *Cordylodus proavus*.

As correctly pointed out by HM A. R. Palmer, the work of such a WG has largely been done by the old Cambrian/Ordovician Boundary working group. A large body of relevant and useful literature already exists so that a decision on such a GSSP can probably be achieved rather quickly.

(c) Additional Working Groups

In addition to these existing Working Groups, further ballots will have to decide about the following potential WGs:

- Working Group on a *Ptychagnostus punctuosus* level GSSP
- Working Group on a *Oryctocephalus indicus* level GSSP.

The *Oryctocephalus indicus* level was already studied during the *China 2001* conference in the Kaili Formation at the Miaobanpo and Wuliu sections in Guizhou, and a small informal WG (including ISCS Members L. McCollum, F. A. Sundberg, and Zhu Maoyan) is already existing and active.

A *Working Group on Isotope Stratigraphy and Radiometric Dating* should be formed from the expertise of members within the subcommission. The major task of such a WG would be 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. A number colleagues have been contacted and agreed to participate.

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 August by the 2001 the *Deutsche Forschungsgemeinschaft* (DFG) and as a bilateral project by the *National Natural Science Foundation of China* (NSFC) for a period of three years. 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.

The Yangtze Platform, South China, offers a unique opportunity for this research. Sedimentary successions across the entire time interval have been preserved and are exposed throughout a large area. Facies variations across the Yangtze platform range from extreme shallow

water settings characterized by carbonates and phosphorites to the deeper water environments with black shales and cherts. Hydrothermal ore deposits are prominent in the Lower Cambrian. An association of fossil occurrences and ore deposits suggests a causal relation, possibly reflecting favorable habitats for chemosynthetic organisms. In this multidisciplinary study, integration of proxy-data from sedimentology, mineralogy, isotope and organic geochemistry and paleobiology through a network of eight individual research projects is envisioned to result in a full assessment of the interaction between environmental conditions and biological evolution.

6.3 7th Conference of the Cambrian Subdivision Working Group

The *VIII Conference of the Cambrian Stage Subdivision Working Group* was held in Caunes-Minervois in Languedoc, southern France, September 12-14, 2002. Field excursions took place during the conference and visited Cambrian sections in the Montagne Noire.

Institutions supporting or patronizing this meeting were: the International Subcommission on Cambrian Stratigraphy (ISCS), the Associatiation Paléontologique Française (APF), the Centre National de la Recherche Scientifique (CNRS, Upresa 8014); the Societé Géologie de France (SGF); the Comité Français de Stratigraphie (CFS); and the scientific Journal *Géobios*. The Organizing Committee consisted of ISCS VM J. J. Álvaro (Lille) S. Clausen (Lille), ISCS HM F. Debrenne (Paris), ISCS Chairman J. H. Shergold, and D. Vizcaïno (Carcassonne).

A total of 41 scientists from 12 countries (Australia, China, France, Germany, Poland, Russia, South Korea, Spain, Sweden, United Kingdom and the U.S.A.) attended the meeting, others sent posters for the sessions. Scientific sessions were held on September 12 and 13 in the Abbey of Caunes-Minervois. During these sessions 17 oral communications were made and 13 poster were presented, followed by a business meeting of the Working Group on the afternoon of September 13. The abstracts are published in a program and abstract volume edited by J. J. Álvaro and S. Clausen (Álvaro, J. J. & Clausen, S., eds., 2002. VII Conference of the Cambrian Stage Subdivision Working Group, International Subcommission on Cambrian Stratigraphy. Caunes, Minervois, September 12-14, 2002. Programme and Abstracts, 47 pp.).

Field excursions concentrated on the Cambrian sections of the Montagne Noire and took place on September 12 and Friday 13, when the Lower Cambrian (regional) stratotype in the Orbiel valley, the Middle-Upper Cambrian of Sallèles-Cabardès and the Middle Cambrian (regional) stratotype at Ferrals-les-Montagnes were studied in detail, including extended discussions on the stratigraphical problems. A further visit guided to the "Cave Museum of Palaeontology" of Berlou.

The relevant sections are described and discussed in a guidebook for the post-meeting excursion of the 2001 conference *Early Palaeozoic Palaeogeographies and Biogeographies of Western Europe and North Africa*. This volume was re-used for this meeting (The Cambrian and Lower Ordovician of the southern Montagne Noire: a synthesis for the beginning of the new century. J. J. Álvaro and D. Vizcaïno, eds.; published in *Annales de la Société Géologique du Nord*, 2e série, vol. 8, fasc. 4, p. 183-242.)

6.4 Topical Session on the Geological Society of America Annual Meeting

ISCS Officers E. Landing and G. Geyer organized a Topical Session on the Geological Society of America Annual Meeting in Denver, CO, October 29, 2002, titled "Reconstructing the Cambrian World: Temporal and Spatial Changes in Physical and Biotic Environments." This session presented twelve talks by 28 scientists from four countries. The abstracts of these talks were published in the Geological Society of America 2002 Annual Meeting, Abstracts with Programs volume.

6.5 Additional meetings of the ISCS

An executive meeting of the ISCS took place in December 2001 in Würzburg, Germany. During the meeting general business plans were discussed. In addition, the participants set up a working plan for the activities during 2002 to 2004 and clarified priorities in the ISCS policy. ISCS Secretary G. Geyer and ISCS Vice-Chairman E. Landing met in Würzburg in September 2002 to discuss possible activities of the ISCS concerning the western Gondwana and Avalonia regions.

6.6 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 of the last decade and completed first in card files by A. R. Palmer. An electronic databases were then developed and is now available as files in a so-called SYNPLUS program. This program, generated by A. R. Palmer (Institute for Cambrian Studies, Boulder, CO) and E. Fowler (Acton, CA), was presented publicly on the 7th Conference of the Cambrian Subdivision Working Group in Caunes-Minervois in September 2002 (see Palmer, 2002, under 9.1) and 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.

6.7 Homepage of the International Subcommission of Cambrian Stratigraphy

The updated internet homepage of the *International Subcommission on Cambrian Stratigraphy*, which can be accessed now under the new address

http://www.uni-wuerzburg.de/palaeontologie/ISCS/index.html

and with a revised layout. This homepage, maintained by G. Geyer, is under permanent revision and presents a section with reports and announcements of the Subcommission as well as a general section which presents an overview of Cambrian general bio- and chronostratigraphy, paleontology, and regional litho- and biostratigraphy. Kevin Evans recently offered help with a mirror site for North America.

6.8 Chief products in 2002

The period 2001/2002 brought again a large number of important publications on the Cambrian. We registered more than 300 articles, books, and abstracts published in 2001 and in 2002, which deal, at least in part, with aspects of Cambrian stratigraphy. Articles that focus purely on stratigraphy are a significant part among them.

A set of thematic reports on the Cambrian subdivisions was presented on the 7th Conference of the Cambrian Subdivision Working Group, held in Caunes-Minervois, southern France, September 12-14, 2002. Thirty-six abstracts are included in a program and abstract volume edited by J. J. Álvaro and S. Clausen (Álvaro, J. J. & Clausen, S., eds., 2002. *VII Conference of the Cambrian Stage Subdivision Working Group, International Subcommission on Cambrian Stratigraphy. Caunes, Minervois, September 12-14, 2002. Programme and Abstracts*, 47 pp.).

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NOTE: A compilation of important publications on stratigraphic aspects of the Cambrian are posted on the Cambrian web site: *www.uni-wuerzburg.de/palaeontologie/ISCS/index.html.*

7. CHIEF PROBLEMS ENCOUNTERED IN 2002

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 pursue is limited to a number of critical ISCS members, which would need a substantial financial support to visit Subcommission meetings and conferences. Both the ISCS chairman and the ISCS Secretary are momentarily without a position or without a permanent position and therefore have limited access to funding of scientific activities.

8. SUMMARY OF EXPENDITURES IN 2002 (ANCIPATED THROUGH MARCH 2003):

A) 2002 Income

a. ICS subvention	Euro	3200.00
b. Carry-over from 2001, DM 771,62	Euro	394.52
c. Bank interests	Euro	14.13
Total funds available, 2002	Euro	3608.65

B) Expenditures obligated

a. General administrative expenses (e-mail, fax, postage, photocopying, paper, printer supplies, misc.)	Euro	46.80
b. Executive attendance funds and organization of the 8th Field Conference, Montagne Noire 2002	Euro	1239.04
c. Partial reimbursement of travel expenses for regular executive meetings in Würzburg	Euro	350.00
Total expenses, 2002	Euro	1635.84
Remainder above expenses, 2002	Euro	1972.81

9. WORK PLAN, CRITICAL MILESTONES AND ANTICIPATED RESULTS TO BE ACHIEVED FOR 2003 and 2004:

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. Further such meetings are planned as follows:

The 9th Field Meeting of the Cambrian Subdivision Working Group of the International Subcommission on Cambrian Stratigraphy is tentatively planned to be held in July/August 2003 in

Albany, NY, U.S.A., with field excursions to the Taconic slice in the New York State, Massachusetts, and Vermont. The meeting will be organized by E. Landing (Albany, NY).

South China 2003, an "International Symposium on the Cambrian Fossil-Lagerstätten in Guizhou Province, China" will be held in Guiyang, end of August 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.

The *Fourth International Symposium on the Cambrian System* is planned to be held in China in 2004, organized by members of the Nanjing Insitute of Geology and Paleontology, Academia Sinica, particularly ISCS Members Peng Shanchi and Zhu Maoyan. Pre- and post-symposium excursions will offer the possibility to visit a number of Cambrian localities in China, such as Yunnan, Guizhou, Hunan, Xinjiang, and Liaoning. The field excursion in South Korea is planned to take place in addition to this meeting to enable the visit of Upper Cambrian fossil localities.

The newly developed Working Groups will lead to smaller and more specified meeting at various potential GSSPs. Planning of such special meeting is momentarily in process and includes a field campaign in Utah, United States, in 2003, and a field campaign in Hunan, China, in 2003.

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 chose 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: June 2002).

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* and a *Working Group on a* Cordylodus proavus *level GSSP*, were formally established, and towards the beginning of 2003 a *Working Group on a* Ptychagnostus punctuosus *level GSSP* and a *Working Group on a* Oryctocephalus indicus *level GSSP* will be formally established.

Further progress is to be made to lay the foundation of a subdivision of the Lower/Early Cambrian, which would be extremely difficult on the basis of the available data. The Subcommission 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.

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 metamorphosis 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.

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.

9.3 Anticipated results and products 2003

(a) 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. Moczydowska, 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 2003.

A. R. Palmer, lead coordinator of the Laurentia volume, announced to expect rapid progress after completion of the trilobite synonymy files (see 12.3).

(b) Working Group activities

Although the Cambrian Subdivision project has the highest priority among the activities of the ISCS, 2003 will be mainly dedicated to collect data on the various GSSP candidates to be selected. These data will be a major source of publications of various stratigraphical aspects. Particularly the *Working Group on a* Acidusus atavus *level GSSP* should trigger a wealth of new results as a core group examining one of the prime GSSP candidates (Drum Mounntains, 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.

Most active are the members of the *Working Group on the Yangtze Platform*, which partly interface with the *Working Group on a* Ptychagnostus/Acidusus atavus *level GSSP* and the proposed *Working Group on a* Oryctocephalus indicus *level GSSP*. 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.

(c) Synonymy Files

The principal project of the *Institute for Cambrian Studies* is in the process of developing electronic data bases for objective synonymy files on the major groups of Cambrian organisms. The trilobites, completed in card files over the last years, are now available as electronic files in a so-called SYNPLUS program, by A. R. Palmer (Institute for Cambrian Studies, Boulder, CO) and E. Fowler (Acton, CA).

F. Debrenne has prepared files for the archaeocyaths, S. Bengtson for small shelly fossils, G. Geyer commented files on Eodiscina. These files are still in progress. The *Treatise on Invertebrate Paleontology* group at Kansas University is in the process to develop Paleobank, a sophisticated database and retrieval system for all invertebrate groups.

Nevertheless, members of the ISCS are seeking for acceptable conditions to make available data files on modern electronic devices.

10. BUDGET AND ICS COMPONENT FOR 2003

A) Income

Carry-over from 2002, 1972.81Euro	US$	1967.09

B) Planned Expenditures

a. Organization of 2003 Field Conference, Albany	US$	1000.00
b. Preparation of the 4th Internat. Symp. on the Cambrian System	US$	750.00
c. Executive and VM attendance funds for meeting during the Field Conference	US$	1800.00
d. Postage for Annual Newsletter and other materials	US$	120.00
e. Regular executive meetings	US$	600.00
f. General administrative expenses (postage, fax, e-mail, photocopies, paper, printer supplies, misc.)	US$	50.00
Total 2003 planned expenses	US$	4320.00

C) ICS 2003 budget request

Total ICS 2003 budget request	US$	2352.91

D) Potential funding sources outside IUGS

Logistical, financial and publication funding of ISCS activities (direct or indirect) in 2002 came from a number of sources, namely the

Chinese Academy of National Sciences,
National Science Foundation of the U.S.,
National Science Foundation of China,
New York State Museum, Albany,
Institut für Paläontologie, Würzburg.

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.

a) 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; M. E. Taylor, Secretary-Treasurer; L. E. Babcock, Vice Chairman; J. H. Shergold, N. Hughes).

b) 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. The Nordisk Energiforskningsprogram organized a Seminar termed *1st Nordic-Baltic Cambrian Geo-Energy Seminar*, 15-16 September 2001, Jægersborg-Gentofte, Denmark. This documents the economic interest of Cambrian deposits.

13. SUBMITTED BY:

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Date: 2 November, 2002

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Date: 2 November, 2002

APPENDIX -- VOTING MEMBERSHIP OF THE SUBCOMMISSION ON CAMBRIAN STRATIGRAPHY (ISCS)

Dr. John H. Shergold (France)
Prof. Dr. Per Ahlberg (Sweden)
Dr. J. J. Álvaro (France)
Dr. Loren Babcock (USA)
Dr. Martin D. Brasier (UK)
Prof. Duck Keun Choi (Korea)
Dr. G. Kh. Ergaliev (Republic of Kazakhstan)
Dr. James B. Jago (Australia)
Dr. V. V. Khomentovsky (Russia)
Dr. P. D. Kruse (Australia)
Dr. Ed Landing (USA)
Prof. Dr. Eladio Liñán Guijarro (Spain)
Prof. Dr. M. Moczydlowska-Vidal (Sweden)
Prof. Peng Shanchi (People's Republic of China)
Prof. Alexey Yu. Rozanov (Russia)
Prof. Dr. Stephen R. Westrop (USA)
Dr. Xiang Liwen (China)
Prof. Andrey Yu. Zhuravlev (Russia)

SUBCOMMISSION ON THE TERMINAL PROTEROZOIC PERIOD

ANNUAL REPORT 2002

1. TITLE OF CONSTITUENT BODY

Subcommission on the Terminal Proterozoic Period

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 chairman (A.H. Knoll, USA), vice-chairman (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.

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 subcommission 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

Historically, the Subcommission worked closely with IGCP Project 320 (Neoproterozoic Events and Resources), now completed. We also had ties to the more recently completed IGCP Project 303 (Late Proterozoic and Cambrian Event Stratigraphy -- which covers Precambrian-Cambrian boundary events but not earlier terminal Proterozoic stratigraphy) and are in contact with IGCP Project 319 (Global Paleogeography of Late Precambrian and Early Paleozoic), and IGCP Project 366 (Ecological Aspects of the Cambrian Radiation).

6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2001, and Chief Problems in 2002

In 2000, we reached agreement to place the initial GSSP for the terminal Proterozoic period at the base of the "cap carbonate" that overlies the Marinoan glaciation beds, which is the recovery from the "almost-Snowball Earth" episode. The age of this event is between 620 and 630 Ma.

The oldest Ediacaria fauna appear in the geological record after the termination of a later glaciation episode (Gaskiers, named after sections in Newfoundland). This Ediacaria appearance is dated at about 575 Ma, and carbon isotopic trends suggest that the driving cause was increasing atmospheric oxygen levels, although recovery from major glacial episodes may have also played a role.

A formal ballot was prepared asking members to indicate preference for one of four proposed type areas for the GSSP. One contender is in the Flinders Ranges of Australia, but other regions have strong potentials. If one candidate receives a strong majority of votes, we will press on with a final ballot, specifying precise GSSP location. An independent and simultaneous ballot will decide on a formal name for the Period (sure to be controversial).

7. CHIEF PROBLEMS ENCOUNTERED IN 2002

However, during 2002, personal difficulties on the parts of several key subcommission members slowed our progress in completing and distributing this ballot, but it is now finished and will be distributed by the Vice-Chair in December 2002.

Lack of initiative by many subcommission members continue to pose problems. After a decade of exciting discoveries and global correlations within the late Proterozoic, it is difficult to maintain the momentum for the relatively boring aspects of formalizing GSSPs and nomenclature. The current mandate of the terminal Proterozoic subcommission will soon be completed. Certainly, the subcommission will have finished its task by the time of the 2004 IGC. 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.

See attached statement.

8. SUMMARY OF EXPENDITURES IN 2002 (ANCIPATED THROUGH MARCH 2003):

As noted under "chief problems", we did not yet expend the $200 contribution from ICS for the ballot mailing costs.

9. WORK PLAN, CRITICAL MILESTONES AND ANTICIPATED RESULTS TO BE ACHIEVED FOR 2003-2004:

We will press on with a final ballot, specifying precise GSSP location and (sure to be controversial) name of the period. This will bring the current incarnation of the subcommission to its

conclusion. We will complete our deliberations by means of newsletters. Should a GSSP be recommended and approved, we will prepare a paper for *Episodes* describing the new period.

Quite simply, we plan to submit our recommendation for an initial GSSP for the terminal Proterozoic period and complete our work.

10. BUDGET AND ICS COMPONENT FOR 2003

No funds are requested for 2003. The carryover from 2002 will be adequate for mailing costs, and most communications will be via Internet.

13. SUBMITTED BY:

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November 28, 2002

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Statement about Problems in 2002

Because of the unusual circumstances governing this year's subcommission activities, or lack thereof, I am appending a brief explanatory document to the annual report. The past year has, in effect, been a failure. I accept my share of the blame for this. To be frank, family health issues have been all-consuming for me during the past two years, leaving me with limited time and energy to devote to subcommission activities. That said, we did complete a newsletter containing a ballot for the second stage of the vote on GSSP placement more than a year ago, but the newsletter has languished unsent in the office of our secretary, Guy Narbonne. Guy experienced significant family problems as well, and I have been sympathetic to his personal issues. Nonetheless, we haven't been able to induce any action. Two weeks ago, in desperation, Malcolm Walter agreed to reconstitute and send the newsletter/ballot. Guy's problems and mine certainly explain the main portion of our subcommission's inactivity, but that doesn't let the rest of the membership off the hook. The number of people, distributed internationally, who have promised to complete tasks and not delivered is high.

Frustratingly, the final stages of completing our subcommission's initial charge come as major issues in Neoproterozoic stratigraphy are finding resolution. It is now increasingly clear that there were three major ice ages and, likely, a fourth, earlier glaciation limited to Africa. The Marinoan ice age, of global extent, is now constrained to be older than 600 Ma and younger than 650 Ma; unpublished U-Pb zircon ages on ash beds suggest that the age will center close to 620 Ma. A post-Marinoan ice age is more precisely constrained to be 580 Ma. Moreover, the nature and isotopic composition of carbonates immediately below and above the three major ice ages can be differentiated, immeasurably improving confidence in correlations. A distinctive biostratigraphic signal characterizes the interval between the two younger ice ages, and a remarkable C-isotopic event

occurs at what should be recognized as a globally correlatable Proterozoic-Cambrian boundary. Radiometric dates firmly establish the age of the oldest microscopic animal remains (599+/-4 Ma), the oldest Ediacaran assemblages (575+/-1 Ma), the C-isotopic anomaly at the end of the terminal Proterozoic Period (543/-1Ma), and several points of change in the highly distinctive C-isotopic profile that runs through the terminal Proterozoic interval. In its first ballot, the subcommission approved placement of the initial GSSP for the terminal Proterozoic period at the base of the cap carbonate overlying a Marinoan tillite. In the second ballot, voting members are asked to choose among four nominated candidate sections in Australia (2), India, and China.

How do we reach the goal line? I believe that Malcolm Walter and I can oversee the current newsletter and the ballots needed to complete the subcommission's recommendation, and I am hopeful that this task can be completed in time for the 2004 IGC. At that point, the subcommission will need new focus, new leadership, and to a significant degree, new membership. I believe that the subcommission can best be revitalized by a new challenge, and to this end urge that the **ICS consider expanding the group's purview to include the entire Neoproterozoic -- with the aim of establishing a geochronologically based Sturtian Period**.

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Appendix : Terminal Proterozoic Subcommission Membership

Chairman: Andrew H. Knoll (USA)
Vice-Chairman: Malcolm Walter (Australia)
Secretary: Guy Narbonne (Canada)

Additional Voting Members:
John Shergold (France; Chairman, Cambrian Subcommission)
Richard Jenkins (Australia)
Wolfgang Preiss (Australia)
Hans Hofmann (Canada)
Sun Weiguo (China)
Xing Yusheng (China)
Janine Sarfati (France)
Gopendra Kumar (India)
Anna Siedlecka (Norway)
Mikhail Fedonkin (Russia)
Mikhail Semikhatov (Russia)
Gerard Germs (South Africa)
Laurence Robb (South Africa)
Martin Brasier (UK)
Brian Harland (UK)
Ian Fairchild (UK)
Nicholas Christie-Blick (USA)

INTERNATIONAL SUBCOMMISSION ON STRATIGRAPHIC CLASSIFICATION

ANNUAL REPORT 2002

1. TITLE OF CONSTITUENT BODY

International Subcommission on Stratigraphic Classification (ISSC)

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

TILL AUGUST 2002

Chairman Alberto Riccardi (Argentina),
Vice-chairman Maria Bianca Cita (Italy)

SINCE AUGUST 2002

Chairman Maria Bianca Cita
Secretary and web-master Maria Rose Petrizzo
No vice-chairman elected

The Subcommission consists of Chairperson, and Secretary, who are Voting Members of the Subcommission. Three categories of voting members belonged to the Subcommission: ex-Officio,

individual and organizational, totaling over 70 persons from 29 countries. Other 18 Voting Members, each with defined areas of expertise will be appointed soon hopefully before end February, 2003. In addition to the Voting Members there are numerous Corresponding Members, whose experience, expertise and corporate memory are essential in order to accomplish the ISSC overall objectives.

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

The Subcommission does not receive financial support from outside IUGS-ICS, except for office support (computer, access to internet services, telephone, etc.) from the host institutions (University of Milano and Museo de la Plata in Argentina). Members obtain individual (personal?) research or conference grants for activities related to the Subcommission.

5. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

ISSC has always been directly or indirectly linked to big international projects such as ODP and IGCP. Under the new chairmanship the interaction will be strengthened.

6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2002

Under Alberto Riccardi chairmanship.

- An ISSC website, linked to the ICS and IUGS websites, was made available on-line from January 2002 (*www.geocities.com/issc_arg* , which is on a commercial site).
- Two Circulars (no. 100 and no. 101, January 25 and July 31, 2002) were distributed. Besides administrative matters, they included information on: 1) the Hedberg Research Conference on "Sequence Stratigraphic and Allostratigraphic Principles and Concepts"; 2) the ISSC WG on Sequence Stratigraphy; 3) the second report of the WG on Cyclostratigraphy; 4) ISC News, including the First Conference on Future Directions in Stratigraphy; 5) a listing of some new publications on stratigraphic classification, etc.; and 6) four documents on stratigraphic matters.
- The Working Group on Sequence Stratigraphy (WG), under the co-ordination of Amos Salvador, produced Memo 22 (December 10, 2001) and Memo 23 (March 25) (2002), where he concluded that it was time to disband the WG and informed "that the WG concluded that the concepts and terminology of sequence stratigraphy are still in a developing stage and that some more time should be allowed for this stratigraphic methodology to evolve and consolidate before an attempt can be made to revise its concepts and terminology". This proposal is now under consideration by the ISSC membership.
- Preparation of a glossary of stratigraphic terms in several languages is being organized under the direction of Prof. I. Chlupác (Czech Republic). The Glossary has already been translated into several languages (Spanish, Russian, German, Portuguese, Bulgarian, Czech, Slovak, Catalan). It is expected that the Glossary in English, French, Spanish, Russian, Italian, German and Portuguese will be ready for the end of 2002.
- The WG on Cyclostratigraphy, formed by F. Hilgen, W. Schwarzacher and A. Strasser analyzed comments received on a first report and on that basis produced a final report which was circulated in ISSC Circular 101 and is now being considered by the ISSC membership.

Chief Products in 2002 (Alberto Riccardi chairmanship)

- ISSC Circulars No. 100 (January 25, 2002) and 101 (July 31, 2002).
- Memo 22 (December 10, 2001) and Memo 23 (March 25,2002), of the Working Group on Sequence Stratigraphy.
- Final report of the WG on Cyclostratigraphy, titled "Concept and Definitions in Cyclostratigraphy".
- ISSC website (available from January 2002), linked to ICS and IUGS websites.
- Publication of the Japanese translation of the International Stratigraphic Guide (The Geological Society of Japan) and the Russian translation of the ISG – Abridged Version.
- Publication of the Guide Abridged Version (2002) in Lithuania (English version).

Under M.B. Cita chairmanship.

The elaborated informative and efficient web-site put together by Alberto Riccardi in La Plata (Argentina) greatly facilitated the turnover to the new chairman in Milano (Italy).

Dr. Maria Rose Petrizzo, a post-doc at the Department of Earth Sciences in Milano specializing in Cretaceous stratigraphy and with a broad international experience, including ODP (as shipboard and shore-based scientist) was appointed as Secretary and web-master of ISSC.

A letter was sent to all past members (ex-officio, individual and organizational) as a test of their interest in future activities of the Subcommission: the prompt, positive and mostly enthusiastic response was encouraging, but a reshaping of the Subcommission and a rejuvenation of membership is necessary. It will be accomplished with most care in the next few months. A new style of frequent and rapid communication via e-mail already proves to give fruitful results.

7. CHIEF PROBLEMS ENCOUNTERED IN 2002

Under Alberto Riccardi chairmanship.

Slow response from members. Difficulties in reaching an agreement within the WG on Sequence Stratigraphy. Postponement in forming a new WG to analyse Chemostratigraphy as a new category of stratigraphic classification.

8. SUMMARY OF EXPENDITURES IN 2002 (ANCIPATED THROUGH MARCH 2003):

I. INCOME	US DOLLARS
Carry-over from 2000	--
2002 ICS subvention	800.00
Total Receipts	**800.00**

II. EXPENDITURES	US DOLLARS
Exchange charges	31.00
Mail	564.42
Website expenses	112.90
Office material	97.70
Printing	199.20
Total Expenses	**1005.22**

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

As pointed out during the Urbino meeting "Conference on Future Directions in Stratigraphy" organized by ICS, three steps characterize the activity of the Subcommission (from Report on ISSC by M.B. Cita, in ISSC Circular no.101, Appendix J). "Step one: principles and concepts. The development of new techniques usable in Stratigraphy such as magnetostratigraphy, isotopic stratigraphy, orbitally controlled cyclostratigraphy etc. have to be monitored and - when ripe - formally defined. This is subject to change through time - needs updating. Step two: procedures. Once established, they have to be maintained (see procedures for the establishment of GSSP, by ICS Chairmen Cowie - in 1986 - and Remane et al. in 1996). This is mandatory. Step three: applications. Applications of the principles and procedures, as applied in different countries by different entities and within different cultural environments (such as Geological Surveys, undergraduate and graduate teaching, professionals) have to be monitored and discussed from time to time. Applications are very important in themselves: they are useful to test that the concepts and procedures are correct, clear and well expressed".

It is not foreseen that final documents of the two Working Groups appointed in the last year will result soon in new chapters of the International Guide, either because no final document was presented (as is the case for the Sequence Stratigraphy WG), or because the document produced is not considered satisfactory (as is the case for the Cyclostratigraphy WG).

These two themes are very important and will, by no way, be dropped, but some re-thinking and understanding the reasons behind these unsuccessful outcomes are required before appointing new Task-Groups.

Strenuous efforts by the new Chairman are focused to call a Special meeting (Symposium ? or Workshop ?) of ISSC at the 2004 IGC in Florence to discuss all critical points and dress a new long-term research plan, based on a clarified and widely international background.

Critical milestones for the near future are considered.

- A clarification on the concepts of unconformity-bounded stratigraphic units.
  - Has the same terminology to be used for surface and subsurface units?
  - Is it appropriate to assimilate paralic environments from cratonic areas as exemplified by the synthem/mesothem/cyclothem model of Ramsbottom (1997) with foreland basins, or thrust-top basins, or piggy back basins of orogenic belts?
  - Are volcanic products accumulated on land or on the seafloor, originated by processes which are discontinuous in space and time, to be assimilated to normal sediments and classified accordingly?
  - Are Quaternary continental deposits from glaciated or periglacial or fluvial or desertic areas to be classified according to the standard rules, or they require a special treatment since the basic principles of superposition and of correlation cannot be applied to them?
- Update of lithostratigraphy.
  - Are the rules of stratigraphic classification applicable to non-sedimentary, non-layered rocks? (most petrologists say they are not).
- Update of cyclostratigraphy.
  - Are astronomically controlled cycles recorded in pelagic sections, or in lacustrine deposits, or in ice-cores in continuous deposition, different in nature from other cyclically repeated sedimentary successions?

10. BUDGET AND ICS COMPONENT FOR 2003

(a)	General office expenses	400,00 Euro
(b)	ISSC Newsletter no 102 and 103	500,00 Euro
(c)	Contribution towards cost to finalization and Publication of Chlupac's multilingual Glossary of most common stratigraphic terms	400,00 Euro
(d)	Contribution towards cost of web-site	400,00 Euro
(e)	Contributions to Conveners to help costs of Task Groups	1000,00 Euro
(f)	Support for meetings	2000,00 Euro
	TOTAL BUDGET REQUEST	4700, 00 Euro

Potential Funding Sources

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) 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 LAST FIVE YEARS (1998-2002)

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-chairman M. B. Cita was a member of the ad-hoc Working Group of experts.
- Creation and world-wide distribution of nine ISSC Circulars:
  - Circular 93 (May 26, 1998)
  - 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)
- 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 flavour 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, micropleontologists, 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 interpretative definitions. Formalization ensures stability in nomenclature, which is important, but formalization of non observational entities has to be discouraged."

- Participation to the Urbino Meeting (June 13-16, 2002) by the ISSC vice-chairman M. B. Cita and presentation of a tentative work-plan or list of problems to be focused: "ISSC purpose is and has been to reach a consensus on stratigraphic terminology and classification by creating, discussing, publishing and disseminating an internationally agreed upon Guide (that means standardization of the stratigraphic units)….The Guides are not conceived as treatises on stratigraphy, but as practical instruments to explain the concepts and their formal applications…....Applications of the principles and procedures, as applied in different countries by different entities and within different cultural environments have to be monitored and discussed from time to time".

12. OBJECTIVES AND WORK PLAN FOR NEXT 5 YEARS (2003-2006)

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.

I do hope that with the new entries now in the stage of negotiations and with the invaluable help of e-mail, a new era on "post-Hedberg Developments in Stratigraphic Classification" is approaching.

In other words, we are now in a transitional stage: change in style but not in scope!

13. SUBMITTED BY:

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Date: 15 November 2002

STRATIGRAPHIC INFORMATION SYSTEM

ANNUAL REPORT 2002

TITLE OF CONSTITUENT BODY

Stratigraphic Information System (SIS), a focused working group under ICS

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 Subcommission 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 Subcommission 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:

(1) Stratigraphic Database Center and Links.

- **Geological and biological events in Earth history.** Integrated graphic correlation database of important geological (e.g., geochemical and paleomagnetic cycles, event beds) and biological components (e.g., biostratigraphic and evolutionary databases), with radiometric ages.
- **Facies stratigraphy.** Database of outcrop and core sections. Iconographic atlases showing types of siliciclastic and carbonate macro- and microfacies, diagnostic sedimentary structures, ichnofossils/ ichnofabrics and ichnofacies, etc., including, wherever possible, interpretations, paleogeographic/ facies models, and references (link with item 4).
- **Paleogeographic and Paleoclimatic Maps.** Database sourced from the published literature, ongoing research, and from still unpublished M.Sc./ Doctorate research results; temporal-spatial GIS-type displays.
- ***Continental ecosystems.*** Stratigraphic correlations, distribution of paleoclimatic indicators, and the relationship (depositional and time-equivalence of events) of continental ecosystems with adjacent marginal marine basins.

- ***Marine ecosystems.*** Paleoclimatic belts, approximate paleobathymetric contour curves, areas of paleo-upwelling, phosphate deposits, black shales, carbonate platforms, turbidites, major trends of surface and bottom currents.
- **Iconographic Atlases.**
- ***Index fossil species: systematics, biostratigraphy and paleoecology.*** Iconographic atlases of stratigraphically significant fossil groups (ammonites, inoceramids, foraminifers, ostracodes, radiolarians, calcareous nannofossils, palynomorphs), to be accompanied by biostratigraphic frameworks for the various basins worldwide.
- ***Biostratigraphy in thin-sections.*** Atlas of index fossil species (e.g., foraminifers, radiolarians, pithonellid calcispheres, calpionellids, roveacrinids) examined in thin sections, illustrating the diagnostic features.

(2) Geologic Time Scale Information.

- **Standard Geological Time Scale.** Subdivisions and GSSPs; age dates; orbital cycles; and absolute time scale; translation of the standard time scale in other languages (e.g., Chinese, Arabic, Spanish, Portuguese, French, German, etc.).
- **Stable isotope and geochemical curves.** Isotope stratigraphy (Sr, C, O) for the Mesozoic and Cenozoic.
- **Paleomagnetic and sequence chronology.** The Geomagnetic Polarity Time Scale (GPTS).

(3) Stratigraphic Standards & Lexicons.

- **Stratigraphic Code (on-line):** with short-term working groups for revisions, as required.
- **Standards of applied techniques on Stratigraphy :** Geochronology, Isotope Stratigraphy (C, O and Sr), Chemostratigraphy, Molecular Organic Geochemistry, Facies Stratigraphy, Magnetostratigraphy, Event Stratigraphy, Cyclostratigraphy, Sequence Stratigraphy.
- **Regional lithostratigraphic frameworks and time scales**: with definitions of regional lithostratigraphic units, photos of type-sections, chronostratigraphic correlations, and references.
- **Regional biozonal schemes:** with definitions of zones and type-sections (link to the iconographic atlases of index fossil species). This would have the enormous advantage of making easily accessible the regional lithostratigraphy and time scales of basins worldwide, with links to related data-bases.
- **Links:** to all stratigraphic lexicons in the world.

(4) Geohistory Education Site & Links (Teaching & Research).

- **Virtual Field-Trips to Key Type-Sections:** stratotypes, GSSP's, stage boundaries, with location maps; digital gallery of key stratigraphic photos with zoom showing details of beds down to thin sections (e.g., set of pictures of all ratified GSSP sections); drawings of stratigraphic charts with litho-, magneto-, isotope-, chemo-, and biochronostratigraphy; distribution charts of fossils, composite graphic correlation of key markers, etc.; published references and non-published theses on the area.
- **Quantitative Biostratigraphy Programs:** Interest in quantitative biostratigraphy is flourishing, and there is demand for teaching modules of key techniques and its computer programs. Hence, compact demonstration modules are being prepared of the three methods Unitary Association (UA), Ranking and Scaling (RASC) and Constrained Optimization (CONOP) that can be downloaded via the SIS/ICS master website.
- **Easy-to-follow Teaching Guides:** quantitative techniques of stratigraphic interpretation,

chemostratigraphy, cyclostratigraphy, and Sr-stratigraphy, applied techniques to sequence stratigraphy: state-of-the-art, among others.

Fit within IUGS Science Policy.

The objectives of the Subcommission relate to the following main aspects of IUGS policy on Stratigraphy:

- Publish a standard and global geologic time scale, and prepare and publish global correlation charts, with explanatory notes.
- Compile and maintain a stratigraphic data base center for the global earth sciences.
- Unify regional chronostratigraphic nomenclature by organizing and documenting stratigraphic units in a global data base.
- Promote education in stratigraphic methods and disseminate stratigraphic knowledge.
- Define the principles of stratigraphic classification, terminology, and procedure, and publish them in guides and glossaries.

3. ORGANIZATION

The Subcommission is organized by a Bureau consisting of Chairperson, Vice-Chairperson and Secretary, who are all Voting Members of the Subcommission. The objectives of the Subcommission will be pursued by thematic Task/Working Groups, which will be arranged according to the primary and subordinate goals of the Subcommission, and coordinated by Conveners who will be responsible for stimulating and coordinating contributions to SIS in their fields of expertise. In addition, Voting Members and Corresponding Members, who will have the responsibility for liaison between the Subcommission and researchers, and for disseminating information about the Subcommission work, will be designated.

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

The SIS Subcommission does not receive financial support from outside IUGS-ICS, except for administrative office support (computer, access to internet services, telephone, fax, etc.) from the host institutions of the Bureau.

5. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

The Subcomission will have a close interaction with ***CHRONOS***, a U.S.A. national initiative sponsored by the U.S. National Science Foundation (NSF) Geoscience Directorate to develop a network of interactive chronostratigraphy and stratigraphic databases. In addition, SIS will interface and collaborate with the NEPTUNE database Project, a stratigraphic information system about Cenozoic marine microfossils biogeochronology of the DSDP and ODP, currently curated by Michael Knappertsbusch (Natural History Museum, Basel). It is also important to note that several active participants of the late IGCP Project 381 (South Atlantic Mesozoic Correlations), which was concluded on February 2000 and coordinated by project leaders E. Koutsoukos (current SIS

Chairman) and Peter Bengtson (University of Heidelberg), have demonstrated their support and willingness to actively collaborate with SIS, and shall play an important role in fomenting specific Task Group activities.

6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2002

The year 2002 was essentially a year of organizing the Subcommission structure, discussing its website design, defining the main tasks to be carried out and establishing priorities.

Liaison between SIS and CHRONOS has also been established, with an acquaintance meeting between SIS (represented by Eduardo Koutsoukos and James Crampton) and participants of the CHRONOS Steering Committee (Jim Ogg and Richard Lane), held on October 29 at the GSA Annual Meeting in Denver.

SIS has now the task to build up its website following the 4-fold basic structure (databases, compiled regional time scales and biozonal schemes, stratigraphic standards, and geohistory teaching modules) outlined in the proposal. The SIS website is to be launched within the next few months. It will be located at the ICS server in www.stratigraphy.org, and placed as a push-button along with the ICS opening page. All stratigraphic information and links presently located in the ICS site will be eventually moved to SIS.

7. CHIEF PROBLEMS ENCOUNTERED IN 2002

None

8. SUMMARY OF EXPENDITURES IN 2002 (ANCIPATED THROUGH MARCH 2003):

Delays in formulating the structure of the Subcommission and its website, and in establishing a bank account for the Subcommission have delayed receipt and allocation of the Subcommission's budget this year. The figures below include deliberate carry-over to 2003 to enable the setting up of the website and increased support to the general activities of the Bureau, Task/Working Groups and SIS meetings.

INCOME	
Allowances for 2002	US$3,000
TOTAL	US$3,000
EXPENDITURE (through Nov. 2002)	
General office expenses	US$ ----
Provision towards setting up website	US$ ----
TOTAL	US$ ----
Carried forward to 2003	US$3,000

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

(a) Launch the website for the Subcommission at the ICS server in www.stratigraphy.org, and enhance network communications with links to related/sister database websites. All stratigraphic information and links presently located in the ICS site will be moved to SIS.

(b) Nominate the Voting and Corresponding Members to the Subcommission. Establish Working Groups to deal with key SIS objectives, as outlined above, and appoint coordinators.

(c) Add three relational stratigraphic data sets derived from Geochemistry (Sr and O stable isotope variations), Paleomagnetism, Biostratigraphy and Geomathematics, to the Geochemical, Paleomagnetic and Time Scale components of SIS/ICS. These are fundamental to build a modern, updated and detailed version of the standard Phanerozoic geological time scale. Making available such international database at the SIS/ICS website will be highly valuable to the global geoscience community.

(d) In addition to the website we plan to issue regularly an electronic newsletter, to be called ***SIS News***, through the SIS/ICS website, to disseminate information on progress reports and research results by individuals and Working Groups, and announcements and reports of meetings.

(e) Furthermore, a link to a thematic discussion group (electronic mailing list, called ***SIS-Net***) could be set up within the SIS/ICS website, or alternatively spread over individual Working Group sites and linked to SIS. Its purpose would be to make it possible to exchange useful information quickly and efficiently. Scientific comments, debates, and discussions of problems within the areas of interest of Working Group members and collaborators, and specifically addressed questions, would be all encouraged, as long as they are of relevance to SIS. Maps and stratigraphic charts are of obvious interest and photographs of significantly and/or problematic fossils could be launched for discussion among specialists.

(f) Hold an *"ad hoc"* inaugural SIS meeting, later in 2003, either in Rio de Janeiro, Brazil, or Urbino, Italy. The meeting will focus on discussing specific issues related to SIS, such as objectives and organization of Task/Working Groups, ways of improving the SIS/ICS website (structure, quality of displays, accessibility, web nodes, etc.) and contributions, and of SIS interactions and linkages with related/sister www-database projects.

10. BUDGET AND ICS COMPONENT FOR 2003

Limited support will be needed to facilitate participation in SIS Symposia and thematic workshops by members of the Task/Working Groups. An *"ad hoc"* inaugural SIS meeting is planned for later in 2003 to be held either in Rio de Janeiro, Brazil, or Urbino, Italy.

It is estimated that the following totals would be needed for 2003 to defray part of the heavy costs of office expenses and setting the website, as well as to support the general activities of the Task/Working Groups and SIS meetings.

(a)	General office expenses	500US$
(b)	Contribution towards cost of website	1,500US$
(c)	Contributions to Conveners to help costs of Task/Working Groups	1,000US$
(e)	Support for meetings	3,000US$
	TOTAL 2003 BUDGET (through March 2004)	6,000US$
	Carried forward from Nov. 2002	3,000US$
	TOTAL BUDGET REQUEST	3,000US$

Potential Funding Sources

The Subcommission does not envisage being able, as an organization, to obtain significant funding from outside IUGS/ICS sources. On the other hand, most of the heavy administrative office costs shall be defrayed by members and their host institutions.

Financial support for the scientific activities related to SIS Task/Working Groups shall be sought by individual members from governmental and other grant-funding agencies for specific projects such as research projects and meetings, in particular where collaborative research has been set up.

12. OBJECTIVES AND WORK PLAN FOR NEXT 5 YEARS (2003-2006)

The Subcommission will focus on a worldwide basis on the continuous gathering of selected stratigraphic information to be edited, incorporated into logically arranged interactive and user-friendly relational (oracle-type) databases, and made easily accessible through its website.

Mechanisms to stimulate scientific exchange and cooperation:
We envisage that periodically a SIS Symposium (every 2 years or so) and regional thematic Task Group meetings/workshops (every year) be held as a forum to where SIS-related research data and results will be presented and discussed, where specific SIS problems will be clarified and new directions appointed, as well as a means of stimulating new research to be carried out within the

scope of SIS, and of facilitating scientific exchange and cooperation.

Mechanisms to update the information:
Establish well-defined mechanisms to allow constant refreshment and update of information into SIS. We may count on a chain reaction mechanism of individual and group contributions to SIS, which could be further stimulated by active thematic Task/Working Group coordinators.

Mechanisms to foster the flow of contributions on integrated stratigraphy:
Develop an exclusive peer-reviewed electronic publication, to be called ***e-Strata***, within ICS/IUGS and SIS, devoted to the main thematic issues of SIS, as a forum to present innovations and applications in integrated stratigraphy. It would be sequential but non-periodical, appearing twice to four times a year, with one or more contributions per issue, and have an ISSN record. Potential papers shall not deal with too specific subjects, which should rather go to specialized journals (such as JFR, J. Micropal., J. Palaeont., J. Sedim., AAPG Bull., etc.). Submitted contributions will be first evaluated by the main editor and/or one or more associated editors. After formal publication in electronic format the contents of the paper could be linked to SIS, and compiled into the databases.

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APPENDIX 1 to ICS REPORT 2002

Future Directions in Stratigraphy

Special meeting of the
International Commission on Stratigraphy (ICS)

Urbino, Italy, 14-16 June 2002

Summary and Report

Outline

Acknowledgements

The ICS thanks Stan Finney (ICS vice-chair) for organizing the meeting, and is very grateful to Prof. Rodolpho Coccioni and Dr. Simone Galeotti of the University of Urbino for hosting this conference and associated scientific and social program. Financial support the Urbino conference logistics was provided by the IUGS, and travel support for several participants was from a special grant from ICSU.

Executive Summary

The special planning meeting of the International Commission on Stratigraphy (ICS) in Urbino, Italy on 'Future Directions in Stratigraphy' on 14-16 June 2002 has been overwhelmingly successful. A few highlights of this first-ever assembly of all ICS voting members are given below.

ICS Mission

The Commission is the primary body for facilitation of international communication and scientific cooperation in stratigraphy, defined in the broad sense of multidisciplinary activities directed towards better understanding of Earth history. The ICS needs to excite the next generation with new tools, high-resolution event correlation on a global scale, and other projects with relevance to public concerns and imagination.

To accomplish this mission, the Commission established several strategic goals, including:

1. Completion of standards
    a. A total commitment by the stratigraphic subcommissions to assign boundary stratotypes for the entire Phanerozoic by the year 2008.
    b. Revitalisation of a Subcommission on Quaternary Stratigraphy scientifically linked with INQUA to propose major subdivisions of the Pleistocene and the base of the Holocene.
2. Enhanced visibility and publications
    a. More effective and broader publication and distribution of the scientific accomplishments of ICS, particularly with respect to new stratigraphic standards, time scale, color codes, stratigraphic guidelines and nomenclature.
    b. A business-like approach to creation and marketing of important stratigraphic products such as geologic time scale posters, boundary stratotype standard brochures, international stratigraphic guide, stratigraphic teaching modules on CD, and major stratigraphic datasets.
    c. A stratigraphic scientific journal sponsored by ICS, which would receive a portion of the income. One possibility is an upgraded and expanded *Newsletter in Stratigraphy*.
    d. An electronic stratigraphic 'journal' with full-fledged articles and databases to link and complement the printed journal of ICS.
    e. A theme-oriented popular stratigraphic journal directed toward understanding new stratigraphic concepts and events. This journal would have beautiful front-page covers, full color images, and general-geology level of review articles on exciting topics.
    f. International stratigraphic prizes (*Hedberg* and *Steno*) to be awarded every 4th year coincident with the IGC.
    g. Potential creation of the 'International Association of Stratigraphic Geologists' (IASG) maintaining close ties with IUGS and preserving a major part of the present Subcommission structure with unique expertise for major Periods of the stratigraphic column.
3. Coordination of comprehensive stratigraphic databases (e.g., CHRONOS system)
4. An Urbino-style all-membership planning meeting will be held every second year.

INTRODUCTION and OVERVIEW OF ICS FUTURE

1. Welcome by Chair of Faculty at Campus Scientifico dell' Università, Urbino

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2. Purpose of Conference

Stan Finney (2nd Vice-Chair of ICS and conference chair)

This ***Future Directions in Stratigraphy*** is an initiative set up by the ICS Executive to increase internal cooperation and plan future ICS activities.

Until now, each Subcommission has worked in isolation. Only the voting for GSSPs crossed boundaries. ICS has never had an intensive meeting of all its members.

The past emphasis of ICS has been on nailing the international geological time scale with GSSPs, and this effort will be completed in 2008.

This workshop has two main goals – summarize the current status, and prepare for the future.

The future mission of ICS will be presented in a public meeting hosted by ICS in Florence in 2004.

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3. IUGS Overview

Werner Janoschek (IUGS Secretary General and Treasurer, ***sg.iugs@cc.geolba.ac.at***)

ICS is the largest and most important IUGS commission. Our strategic planning for 6 years ahead is much commended and appreciated.

IUGS started in 1961, under International Council of Scientific Unions (ICSU). IUGS is a non-governmental, non-political, non-profit scientific organization with 115 National members, 17 Associate members and 37 Affiliates. The IUGS Council meets every four years at the International Geological Congress (IGC). The Congress an independent body, much older than IUGS, but IUGS is the main sponsor and the two bodies are planned to merge in the future. UNESCO is an active partner with IGCP (International Geological Cooperation Program).

There are 8 Commissions in IUGS, of which ICS is the largest expert group in IUGS and the flagship commission. As a result, ICS has five to ten times more funding from IUGS than any other commission.

The other IUGS commissions are environmental geology (COGEOENVIRONMENT), Global Sedimentary Geology, History of Geological Sciences, Igneous and Metamorphic Petrogenesis, Systematics in Petrography, Tectonics, information management (COGEOINFO), and education (COGEOED). There are also IUGS working groups for geochronological decay constants, global geosites, continental geochemical baselines, fossil fuels and public affairs. New IUGS initiatives are geoindicators and medical geology (both from COGEOENVIRONMENT).

IUGS is considering an ***International Year of Planet Earth*** for 2004.

More information on IUGS, publications, and commission activities are at the IUGS website: ***www.iugs.org***.

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4. Florence 2004 International Geological Congress

Leo Boriani (new President of 32nd IGC)

Copies of the IGC First Circular (just printed) can be requested from ***casaitalia@geo.unifi.it***, or the IGC website. The Second Circular will be March 2003.

The IGC returns to Italy after 123 years). The initial IGC was in Paris in 1878, the second in 1881 in Bologna and already came out of needs for standards in stratigraphy.

The Florence 2004 IGC will be Aug. 21–28 (2 days shorter than the previous one in Rio de Janeiro, due to having no weekend break). The program includes Special Symposia (only invited speakers), plenary lectures (about twelve, before lunch), general sessions, poster sessions with free beer, field trips (nearly 100 different ones are proposed in the first circular), etc. Abstract deadline is Oct. 2003, and all session planning will be handled electronically to avoid confusion.

Registration is about 450 Euro, with 20 Euro of each registration will go to IUGS and to commissions.

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5. Present and Future Directions in ICS

Felix Gradstein (Chair of ICS)

ICS is a body of expert stratigraphers founded for the purpose of promoting and coordinating long-term international cooperation and of establishing and maintaining standards in stratigraphy.

The scientific activities shall be carried out through projects or meetings arranged in collaboration with IUGS-affiliated organizations, IUGS-joint programs, non-governmental bodies and inter-governmental bodies. Some commission work will always exist and be part of our mandate, but we can with own funds start to encourage IGCP style projects on specific new and socially relevant topics.

Principal objectives (proposed new missions are in **bold**)

(a) the establishment and publication of a standard global stratigraphic time scale and the preparation and publication of global correlation charts, with explanatory notes,

(b) the compilation and maintenance of a stratigraphic database center for the global earth sciences.

(c) the unification of regional chronostratigraphic nomenclature by organizing and documenting stratigraphic units on a global database,

(d) the promotion of education in stratigraphic methods, and the dissemination of stratigraphic knowledge,

(e) the evaluation of new stratigraphic methods and their integration into a multidisciplinary stratigraphy, *and*

(f) the definition of principles of stratigraphic classification, terminology and procedure, and their publication in guides and glossaries.

ICS Strengths and Weaknesses

ICS is academically very strong but lacks a good business plan. Many items like time scale, strat guide, guidebooks, strat teaching material on CD , strat lexicons etc. are items that can be sold with small profit.

Strengths

- Solid academic tradition and quality
- Best experts/ international representation
- Good support from IUGS
- *Improved* information/data communication
- Good progress with standardization *(GSSPs + Stratigraphic Chart)*
- Leadership in CHRONOS database initiative
- Good links to national Geological Surveys
- Good support from successive IGCs
- Good 'stratigraphic' workshops/conferences

Weaknesses

- Lacks a publishing face
- No high-profile (actual) scientific visibility
- Information + data can be difficult to find
- Stratigraphic standardization has been the all-absorbing task
- Some disagreement in stratigraphic guidelines
- Little visibility with industry *(e.g., seq. strat. and time scale)*
- Generation gap *(no under 40 voting members)*
- No teaching modules *(stratigraphy has low esteem in academic curriculum)*
- Non-business mentality; ignores funding potential

Scientific Challenge and Future Mission

- Complete stratigraphic standardization by 2008
- Top-notch teaching modules in all aspects of stratigraphy
- Develop geological process oriented stratigraphy

  High-resolution global change as seen through the eyes of dynamic stratigraphy, i.e. geological process oriented stratigraphy is an exciting and socially responsible challenge . In this human era, global changes and global environmental challenges are ever more pressing issues. Stratigraphy plays an exciting role in this, since its fossil record can often be unraveled to a level of detail and accuracy in correlation that allows great insight into the dynamic forces that drive global changes. It is this geological process oriented stratigraphy that is the most exciting and meaningful as new mandate. It will greatly improve the resolution in the Geological Time Scale.

Some Potential Future Scientific Initiatives

- Specific high-profile stratigraphic projects (like IGCP)
- Limited role as global stratigraphic watchdog/caretaker
- Active unified website (SIS initiative) for all information and data
- Create principal publication medium (*Chronos* journal)
- Relational (ORACLE-type) stratigraphic databases (expanded CHRONOS database

initiative)
- International stratigraphic prize (***Steno*** and ***Hedberg*** prizes)

Stratigraphic Information Services

New program under ICS with the following components:
- Geological Time Scale Information
  - *Geological time scale subdivisions and GSSPs*
  - *Age dates, Orbital cycles, and Absolute time scale*
  - *Stable isotope and Geochemical curves*
  - *Magnetic and Sequence chronology*
- Stratigraphic Database Center and Links (See below for details on this CHRONOS initiative)
  - *Biostratigraphic and evolutionary databases*
  - *Integrated Stratigraphic Network and links*
  - *Stratigraphic tools (statistics, temporal-spatial GIS-type displays, paleogeography)*
- Stratigraphic Standards
  - *Stratigraphic Code on-line, with short-term working groups for revisions as required*
  - *Geochronology and other standards*
- Geohistory Education Site and Links
  - *What is the geological time scale*
  - *Adventures in geo-time (with links)*
  - *New discoveries and concepts*
  - *Stratigraphic applications and methods*

Future ICS Organization Suggestions

Some recent changes:
- *New Statutes approved – Single vice-chair, 'Task group' instead of 'Working group'*
- *Quaternary merged with Neogene into joint subcommission after discussions with INQUA and dual-commission 'science planning' meeting in Utrecht*
- *Geochronology and Gondwana subcommissions were dissolved*
- *Stratigraphic Information Services created as a task-oriented group (not a subcommission)*
- *Task group formed to compile radiometric age database*

Post-2008 possibilities:
- More compact subcommission structure *(in contrast to current 14 subcommissions)*
  - Pre-Cambrian, Paleozoic, Mesozoic, and Cenozoic subcommissions
  - + IGCP style projects on actual fundable topics
- Central coordinating office (= improves national contacts)
- Adopt science business model (AGI, AGU, IAMG, SEPM, etc.)
- Membership with small fee and free top-notch stratigraphic. journal
- Closely affiliated with IUGS

- Publicize and sell products, such as:
    - *stratigraphic guide, CD's with standards,*
    - *time scale cards and charts,*
    - *books, journal (s),*
    - *teaching compendia, slide series, stratigraphic highway guide books,*
    - *index fossil collections, etc.*
- Rename as…. *International Association for Stratigraphic Geology*…?

The *Association* concept

IAMG (Internat. Assoc. Mathematical Geology), AGU (Amer. Geophys. Union), SEPM and other associations are successful professional organizations with good funding of their own making.

ICS will appoint a small task group to formulate a plan to look into becoming an association after 2008 with a publishing house, own journal with electronic features (3D, color, dynamic) such as stratcube and 4 D simulations and dynamic stratigraphy views, paying members, student fees, joint conferences with other associations, keynote lectures at symposia , credit-card payment for members, links to amateur collector organizations, national surveys, field meetings, etc.

Members must feel they belong to something!!!!

Time Frame for Future ICS Directions

- Urbino 2002 Workshop
    - *Provide guidelines and objectives*
    - *Prepare planning guide and template*
- Florence 2004 Workshop
    - *Present details of GSSP and organizational progress*
    - *Discuss specific plans for implementation*
- ICS 2nd workshop 2006 (Vienna?), or in 2007/2008
    - *ICS re-news and re-organizes, including*
    - *ICS adopts new name*
    - *New and improved scientific objectives*
    - *New business mode*

CURRENT STATUS OF ICS IN FULFILLING OBJECTIVES

1. Summary of ICS Standards – International Stratigraphic Chart and GSSPs

Jim Ogg (Secretary General of ICS)

The ICS website (***www.stratigraphy.org***) contains the following compilations:

- Table of all ratified GSSPs. About half of these GSSP entries now link to dedicated pages with standardized-format location maps, stratigraphic sections, and correlation markers. More information and photographs of ratified GSSPs are posted on some of the individual subcommission websites (e.g., suite on the Neogene Subcommission website).
- The status of potential correlation levels and stratigraphic points for the remaining geological stages. This table is being constantly updated.
- The associated International Stratigraphic Chart (PDF formats) with color schemes in both 'Paris' (Commission of the Geological Map of the World) or the 'USGS' (U.S. Geological Survey coordinated with other North American surveys). A table of the official colors (CMY or RGB) for each version can also be downloaded.

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2. Reports of Individual Subcommissions

The detailed 2001 Annual Report of each subcommission, plus an updated status of GSSPs for each period are posted on the ICS website (***www.stratigraphy.org***). Only selected highlights of the Subcommission reports are given below.

a. Terminal Proterozoic

Andrew Knoll could not attend, but the 2001 report indicated that final voting was underway for the correlation criteria and GSSP location. The most contentious issue is the eventual name for the terminal-Proterozoic period.

b. Cambrian *(by John Shergold)*

The philosophy of the Cambrian subcommission was to begin with a clean slate, rather than try to blend competing regional stage concepts. First, they identified biohorizons that have widespread correlation potential. Second, they identified the preferred location for each GSSP. Third, they assigned a new name for the series and stage.

The subcommission expects to complete subdivision of the upper and middle Cambrian by 2003. The lower Cambrian will be the most difficult. There is also a chronostratigraphy working group.

c. Ordovician *(by Stan Finney)*

The Ordovician was in terrible confusion with constantly changing regional zonations and stage names. For example, a 2001 paper in GSA Bulletin on Appalachian tectonics mixed British, Australian and North American regional stage names. The 'traditional' UK subdivisions were not useful on a global scale, therefore the Subcommission voted to abandon these UK-based units and names in 1995.

Therefore, this group has the same philosophy as the Cambrian – identify correlation levels and GSSP placements, then assign new names (unless an existing regional stage name closely corresponds to the new GSSP-delimited unit). As a result, some stages currently have a basal GSSP, but await assignment of the stage name (with ICS voting required by statutes) pending decision on their upper limits. Each paleoplate has its own set of series and zones, which now are to be correlated to a set of *Global Stages* and key faunal markers, keeping Lower, Middle and Upper as the names of the *Global Series*.

d. Silurian *(by Jia-yu Rong)*

The placements of a full suite of Silurian GSSPs in the early 1980's were heavily based on discontinuities in British lithostratigraphy, rather than consideration of widespread correlation potential. Some GSSP sections even lack biostratigraphic control (see GSSP summary on the ICS website). For example, the series-level base-Wenlock GSSP is within a hiatus spanning three graptolite zones, and the base-Ludlow GSSP has no index fossils. Only the base-Silurian GSSP at Dob's Lin in Scotland seems to be within a continuous succession, but the cited placement near the lowest graptolite occurrence of *Parakidograptus acuminatus* sensu stricto is incorrect and a placement near the lowest graptolite occurrence of *Akidograptus ascensus* would enable better global correlation..

Therefore, the Silurian Subcommission must now review some of these lithostratigraphy-based GSSPs. A vote within the subcommission indicated that the priority GSSPs for review are the base-Silurian (a working group led by Mike Melchin) and the base-Wenlock (led by David Loydell). GSSPs must be changed only with care and rigor to provide long-term stability.

e. Devonian ***(by Pierre Bultynck)***

The Devonian is fully pinned by stage-level GSSPs. Full details on the GSSPs and fossil groups important for stage definition are recently published (2000 and 2002) in the *Courier Forshunginstitut Senckenberg* (volumes 220 and 225).

However, some stages are over 10 myr in duration and require standardized substage-level definitions for global usage. Substages (Upper, Middle and Lower terminology) are being developed for the Famennian, Frasnian, Givetian and Emsian, and will be completed by 2004. These will not be GSSP-based definitions, but correlation charts for neritic and pelagic facies that include the recommended substage terminology. The substages will be associated with conodont and sea-level events.

f. Carboniferous ***(by Richard Lane, with contribution by Phil Heckel)***
(Heckel's flight was delayed and missed the overseas continuation)

The Carboniferous was one of the first periods to be established, but is the least advanced with GSSP subdivisions. For the past 25 years, the Carboniferous Subcommission has been trying to meld the independent European, North American and Russian subdivisions and nomenclature. The Carboniferous is now formally divided into Mississippian and Pennsylvanian subsystems, and it is probable that the component series and stage units will use Russian names. A base-Visean GSSP (=base of middle Mississippian series) in China using *Eoparastaffella simplex* foraminifer is close to agreement. The Subcommission will meet a 2008 goal of establishing all GSSPs.

g. Permian ***(by Bruce Wardlaw)***

The stages of the Middle Permian were approved in 2001. The base-Lopingian GSSP (= base of upper Permian series) is undergoing a vote in the Subcommission. A Volgian regional working group is active in understanding how the traditional Russian upper-Permian stages (Tatarian, etc.)

correlate to the international stages (Changhsingian, Wuchiapingian). A Russian team will spend two months with the Permian Research Institute (Boise, Idaho, USA) to decide on placement of lower Permian stage GSSPs. All Permian GSSPs, except the base-Kungurian which has a severe regression, will be established by the Florence 2004 IGC.

h. Triassic ***(written report was submitted by Michael Orchard)***

No intra-Triassic GSSPs are yet assigned, but the Triassic working groups are actively striving to meet an ambitious schedule. Decisions on Middle Triassic GSSPs (base-Anisian will probably be in Romania and base-Ladinian in either Hungary or Italy) will be made by 2003. A base-Carnian GSSP and perhaps base-Norian GSSP will probably be chosen in 2004. The base-Olenekian and base-Rhaetian GSSPs are more difficult, but the goal is completion by 2005.

i. Jurassic ***(by Nicol Morton)***

Arkell (1951) standardized most Jurassic stages as clusters of ammonite zones, and the Subcommission has generally followed these ammonite criteria. Most GSSPs will be decided in the next four years. The Jurassic symposium in Sicily (Sept., 2002) is expected to decide on base-Pliensbachian and base-Callovian GSSP placements. One problem is that publication of the details of a fossil-rich GSSP in Germany may lead to destruction by amateur collectors. The important base-Jurassic GSSP has potential sections in SW England, Peru and western Canada). The base-Oxfordian and base-Kimmeridgian definitions are subject to obtaining reliable Boreal-Tethyan correlations, which indicate approximate 0.5 myr offsets in the different traditional placements among regions. The base-Bathonian once had a GSSP proposal, but the details of the section need to be confirmed. The base-Toarcian GSSP currently has no candidate sections, and the uppermost Jurassic stage of Tithonian is mainly useful in the Tethyan region. Most GSSPs will be sorted out in the next

The Jurassic Subcommission has established thematic task groups on geosites (conservation of key outcrops), sequence stratigraphy, paleo-biogeography, relations with amateur collectors, and other items. Paleoclimate and tectonics during the Jurassic are future themes.

j. Cretaceous ***(by Peter Rawson)***

The Subcommission has approximately 130 members working in 13 task groups for the 12 stages (the odd task group is for Lower Cretaceous ammonites). Possible GSSPs for all stages and substages were published after an intensive meeting in Brussels in 1995. Base-Maastrichtian and base-Cenomanian GSSPs are ratified, and base-Turonian will be decided in 2002. The remainder of the Late Cretaceous suite will be finished soon, but the Lower Cretaceous is hindered by pronounced bio-provincialism. The base-Aptian was proposed to coincide with a magnetic reversal (a break with tradition), which sparked re-investigation by French ammonite paleontologists.

Defining the base of the Cretaceous (perhaps the base of the traditional Berriasian stage) has proved the most difficult, even after 30 years of focused conferences with passionate discussions. Geopolitics and tradition, in addition to Jurassic provincialism, have been the main stumbling blocks. Only 7 people responded to an early-2002 call to reform a working group.

k. Paleogene ***(by Hans-Peter Luterbacher)***

The base-Cretaceous is placed at the iridium anomaly at the boundary clay in El Kef, Tunisia, and there is a Paleo-3 special issue on the boundary in this region. Base-Thanetian and base-Selandian of the Paleocene have good potential sections. The base-Eocene GSSP near Luxor, Egypt, is undergoing a subcommission vote and is proposed to coincide with the base of a pronounced global carbon-isotope anomaly. Progress in assigning GSSPs within the Eocene has been slow, except for the base-Lutian with a candidate section in the Betics of Spain. A base-Chattian (mid-

Oligocene) proposal is coming in 2002. Most GSSPs within the Paleogene should be established before the Florence 2004 IGC.

l. Neogene ***(by Domenico Rio, reading summary submitted by Neogene Subcommission)***

GSSPs within the Miocene are progressing well, with a prime criteria for GSSPs being suitability for high-resolution cycle-stratigraphy. The base-Tortonian GSSP (placed near Ancona coinciding with lowest occurrence of discoaster *kugleri*) is expected in 2003, and base-Serravillian in 2004. GSSPs in the lower Miocene (base-Langhian and base-Burdigalian) is not expected prior to 2006 due to difficulties in finding land outcrops that can be tied into the cycle-stratigraphy developed in deep-sea sections (e.g., Ceara Rise of South Atlantic).

The Neogene System encompasses the Miocene through the Holocene. Formal subdivision of the Pleistocene series should now proceed with the new agreement to include this aspect of the INQUA Commission on Stratigraphy (which had been dormant) with the Neogene effort. A joint Pleistocene group that is co-chaired by Gibbard (INQUA-Strat. Comm. secretary) and Castadori (ICS-Neogene secretary) will prepare GSSPs or GSSAs to formalize the main divisions (see the following Quaternary presentation).

m. Quaternary stratigraphic subdivisions ***(by Philip Gibbard)***

The Quaternary is traditionally considered to be the interval of oscillating climatic extremes (glacial and interglacial episodes) that was initiated at about 2.5 Ma. Marine oxygen isotopes provide a suite of well-defined 'stages' that can be partially correlated to continental glacial surges (regional 'stages' of Eemian, Würm, Illinoisian, etc.) and anthropologic trends ('trace fossil'-based 'stages' such as Paleolithic, etc.). Essentially, the sets of Quaternary 'stages' are equivalent to 'zones' of isotopic or biostratigraphic chronostratigraphy within the rest of the Phanerozoic systems, but Quaternary usage of the term 'stage' is now too entrenched to be revised. Therefore, to avoid confusion, the broad subdivisions of the Pleistocene should be called 'subseries', rather than 'stages'.

The base of the Middle Pleistocene 'subseries' is generally placed at the Brunhes-Matayama magnetic reversal boundary at 780 ka, the base of the Middle Pleistocene 'subseries' is the base of the Eemian interglacial stage (= base of marine isotope stage 5e) at 126 ka, and the base of the Holocene is commonly assigned as exactly 10,000 Carbon-14 years (= 11.5 ka calendar years BP) at the end of the Younger Dryas cold spell. Physical GSSPs to coincide with these chronologic definitions would be most convenient in an ice core (base of Holocene, unless a GSSA-concept is used), a level in a sediment core under the Netherlands (base of Eemian 'stage'), and perhaps the magnetic reversal position in Icelandic volcanic flows (base of Brunhes magnetic zone).

A task group was established to prepare an organization and a science plan (with deadlines) to formalize these divisions. Philip Gibbard, the INQUA representative, assured ICS that standardization of the Pleistocene is more a matter of mis-communication between ICS and INQUA than of a disagreement among Quaternary workers.

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3. Stratigraphic classification items

a. Stratigraphic Classification Subcommission ***(by Maria-Bianca Cita)***

This Subcommission was established in Algers in 1952. A 20-year effort under Hedberg produced the first International Stratigraphic Guide. Amos Salvador supervised a second edition (1994), followed by an Abridged Guide (2000) published in *Episodes*. Preparation of these Guides

involved nearly 100 circulars (3000 pages). More details are on the subcommission's new website (***www.geocities.com/issc_arg/, although items on this site seem to be occasionally overlain by GeoCities advertisements),*** and the Abridged Guide is reproduced on the ICS website (*www.stratigraphy.org*).

The Subcommission has been discussing standardizing concepts and terminology in sequence stratigraphy (16-member working group for past 6 years) and cycle stratigraphy (3-member group of Schwarzacher, Hilgen and Strasser). The AAPG Hedberg conference on sequence stratigraphy (Dallas, 2001) indicated that this aspect of stratigraphy is still an arena of debated concepts that can not even agree on the definition of 'sequence'. The cycle stratigraphy group has submitted a suite of recommendations. Both of these working groups will be disbanded in 2002.

The future directions of the Subcommission will include:

(1) Definitions, concepts and procedures in cycle stratigraphy, magnetic stratigraphy, ice core stratigraphy and other new stratigraphic methods.

(2) Application of concepts and procedure to other areas of geoscience (e.g., igneous mapping, and petrologists who often don't follow the Guides), to other nations and in geoscience education

(3) Revisiting lithostratigraphy, including improved and on-line lexicons (catalogues of national lithostratigraphic units) and discontinuity-bound units (sequences and volcanic units).

b. Russian Stratigraphic Guide (by Yury Gladenkov)

The Russian Stratigraphic Code was published in 1992, and Gladenkov has just produced a Russian translation of an abridged International Stratigraphic Guide. The Russian Code includes a few different concepts compared to the International, including a fundamental duality between principle stratigraphic units (global, regional to local rock formations) and special stratigraphic units (biostratigraphic, magnetic, cycle, etc.). These are associated with two levels of investigation – methodological and technological. A proper understanding of natural processes must incorporate a hierarchy from infra-zonal subdivisions to regional chronostratigraphic units.

c. Miscellaneous Stratigraphic Classification Items

(1) Rock versus Time nomenclature for Middle

We have Upper vs Late and Lower vs Early distinctions for rock versus the equivalent time divisions of the geological scale, but 'Middle' is currently used ambiguously. Peter Rawson presented a proposal from the British Stratigraphic Procedures publication that recommends '**Mid'** to distinguish the time-based unit from the equivalent rock-based 'Middle' in chronostratigraphy.

(2) Geochronometry standards

For absolute ages, the nomenclature abbreviations are standardized as 'Ma' and 'ka'. However, for intervals, there are no standard abbreviations and different journals have diverse usages. It is recommended that '**myr'** and '**kyr'** be formally accepted as the standard abbreviations for elapsed years.

(3) Holostratigraphy

Peter Rawson suggested that the term 'integrated stratigraphy' for a suite of combined stratigraphic tools applied to a section is ambiguous. The term 'Holostratigraphy' ('holo' means 'all') may be more appropriate.

(4) Cainozoic

A long-standing error has been use of 'Cenozoic' (translating as 'empty life') as a mis-spelling of the original 'Cainozoic' (translating as 'recent life'). However, this usage may be too much ingrained into English-language journals and geological surveys to modify.

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4. Promoting Completion and Publicity of New GSSPs

- Strong Leadership. Both at the Subcommission and Task Group level. Push all the time. Have as the top agenda item.
- Regular Meetings. Not just discussions at the 4-year symposia to hear reports. Annual meeting of the Subcommission Chair with task group leaders.
- Regular Communication. E-mail and website. The Ordovician has an ongoing web-based discussion of certain potential GSSP placements.
- ICS provides seed money. Especially for essential fieldwork. The Subcommission must ask ICS in advance (budget year) for major amounts, but small contingency funds (few hundred dollars) are held in reserve.
- Subcommissions should link to the GeoSite program (IUGS). All GSSP sites should be on their list.
- Send GSSP write-ups to other newsletters, not just the formal *Episodes* publication.

FUTURE DIRECTIONS
Summary of Working Group Presentations and Discussions

1. New Missions and Goals for ICS

ICS Mission

The Commission is the primary body for facilitation of international communication and scientific cooperation in stratigraphy, defined in the broad sense of multidisciplinary activities directed towards better understanding of Earth history.

The ICS needs to excite the next generation with new tools, high-resolution event correlation on a global scale, and other projects with relevance to public concerns and imagination.

ICS Goals – develop a common language, then achieving global understanding of Earth's history.

(1) **Standards** – the major role under the mandates from IUGS. The ICS is responsible for standardization of stratigraphic concepts and the continued improvement of resolution of the International Geological Time Scale. Stratigraphy has evolving methods that will require new standards and provide progressively more depth in regional to global correlation. The chronostratigraphy time scale does not stop with just stage-level GSSPs.

(2) **Understanding** -- establishment of international frameworks and symposia for collaboration in understanding the evolution of the Earth. Most stratigraphers have focused interests, hence more involvement with subcommission-level activities than with the full ICS. The subcommissions and their sponsored symposia are valuable hubs for assembling specialists in intervals of geologic time (e.g., Jurassic, Silurian). In a similar vein, the ICS can provide international networks for thematic studies that require precise stratigraphic correlation (e.g., paleoclimate, tectonics, glacial episodes, eustatic sea-level).

Other scientific goals mentioned by the working group:

Absolute ages. The ICS could encourage radiometric age acquisition in key intervals that lack dates. For example, the early spreading history of the global oceans during the late Jurassic and early Cretaceous is poorly constrained (a 30 million-year gap in radiometric ages). It is important that the ICS reference time scale charts have reliable ages! This will partly be addressed by the ICS-sponsored task group to assemble a radiometric age database and associated decay constants (Villeneuve of the Canada Geological Survey, Palfy in Hungary, etc.), but IGCP-type attacks are needed to fill the age gaps.

Ecostratigraphy. The concepts of marine macrofossil ecostratigraphy should be extended to a wide variety of fossil groups and ecosystems. [*Note – the working group did not agree on a concise definition of 'ecostratigraphy'.]*

Integrated stratigraphy standards. The subcommissions should produce reference material on (1) the most reliable index fossils in all environments, (2) summaries of different regional stratigraphies and how these correlate to the global standard chronostratigraphy, and (3) inter-calibrations of different faunal groups and isotope-magnetic-sequence variations. An ICS goal would be a comprehensive book in 2008 that summarizes all regional to global stratigraphic scales including an absolute-time calibration.

Origin of Life. The ICS should sponsor investigations on origins of life, evolutionary jumps, rates of major leaps, and significance of rare fossil deposits (e.g., Burgess Shale). How do different

ecosystems and geologic processes (e.g., weathering, biogeochemical cycling) respond to climatic and evolutionary changes in different settings (e.g., Arctic, tropical, bathyal)?

Units, not just lines. GSSPs focus on boundary events, but what happens within these units is also important. The ICS should encourage good 'interval' methods in stratigraphy, such as integration of radiometrics with cycle stratigraphy. How fast do things happen?

Caution on cosmetics:

An old dog with a new collar is still an old dog. The ICS must avoid merely changing terminology for objectives, but actively pursue new creative lines of global stratigraphy.

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2. CHRONOS – Earth History Database Concept, *under ICS scientific auspices*

Report by Jim Ogg on NSF-sponsored workshop.

Complete details and links are given on the CHRONOS website – ***www.eas.purdue.edu/chronos/***

CHRONOS Mission – to produce a dynamic, global timescale to frame Earth history events and processes for societal benefit.

A major direction of geoscience in the 21st century is the improvement and extension of facilities to collect and analyze data on local, regional and global spatial scales and appropriate temporal scales in which massive data archiving and distribution systems, both hardware and software, are required to provide access to geodata. (from *NSF Geosciences Beyond 2001*). A group of 30 international stratigraphers and information-technology specialists that represented the spectrum from paleontology to cycle stratigraphy to paleomagnetism assembled at Amherst, Massachusetts in Nov 2001 to prepare a plan for a comprehensive suite of global databases of Earth history, which they named CHRONOS.

The principle goals of the resulting CHRONOS initiative are:

- Assembly, integration and distribution of data relevant to geologic time
- Maintenance of a consensus geological timescale
- Public outreach – *Communicate to the public the importance of understanding rates in natural processes using the geological timescale*
- Research outreach – *Provide a fundamental research tool for the broader geoscience community and a temporal framework for understanding the 4th dimension (rates and processes)*

A chronostratigraphic database system is vital for future earth science studies in a vast spectrum of topics, including evolution and controls on biodiversity, catastrophes and abrupt climate change, climate history and oscillations, basin modeling, rate studies, high-resolution geochronometry, linkages of Earth's systems, and forward projection in future scenarios.

The suite of CHRONOS databases includes all chronostratigraphic data that have adequate attribution, including:

- Life – *paleontological assemblages, evolution, biodiversity, ...*
- Climate – *orbital forcing, oxygen isotopes, ecosystem changes, ...*
- Surface processes – *biogeochemical cycle monitors, strontium isotopes, ...*
- Care-Mantle dynamics – *magnetic reversals and intensity trends, plate motions ...*

- Catastrophic episodes – *impact-related anomalies, oceanic anoxia episodes, ...*
- Time – *absolute ages and relative ages, stage boundaries, ...*

A Standard Geological Time Scale is the centerpiece of the CHRONOS database system. The scale is linked to geochronologic and biostratigraphic scales, and is based on the highest quality data. A CHRONOS function is to continuously improve precision and accuracy of this Standard Time Scale according to international consensus and updating. Probably the scale will only have 5-year updates in order to maintain a reference standard. The scale will be transparent, in that the foundation data and methods of interpolating ages are clearly presented. CHRONOS provides the capability to link outcrop observations to the Standard Time Scale with error bars on the correlations.

The CHRONOS system will have thematic nodes (e.g., micropaleo, isotopes, radiometrics), each with distributed institutional databases housing the raw data, that are coordinated through a central global hub. The central hub will be responsible for the Standard Geological Time Scale, developing search and toolbox functions, and setting standards for databases. Examples of component databases include the Amoco-EGI dataset (19,000 sites, including 2000 research sections), the DSDP-ODP dataset (plus the Neptune compilation of all Cenozoic material and the Ocean Drilling Stratigraphic Network developed in Bremen), the North American Mammal Paleofaunal Database, etc. Some capabilities of the CHRONOS network include chronologic, geographic or thematic interfaces, transparent linkage to the Tapestry of Time public education network, personal user workspace to analyze and visualize assembled data, search engines with fuzzy logic and conceptual aspects, and different layers of interpreted to completely raw data.

CHRONOS will be under the scientific auspices of the International Commission on Stratigraphy, with an administration and multi-national funding structure similar to the international Ocean Drilling Program. A small permanent core staff of both information-technology and professional chronostratigraphers will be responsible for system standards, and international steering committees (academic, government, industrial members) will be responsible for oversight, planning and finances. The initial CHRONOS steering committee assigned to guide the CHRONOS initiative through early funding and development stages consists of ICS officers (Felix Gradstein, Rich Lane, Jim Ogg), public institutions (Brian Huber at Smithsonian), academic (Charles Marshall, Jim Ogg), government surveys (Bruce Wardlaw), industry (Jeff Stein, Paul Sikora), and public education (Cinzia Cervato).

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3. ICS Organization, Publicity and Funding

a. Subcommission Structure

ICS's stratigraphic-oriented structure (e.g., Cretaceous, Permian) would be retained, but thematic skill groups (e.g., biostratigraphy, geochemistry, tectonics) will be added that span multiple time intervals. Thus, ICS could act as a broker that matches skill groups with time-based projects to examine exciting topics in stratigraphy. Some multi-discipline topics are Glaciation episodes, continental-oceanic effects of Milankovitch climate oscillations, Snowball Earth, geochemical cycles, biodiversity responses, and environmental and ecological problems.

The working group recommended that the Quaternary should be recognized as a subcommission that is subject to ICS statutes. However, the purpose of such an ICS subcommission (distinct from the encompassing Neogene system) and the relationship/overlap to the active INQUA program of Quaternary research was uncertain.

b. Meetings of the Full ICS Membership

The combined ICS membership (all chairs of subcommissions and the ICS Executive) should meet every two years, with open meetings at the quad-annual International Geological Congress alternating with intensive ICS-only meetings. Tentatively, an ICS meeting would be hosted during 2006 in Vienna (invited by Werner Janoschek, IUGS Secretary General). The alternating ICS-only meetings could also be designed to coincide near dates of other international stratigraphic meetings.

c. Publicity

ICS should interact more with other organizations, including other IUGS commissions (INQUA, GEOINFO, etc.), national stratigraphic committees, and national surveys. This will help to give ICS a more public profile.

ICS should publicize its accomplishments more aggressively, thereby increasing visibility and funding possibilities. Press releases, such as the significance of new GSSPs, needs to be distributed to all geological journals. At present, GSSPs are only published in *Episodes*, which has a restricted circulation (3500 copies) that is distributed to representatives of member nations according to a membership-support formula. In some nations, these copies never reach institutional libraries. Even in Europe and North America, most stratigraphers do not know about the existence of this journal. IUGS recognizes this problem and is trying to improve *Episodes* visibility and quality of articles with a review board. But, regardless, a single outlet is inadequate – ICS accomplishments should be published in *GSA Today*, *AAPG Explorer*, and other national geological newsletters.

Such publicity tasks and comprehensive web-information updating require a paid Secretariat (such as exists for IUGS central office), rather than only volunteers. IUGS has a task group on public affairs, but cannot provide ICS with funding for secretarial support.

d. Support – People and Funding

An expansion of ICS activities requires two ingredients – dedicated people, and funding. Employing full-time professionals (such as the Stratigraphic Information Services effort) is expensive, but perhaps a source of superbly qualified personal could be retired stratigraphers who still wish to contribute to a global understanding of Earth history and education in stratigraphy. With funding to cover expenses and travel, many retired professionals might be willing to devote their time and expertise toward ICS-sponsored activities. Other sources of dedicated short-term support could be sabbatical support for professors, and rotating internships for dynamic graduate students and post-docs.

ICS should move aggressively to pursue national, federal and industrial funds. Private philanthropy donations, which support many scientific, educational and museum activities in the United States, are generally discouraged under the tax policies of European and other countries, but could still be an important source. Component activities, such as the CHRONOS database network and stratigraphy-education modules, will have better access to specialized funding than will the general ICS organization. Corporate funding is generally possible for activities that will benefit those industries (e.g., petroleum stratigraphy).

The ICS should promote more funding possibilities by marketing materials, such as general-audience or middle-school books ('Building the Time Scale'), stratigraphic journals (*see below*), printed glossy timescale posters, and short courses. Marketing educational modules in stratigraphic topics was discussed, but these are difficult to compile at an *inter*-nation level due to different educational standards. It may be preferable to allow downloading of educational resources from the ICS website (e.g., educational material) for free, and charge if printed versions are requested.

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4. Distribution of Standards

The ICS needs to be recognized as the authority for stratigraphic standards and as a premier source of high-quality stratigraphic information. Such information should be distributed freely on-line and printed copies provided to qualified stratigraphic institutions.

a. **International Stratigraphic Chart** (*name, rank, definition of units*)

'Presumably, the **Chart** should be mandatory for all geological projects run on an international basis with the financing and scientific guidance of the international organizations. Since in some countries, their own geological traditions are strong and justified by practice, the **Chart** is recommendatory for national and international projects and publications, provided the latter do not involve international geological organizations.' *(proposed by Russian Stratigraphic Commission)*

- Florence, 2004 – distribute copies of the Chart free to all delegates and present in IUGS and IGC Councils as the standard. Continuously communicate the evolving standard to the World Map group.
- Florence, 2004 – also include the Chart in all registration packets to attendees through IGC. We would request IGC to reimburse ICS for part of the printing costs, plus an extra Euro for ICS budget support.
- Distribute the Chart to all geological surveys as each GSSP and associated stage nomenclature is ratified. Follow up with direct person-to-person voice contacts to ensure that each survey understands the standard and the process that was involved.
- Distribute the Chart and periodic updates to all major geological journals and publishing houses. As with geological surveys, a follow-up call should be made.
- Publish Chart and links to get the PDF version from the ICS website in numerous newsletters – Easy and redundant access for all geologists and the general public.
- Codify the color information (CGMW = World Map, and the 'USGS' with our modifications). The USGS will adopt the Chart and associated 'USGS colors' as the official North American standard.

b. **Global and Regional Correlations**

- Each Subcommission should publish how regional stages and integrated stratigraphies 'map' into the International Scale for each system. Distribute these important 'user-friendly' guides by web-posting, widespread publication in newsletters and journals, delivering to geological surveys, etc.
- Each Subcommission is encouraged to compile a summary volume, similar to the 'Carboniferous of the World', perhaps keeping these continuously updated as a web posting.
- Next level – Subcommissions should post most commonly used zonal schemes (with images of key zonal markers) and integrated stratigraphic scale (with uncertainties in inter-calibration).

c. **Lexicons** (definition of lithostratigraphic units)

ICS web site should have links to lexicons of countries. Belgium has complete lexicon (but not on-line), Italy is in middle of extensive on-line series (very labor-intensive, with a dedicated Maria Bianca Cita), USGS has basic information on-line, etc.

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5. Publications

At present, the ICS and the subcommissions have a limited amount of information on-line. Only the Triassic Subcommission, with the *Albertiana* journal/newsletter, has any presence in a few libraries, and symposia proceedings periodically appear in special journal issues or monographs.

The *Computers in Geoscience* journal of the Internet. Assoc. Mathematical Geology provides an overabundance of funds for that association, plus a high-profile visibility. We could adopt an existing journal (e.g., something like *Newsletter of Stratigraphy*) for a printed professional presence in libraries and/or begin a new one (maybe using the Chronos name, similar to the database initiative) via electronic, cyberspace means.

a. Printed Professional Journals and Monographs

Young people want to publish in journals with a high-ranking citation index profile. This takes time to develop a circulation and quality standing, and is a problem when beginning a new journal (or acquiring one that doesn't have a good track record).

The Quaternary Research Association (UK) began a Quaternary journal with a contract to Wiley Publ. The Publisher does not own the journal, the organization does with a certain amount of income (after an initial return to the publisher) going to the organization. With a current 500 circulation, the profit in 2001 was 10,000 pounds back to the organization.

Unfortunately, the scientific journal market is over-saturated. Libraries are generally trimming on buying journals, rather than adding new ones.

Most subcommissions contract with publishers for their special issues or symposia volumes, with no return percentage to the organization. It may be preferable to farm out special books for printing and distribution by the Geological Society publishing house, which charges less than commercial.

Sorin Filipescu and Simone Galleotti will explore further investigation of publication costs, in-house printing, and journal options.

b. Electronic Journals

Electronic publication, such as the Geochemistry, Geophysics, Geosystems (G3) journal (http://146.201.254.53/), is now desired – low costs, continuous production rather than waiting for enough articles to fill the issue, color and animated graphics, 4-dimensional models, and other features. The downside is being invisible in libraries (but this is rapidly changing)

c. Printed Popular Journals

For many years, a consortium of U.S.A. oceanographic institutions on the Atlantic coast produced an oceanography journal, OCEANUS. Each issue was centered on a theme, such as bioluminescence, submersibles, hydrothermal vents, etc. A dedicated editor was largely responsible for the success of this educational journal, which was received by numerous schools and professionals.

A similar theme-oriented quarterly journal in stratigraphy might have a wide appeal. Certainly there is no competition in this niche. Beautiful front-page covers, full color images, general-geology level of review articles, and directed toward understanding new stratigraphic concepts and events. Possible issues could include end-Permian mass extinction, Snowball Earth, past impacts, evolutionary trends, history during the Cambrian (or other periods), anoxic ocean events, sequence stratigraphy, and cyclic sedimentation applications in time scale. An electronic edition could also be prepared.

d. Printed Color Timescales

ICS could send nice-quality color prints (11x17 inch, or poster-size) of the International Stratigraphic Chart, a standard timescale (absolute ages), regional correlation charts, and other products. These items would always be free to download (PDF files) from the website, but requests for printed versions could be handled by a credit-card order through the website, with mailing in tubes from American, Europe or Asian sites as appropriate. Such an on-line and mailing system would require ICS having credit-card processing approval, plus one or two regional people to do the mailings (unless this is subcontracted).

The IUGS-UNESCO printing of the Chart in 2000 was assigned an ISBN number, hence can be cited in publications. However, a web-updated chart that incorporates changes every 6 months would require adding new ISBNs or some 'edition' reference.

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6. International Stratigraphy Awards

There is no international award for achievements in stratigraphy.

Felix Gradstein proposed an international prize for the greatest contribution to stratigraphy. This concept was refined during discussions into two prizes – the HEDBERG for outstanding academic lifetime achievements or major revisions in the way that we understand the Earth's stratigraphy (e.g., to Oppel for the zonal biostratigraphic concept and applications to Jurassic correlation), and the STENO for the best young stratigrapher (under 33 for a major paper and discovery). The STENO would be the most difficult decide, because it would have to rely on national nominations of young geologists, language differences (we wish to avoid a bias toward publication in English-language Anglo-European journals), and evaluation of 'achievement' at an early stage in one's career.

A committee (Morton, Rong, Finney) will formulate a plan for these awards and associated presentations, with the first set of prizes to be given at the Florence 2004 IGC. A committee would be needed to solicit nominations and make a selection. A possible prize amount is travel to the IGC.

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7. GSSP Plaque

Richard Lane presented a template for a standard marker for GSSPs. In addition to providing the basic information (placement in stratigraphic scale, meter level and primary correlation criteria), the plaque would include an estimate of the absolute age, and be produce in the local and English language.

The local governments would be encourage to supplement this simple field plaque with explanatory signs, such as the dual set at Massignano base-Miocene GSSP (stratigraphy methods, importance of the GSSP). Information for such signs at an education-public level would need to be provided by the associated subcommissions. The Portuguese have produced a CD-ROM documenting their base-Aalenian GSSP in both languages.

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8. Next Step – ICS at Florence 2004 IGC

The new directions for ICS will be presented at a special workshop at the Florence 2004 IGC. Prior to this open assembly, each subcommission should hold an afternoon business meeting, to which at least one ICS Executive officer should also attend. If three or four subcommissions meet

daily, then all will be completed during the first five days of IGC. These subcommission meetings will be followed by an ICS-chairs-only business meeting (day 7?) to get progress on the GSSPs and other issues.

The ICS should consider a permanent booth (with copies of charts, etc.) in the GeoExpo arena to provide information and improved visibility.

ICS open workshop is planned as a follow-up to Urbino, with a 3-hour session hosting up to 75 people being authorized by IGC (day 9?). The ICS should probably budget for refreshments to encourage attendance. Following this general meeting, the ICS executive will meet to review and summarize the issues and achievements.

This general workshop, plus the chairs-only meeting, will provide the basis for the post-2004 strategic plan of ICS.

First Conference on Future Directions in Stratigraphy, 14-16th June 2002

Campus Scientifico dell' Università, Urbino, Italy

Participant List

Prof. Felix M. Gradstein,	Chair of ICS
Prof. James G. Ogg,	Secretary General of ICS
Dr. H. Richard Lane,	Vice-Chair of ICS
Dr. Stanley Finney,	Vice-Chair of ICS, and Chair of Sc on Ordovician Stratigraphy
Prof. Domenico Rio,	Vice-Chair-at-Large of ICS (coordinator with IGC)
Dr. Werner Janoschek,	IUGS Treasurer
Prof. Attilio Boriani,	Chair of 2004 IGC
Prof. Hans-Peter Luterbacher,	Chair of Subcommission on Paleogene Stratigraphy
Prof. P.F. Rawson,	Chair of Subcommission on Cretaceous Stratigraphy
Dr. Nicol Morton,	Chair of Subcommission on Jurassic Stratigraphy
Dr. Bruce R. Wardlaw,	Chair of Subcommission on Permian Stratigraphy
Prof. Pierre Bultynck,	Chair of Subcommission on Devonian Stratigraphy
Dr. Rong Jia-yu,	Chair of subcommission on Silurian Stratigraphy
Dr. John Shergold,	Chair of Subcommission on Cambrian Stratigraphy
Prof. Maria Bianca Cita Sironi,	Viced-chair of Subcommission on Stratigraphic Classification
Dr. Sorin Filipescu,	ICS webmaster
Dr. Yuri Gladenkov,	representing Russian Stratigraphic Commission
Dr. Philip Gibbard,	representing INQUA Stratigraphic Commission

APPENDIX 2 to ICS REPORT 2002

A complete table of GSSPs is attached as the file "GSSP-Web.xls". This table is a slightly updated version of the compilation published in Episodes of November, 2002.