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**INTERNATIONAL COMMISSION ON STRATIGRAPHY**

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*21 December 2007*

**International Union of Geological Sciences**  
**International Commission on Stratigraphy (ICS)**  
**CONSOLIDATED ANNUAL REPORT**  
**FOR 2007**

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

**OVERVIEW**

The past year has seen several major accomplishments of ICS. Many are presented in the attached series of reports, and we highlight only a selected suite:

**(1) International Divisions of Geologic Time**

**Precambrian:** The much-requested *Hadean Eon* – a fascinating interval of lunar formation, origin and near-extinction of Earth's life, heavy bombardment, and evolution of early atmosphere prior to the earliest preserved sediments – will be proposed as a standard for Earth, which will allow direct comparison to Mars and other bodies.

**Cambrian** – The suite of newly ratified international stages has resolved nomenclature problems among regions. These, plus the carbon-isotope correlation horizons, indicate that the “*Cambrian Explosion*” of faunal diversity is not as nearly sudden as generally presented in popular textbooks.

**Ordovician** – A milestone has been achieved with the establishment of the full suite of inter-regional Ordovician stages. There is finally a universal language for understanding the tectonic revolutions and the surge in life's diversity punctuated by an ice house.

**Quaternary** – The Cenozoic currently has two GSSP-defined periods ratified by IUGS (Neogene and Paleogene). A consistent definition for the base of the “Quaternary” interval among late Cenozoic workers that is consistent with the onset of major cooling and field mapping of the oldest major continental glacial-derived sediments (e.g., oldest till in USA and related “typical Quaternary” deposits in Eurasia) was unanimously approved by both the different national bodies of the INQUA council and the full membership at the INQUA Congress. The Quaternary begins at ~2.6 Ma; and INQUA-ICS has agreed that the Pleistocene will begin at this same level, thereby allowing the standard Quaternary to become an international Period/System. The Pliocene returns to its pre-1996 status of having two stages; with that added Gelasian stage transferred to become the earliest stage of the Pleistocene. This solves an incompatibility with the INQUA-defined Quaternary that has lingered since 1985, and is consistent with the 1948 IGC-resolution that required the Pleistocene to include the Villefranchian continental stage of Europe (which is quasi-coeval with that Gelasian Stage). This INQUA-ICS historic agreement to establish the Quaternary still awaits IUGS ratification. This Quaternary is now shown in the ICS charts, publications, and website.

**Inter-Planetary** nomenclature and correlation charts – In conjunction with planetary geologists at NASA and other institutions, the ICS will be publishing the first inter-planetary correlation charts for the histories of Earth, Moon, Mars, Mercury and Venus.

## (2) School and Public Outreach

A major mandate of ICS is the promotion of education in stratigraphic methods, and the dissemination of knowledge about the history of our planet. In addition to our widely used suite of information on the ICS website ([www.stratigraphy.org](http://www.stratigraphy.org)) and the individual subcommission websites; we are active in drafting, printing and distributing information about Earth history:

**School posters** – During 2007, in conjunction with the *International Year of Planet Earth*, the ICS distributed 2500 school-audience posters in Australia (funded by Australian National University and GeoScience Australia) and 3000 posters in USA (funded by Purdue University and with the National Association of Geoscience Teachers). We worked with Smithsonian Institution and USGS for the imagery on this vivid chart.

**Pocket cards** – A convenient and laminated pocket-card of Earth history was printed in different batches in different countries (usually 2000 each), with each printing for different agencies (Exxon/Mobil, Neflex/200 Year Anniv Geol. Soc, Chevron Arabia, Bahrain Geol. Soc.).

**A3 chart** – In collaboration with the World Geological Map Office in Paris a chart of the international divisions of geologic time will be distributed to all IGC participants in Oslo, with printing likely provided by industry. A more elaborate A3 chart is being compiled showing Russian-international stage correlations. The outstanding geoscience journal *Geoarabia* closely follows ICS sponsored chronostratigraphy and regularly publishes our updated charts.

**TimeScale Creator** – With the aid of numerous experts and a brilliant programmer, we have expanded the databases and capabilities of this free Earth-history visualization JAVA package at the ICS website.

**Time Tree of Life** – Oxford University Press is publishing a major text book on the paleontology and biology of all major living and fossil animal families. ICS wrote the time scale chapter, using GTS2004. The latter is used to align all groups in cladograms and phylogenetic trees.

**Geologic Time Scale booklet for 2008** – All ICS chairs have contributed to a booklet (~100 pages, full-color charts) of the status of the GSSPs, inter-regional correlations, and extensive diagrams of major zonations and geochemical trends. ENI Norway funds the insert of the laminated GTS pocket card.

**World Geological Map** – ICS maintains close ties with the Bureau of the World Geological Map (CCGM) in Paris. The Bureau advises ICS on the stratigraphic colour patterns in the GTS, and is printing and selling GTS mouse pads and GTS charts provided by ICS. In 2008, an updated English edition of the textbook *Stratigraphie, terminologie française*, edited by Jacques Rey will be sponsored by ICS and CCGM. Gradstein, Ogg and Ogg wrote the Chapter 9, dealing with the latest advances in the geologic time scale, and current chronostratigraphic proposals and trends.

### (3) Geologic Time Scale (*numerical ages*)

The first steps in establishing an international task group to synthesize the advances from astronomical tuning, radiometric dating and advanced quantitative stratigraphy are underway. This group is charged with compiling a vastly improved numerical-age scale by mid-2009, leading to a new version of the GTS2004 book. The book will be major update of the Geologic Time Scale, targeted for publication in 2010 in collaboration with Cambridge University Press. It will be a full colour version. The book will be online with a sophisticated search and browsing front menu. Newly planned chapters include the Planetary scale, the Cryogenian-Ediacaran Periods scale, a Prehistoric scale, a sequence stratigraphic scale, and extensive emphasis on stable isotope chemostratigraphy. Use will be made of the most modern insights in error analysis of radiogenic isotope analysis for age dating. Orbital tuning will be extended from Neogene downward into Paleogene and Cretaceous. Significant linear scale update itself may come both from new age dates in Ediacaran, Cambrian, Devonian, Carboniferous, Triassic, Jurassic and Cretaceous, and from substantial progress in ICS with the formal definition of the lower boundaries of stages and periods in the Phanerozoic.

## ANNUAL REPORT

This ICS Consolidated Annual Report for 2007 has several portions:

- The executive summary, with two main parts:
  - **Items 1 - 8** summarize the current goals and scientific activities of the Commission and its component Subcommissions.
  - **Items 9 - 13** detail the plans for 2008 and associated budget, and a multi-year overview of achievements and future goals.
- An updated list of officers of all ICS subcommissions
- The detailed reports of each individual Subcommission.
- An Appendix of ICS-sponsored Symposia and other activities for the 33rd IGC.

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

Several longer-range issues have been active topics of discussion in 2007. These include:

- A distinct role of a 'Bureau of Standards' to preserve and communicate our GSSPs and other stratotypes, and to start to more actively focus on intra-stage standardization.
- Councilors for regional contacts, and improved coordination with INQUA and IODP, and with the radiogenic isotope (*EarthTime*) community.
- Special projects section of ICS to collaborate with national Geologic Surveys, Industry, BRGM and Geology Sections in Academies of Sciences and the 'INTERNATIONAL YEAR OF PLANET EARTH'. In particular, for the *International Year of Planet Earth*, ICS is compiling a popular-level booklet on the modern geologic time scale is actively distributing a school-level poster on Earth's history.
- Favored status for three journals: *Episodes* and *Newsletters on Stratigraphy* for news, forum, GSSPs, etc., and the appropriately named, *Stratigraphy*, for major science items. Cooperation with *Geoarabia* for special notices to regional petroleum industry.
- An "International Association of Stratigraphic Geologists" that would have a complementary role to ICS in Earth history activities and promotion. The latter is preparing its founding meeting in 2009 in Italy.

New on the long-term agenda are:

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

## **BUDGET REQUESTS – Operating, and Special IGC subsidy**

Nearly all the subcommissions have indicated that budget-cutbacks to ICS have severely impacted their ability to fulfill objectives. As explained at the IUGS-review in Paris, the funding levels (especially the 25% reduction that was incurred after 2004 in basic "operating" support, followed by further reductions after 2006) to ICS are insufficient. The planned and projected GSSP completion in 2008 had to be delayed by some subcommissions. Several of the subcommissions have vividly complained about these cutbacks (*see excerpts in Part 8 of the Summary Annual Report*). We have aggressively pursued other sources of funds for our ICS-wide projects, but it is important that the "core IUGS support" be returned to pre-2005 levels or higher.

We kindly request that IUGS, at minimum, return ICS to the pre-2005 funding level for a 'bare bones' **2008 budget of \$36,000**. This amount represents a 50% reduction in the modest budgets submitted by our component subcommissions for 2007 (a total of \$72,000, *as detailed in Part 10*).

In addition, as was granted by IUGS to ICS in 2004 to enable participation at the International Geological Congress by those incoming and continuing ICS officers who are on

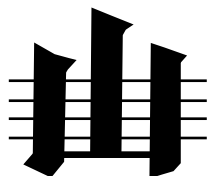
pension and from less-funded nations (e.g., Argentina, some government geologic surveys, etc.), we request a special subsidy of **\$14,000**. This will be used to provide half-price registration, subsidy for travel (especially overseas), and for lodging (but not food). Without this assistance to our pensioned or less-affluent volunteer officers, then it will not be possible for ICS to have effective open international meetings and discussions at the IGC.

Therefore, with this one-time special request to enable participation at the IGC, the total funding request to IUGS is **\$50,000**.

With best regards

Yours Sincerely

Felix M. Gradstein *and* James G. Ogg



INTERNATIONAL UNION OF GEOLOGICAL SCIENCES  
INTERNATIONAL COMMISSION ON STRATIGRAPHY

## International Commission on Stratigraphy (ICS)

### *SUMMARY OF ICS AND SUBCOMMISSION REPORTS*

#### 1. TITLE OF CONSTITUENT BODY

##### **International Commission on Stratigraphy (ICS)**

*Summary and compilation of subcommission reports submitted Jointly by:*

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

The International Commission on Stratigraphy (ICS) is a body of expert stratigraphers founded for the purpose of promoting and coordinating long-term international cooperation and establishing standards in stratigraphy. Its principal objectives are:

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

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

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

The objectives satisfy the IUGS mandates of:

- Fostering international agreement on nomenclature and classification in stratigraphy
- Facilitating international co-operation in geological research
- Improving publication, dissemination, and use of geological information internationally
- Encouraging new relationships between and among disciplines of science that relate to geology world-wide
- Attracting competent students and research workers to the discipline
- Fostering an increased awareness among individual scientists worldwide of what related programs are being undertaken.

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

- (a) Development of an internationally agreed scale of chronostratigraphic units, fully defined by Global Stratotype Sections and Points (GSSPs) where appropriate and related to a hierarchy of units to maximize resolution throughout geological time.
- (b) Promotion of international consensus on stratigraphic classification and terminology, which is essential for advancement of earth-science research and education.
- (c) Establishment of frameworks and systems to encourage international collaboration in understanding the evolution of the Earth.

## **3. ORGANIZATION**

ICS is organized in two types of constituent bodies: Subcommissions for longer-term study, and Committees for more limited, shorter-term tasks. ICS is managed by the Executive Committee, which consists of elected and appointed officers. The current structure of ICS consists of the Executive Committee, an executive task group (Stratigraphic Information Services), and 14 Subcommissions that deal with the major chronostratigraphic units and aspects of stratigraphic classification and time scales.

### **Subcommissions:**

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

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In addition, there is an *Executive Task Group*: Stratigraphic Information Services that constructs and keeps control of the ICS website.

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

The subcommittees of ICS together have about 350 titular members. When the corresponding members of Subcommittees are added, several thousand stratigraphers worldwide participate in the activities of ICS. In addition, many countries have national stratigraphic committees, with which ICS tries to establish or maintain contacts. The members of the Full Commission (i.e. the 3 members of the Executive + webmaster and the officers of the 15 Subcommittees and task group) come from 21 countries: Argentina, Australia, Belgium, Brazil, Canada, China, France, Germany, Great Britain, Ireland, Italy, Morocco, Netherlands, New Zealand, Norway, Poland, Romania, Russia, Spain, Sweden, and USA. The voting memberships of the aggregate subcommittees include at least 30 more nations.

### Websites:

ICS main site	<a href="http://www.stratigraphy.org">www.stratigraphy.org</a>
Quaternary	<a href="http://www.quaternary.stratigraphy.org.uk">www.quaternary.stratigraphy.org.uk</a>
Neogene	<a href="http://www.geo.uu.nl/SNS">www.geo.uu.nl/SNS</a>
Paleogene	<a href="http://wzar.unizar.es/isps/index.htm">wzar.unizar.es/isps/index.htm</a>
Lutetian GSSP task group	<a href="http://wzar.unizar.es/perso/emolina/ypresian.html">wzar.unizar.es/perso/emolina/ypresian.html</a>
Jurassic	<a href="http://www.es.ucl.ac.uk/people/bown/ISJSwebsite.htm">www.es.ucl.ac.uk/people/bown/ISJSwebsite.htm</a>
Triassic	<a href="http://paleo.cortland.edu/sts/">paleo.cortland.edu/sts/</a>
<i>Albertiana</i> newsletter:	<a href="http://www.bio.uu.nl/%7Epalaeo/Albertiana/Albertiana01.htm">www.bio.uu.nl/%7Epalaeo/Albertiana/Albertiana01.htm</a>
Permian (newsletter)	<a href="http://www.nigpas.ac.cn/permian/web/index.asp/">www.nigpas.ac.cn/permian/web/index.asp/</a>
Link to Permian research:	<a href="http://www.geo.ucalgary.ca/asrg">www.geo.ucalgary.ca/asrg</a>
Devonian	<a href="http://www.unica.it/sds/">www.unica.it/sds/</a>
Silurian	<a href="http://www.silurian.cn/home.asp">www.silurian.cn/home.asp</a>
Pre-2005 newsletters	<a href="http://iago.stfx.ca/people/mmelchin/SILURIAN.HTM">iago.stfx.ca/people/mmelchin/SILURIAN.HTM</a>
Ordovician	<a href="http://www.ordovician.cn">www.ordovician.cn</a>
GSSP discussion site	<a href="http://seis.natsci.csulb.edu/ISOS">seis.natsci.csulb.edu/ISOS</a>
Cambrian	<a href="http://www.uni-wuerzburg.de/palaeontologie/ISCS/index.html">www.uni-wuerzburg.de/palaeontologie/ISCS/index.html</a>
Precambrian	<a href="http://www.stratigraphy.org/precambrian">www.stratigraphy.org/precambrian</a>
Stratigraphic Classification	<a href="http://www.geocities.com/issc_arg">www.geocities.com/issc_arg</a> (commercial site, which will be moved to <a href="http://users.unimi.it/issc">http://users.unimi.it/issc</a> )
Stratigraphic Information Systems	
Main site	<a href="http://www.stratigraphy.org">www.stratigraphy.org</a>
<b>CHRONOS</b> database network	<a href="http://www.chronos.org">www.chronos.org</a>
(concept posted at:)	<a href="http://www.eas.purdue.edu/chronos">www.eas.purdue.edu/chronos</a>
<b>PaleoStrat</b> database network	<a href="http://www.paleostrat.org">www.paleostrat.org</a>

### **ICS Executive Officers for 2004-2008:**

Chair: <b>Felix Gradstein</b> (Oslo, Norway) <i>is serving a second and last term</i>
Vice-Chair: <b>Stanley Finney</b> (California, USA) <i>is serving a second and last term</i>
Secretary ( <i>appointed by Chair</i> ): <b>James Ogg</b> (Indiana, USA)



**ICS Executive Officers for 2008-2012:**

Chair: **Stanley Finney** (California, USA)  
 Vice-Chair: **Shanchi Peng** (Nanjing, China)  
 Secretary (*appointed by Chair; no designated term*): **pending**

**(2) ICS Subcommittee officers**

All subcommissions, except the Quaternary, had elections for 2008 officers. The voting memberships of each subcommission will also be revised in 2008. Those subcommissions with re-elected chairs who will serve a second (and last) term are: Quaternary, Jurassic, Carboniferous, Silurian, Precambrian and Stratigraphic Classification. The vice-chair of the Precambrian Subcommission in 2007 took over from its chair.

A full listing of current officers (with addresses, telephones, e-mails) is at the end of this main ICS report. The individual subcommission reports include a listing of all voting members (typically 20 in each subcommission).

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

Only a few of the subcommissions have formal financial contributions from external sources other than IUGS (through ICS), and these are listed in the individual reports.

Some activities that are associated with ICS goals, such distributing charts of the Geologic Time Scale 2004 and placing this information onto public websites, receive some support from petroleum companies (e.g., GTS2004 chart printing) and the National Science Foundation of USA through its CHRONOS database consortium funding.

Informally, every officer and member of ICS donates their own time, office space, institutional facilities, and other components to the activities of the organization. No officer or executive receives any salary compensation from IUGS or other ICS funds. Indeed, most officers personally contribute toward their own travel and operational expenses. In particular, the majority of the extensive ICS-related travel by Dr. Gradstein, the ICS chair, is reimbursed from his research grants or home institution.

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

Active and highly fruitful interfaces with many international organizations and geo-projects are a standard feature of ICS activities.

ICS maintains a strong link with the International Quaternary Association (*INQUA*) Commission on Stratigraphy regarding the stratigraphy of the Quaternary, and to Commission for the Geological Map of the World (*CGMW*) in Paris regarding standardization of chronostratigraphy and its color scheme on charts

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

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

ICS members maintains active links with international research groups, including The (British) Micropaleontology Society, the North American Micropaleontology Society, and the Association of American Stratigraphic Palynologists, and international paleontological research groups on Graptolites, Conodonts, Ammonites, Radiolarians (Interrad), Nannofossils, Foraminifers, etc.

There are close links of many ICS stratigraphers with the International Ocean Drilling Project (IODP). The latter is presently undertaking a major re-organization with focus on ultra-deep drilling using riser systems (in Japan 's subduction zones), non-riser high-resolution grid drilling, riser and non-riser continental margin drilling, and mobile platform Arctic Ocean drilling (the last major stratigraphic frontier, for which an initial successful drilling campaign occurred during 2004). ODP cores routinely test the global correlation potential of a great number of bio-events since the Jurassic, and this record is vital to develop integrated timescales at several scales of resolution, and global paleo-climate models.

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## 6. Chronostratigraphic Stage and Series names and definitions established in ICS since 2000

Quaternary	Base Quaternary System ( <i>still pending with IUGS</i> )
Neogene:	Base Zanclean Stage (Base Pliocene Series) Base Messinian Stage Base Tortonian Stage Base Serravallian Stage
Paleogene:	Base Ypresian Stage (Base Eocene Series)
Cretaceous:	Base Maastrichtian Stage Base Turonian Stage Base Cenomanian Stage
Jurassic:	Base Aalenian Stage Base Pliensbachian Stage Base Sinemurian Stage
Triassic:	Base Ladinian Stage Base Induan Stage (Base Triassic System)
Permian:	Name and Base Changhsingian Stage Name and Base Wuchiapingian Stage Base Capitanian Stage Base Wordian Stage Base Roadian Stage
Carboniferous:	Mississippian and Pennsylvanian subsystem Names and Lower, Middle and Upper series subdivision of each and stage nomenclature for each

Silurian: Base redefinition for Ruddinian Stage (Base Silurian)

Ordovician: Name and Base Hirnantian Stage  
 Name and Base Katian Stage  
 Name and Base Sandbian Stage  
 Name and Base Dapingian Stage  
 Name and Base Floian Stage  
 Base Tremadocian Stage

Cambrian: Name and Base Furongian Series  
 Name and Base Paibian Stage  
 Name and Base Guzhangian Stage  
 Name and Base Drumian Stage  
 Name Terreneuvian Series  
 Name Fortunian Stage

Neoproterozoic: Name and Base Ediacaran System

## 7. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2007

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

### Full Commission

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

The following is a partial summary of achievements during 2007:

- ***Ongoing standardization of the International Chronostratigraphic Scale***
  - Approval of the GSSPs for the Serravalian, Toarcian, Dapingian, Guzhangian and Drumian stages.
  - Satisfactory resolution with INQUA of the definition and ranking of Quaternary (as a Period/System beginning with the current Gelasian GSSP).
  - Naming of the Calabrian stage, Fortunian stage, Terreneuvian series; and agreement on future nomenclature for Carboniferous series and stages that are awaiting definition with GSSPs.
  - ICS proudly announces that the scientifically and politically complex task of standardizing the international Ordovician Chronostratigraphic scale is essentially complete, with only one single stage needing selection. At the same time the Cambrian is following suite and achieving much needed clarity and much improved resolution. The managing officers, and participating officers of the Ordovician and the Cambrian Subcommissions, and not

least the vice chair of ICS, Dr. Stan Finney deserve much compliments for these prominent scientific achievements.

- To ensure broader stratigraphic standardization, closer cooperation is being executed with the CGMW (World Geological Map) in Paris. ICS is helping CGMW's drive to establish a single global colour scheme for all chronostratigraphic charts, thus simplifying map and chart (re-)productions.
  - Close cooperation is underway with the journal 'Geoarabia', and its editors, that in an Open Letter to this journal we have called 'The Best Stratigraphic Journal' in the World. The Journal actively publishes superb stratigraphic articles on a wide range of petroleum related Geoarabian topics, many executed in classic stratigraphic style, closely adhering to the international standards. The journal actively promotes the ICS stratigraphic chart and other products, and keenly follows ICS's lead.
  - A JAVA package "***Time-Scale Creator***" was considerably enhanced on the ICS website. The powerful software now incorporates a database of over 15000 biostratigraphic, magnetic and geochemical datums and zones that are tied to the Geologic Time Scale 2004 age-model. The package enables both on-screen visualization of user-selected time intervals (with choice of columns to display, etc.) and downloading of final publication-quality charts for printing. Future versions with enhanced databases and plotting capabilities are underway, including a version tailored for professionals, '*TSCreator Pro*', that will be licensed by a third party.
  - The ICS is coordinating an international program on '*Astronomical Tuning of the Geologic Time Scale*'. This was initiated by excellent international workshop/symposium on this hot topic was conveyed at the occasion of the 6<sup>th</sup> Congress of the International Association of Mathematical Geology in Liege, Belgium. Presentations by Hinnov, Ogg, Gradstein, Hilgen, Lourens, Weedon, Palike, Laskar and others were well attended and much debated. Blueprints for orbital tuning of most of the Cenozoic and also Mesozoic unfolded. The NSF of USA has funded their component.
- ***New initiatives in organization and outreach***
    - Strategic planning, especially the role of ICS in the post-GSSP (after 2008) period, is moving ahead. The ICS had a role in such a planning conference (Penrose) in Graz, Austria, chaired by Werner Piller.
    - Over 20 lectures were given by the executive on ICS achievements and prospects, incl. GTS2004 and beyond at geosocieties, national and international conferences, and stratigraphic shortcourses in over a dozen countries.
  - ***Selected Major Products under ICS Executive***
    - ICS is extending its longterm collaboration with several dozen specialists to create *Geologic Time Scale 2008 - 2010*, that (for the first time) will be in interactive digital format. Cambridge University Press and the GTS editors are actively planning this ambitious and prestigious digital stratigraphic project.
    - ICS is co-sponsoring publication of '*The Concise Geologic Time Scale*' handbook by Ogg et al. This inexpensive, full-color, 100-page booklet of diagrams and brief text for a general audience will appear mid-2008 as part of ICS's contribution to the **INTERNATIONAL YEAR OF THE PLANET EARTH**.
    - ICS is assisting revision of the Offshore Norwegian Lithostratigraphy (NORLEX; <http://norges.uio.no>), and nearing completion.

- The 2004 book '*A Geologic Time Scale 2004*', Cambridge University Press, co-sponsored by ICS received the Mary B. Ansari Best Reference Work Award of the Geoscience Information Society (GSIS). The award was presented at the Geological Society of America 2006 Annual Meeting and Exposition in Philadelphia. The chair of ICS, Dr. Alan Smith and senior publisher of Cambridge University Press, Dr. Matt Lloyd attended the ceremony.
- A **Geologic Time Scale** A3 linear chart, a wall chart, a laminated card and a standard (landscape) chart are products sponsored by ICS since 1996, with over 50,000 copies distributed. Laminated GTS cards, and/or A3 size linear GTS chart amongst others have been produced or distributed by

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

These were also printed in several newsletters of national geoscience organizations, incl. KNGMG, BGS, GSC etc.

- A three-person task force (Pillans, Heckel, Tesakov) was proposed to gather scientific input on an appropriate global (land, sea) set of useful divisions and hierarchy for the Late Cenozoic. There has been ongoing confusion in some circles on the historic background, achieved ratification and definition of terms like Neogene, Quaternary, Tertiary, Pleistocene, Gelasian, etc. ICS has adopted the time-span of the term Quaternary as utilized by INQUA; but the overlapping array of other divisions need to be established from first-principles, rather than trying to force to past historical or popular precedents.
- In 2007, ICS will co-sponsor a quantitative stratigraphy workshop and symposium at the Institute of Land and Resources Information System of the China University of Geosciences, Wuhan, China.

### **Color of International Divisions of Geologic Time**

The International Commission for the Geologic Map of the World (CGMW) in Paris is responsible for standards in geologic maps, including the colors assigned to represent lithologic units of a certain age. Until early 2007, the standard colors were only to the Series (Epoch) level. ICS has worked with CGMW to achieve a systematic system for stage-level color system for higher-resolution geologic maps. This improved color scheme is now used on the ICS chart of "International Divisions of Geologic Time" that is posted at our [www.stratigraphy.org](http://www.stratigraphy.org) website.

### **Quaternary Subcommittee (jointly with INQUA)**

- ICS and INQUA agreed that the Quaternary, as currently used by active Quaternary researchers, began at 2.6 Ma (approximately equivalent to base of Gelasian stage of upper Pliocene), and should become a formal unit of the international geologic scale. The request to establish a Quaternary at this level with sub-era ranking (which allowed a preceding Tertiary sub-era) was submitted to INQUA/IUGS. INQUA agreed in principle (indeed, this sub-era placement was originally proposed by their executive in 2005). However, the IUGS executive indicated that neither this basal age nor a sub-era ranking that was offset from lower-ranked units was acceptable; therefore, the "status-quo" of

non-ranked Quaternary (as ratified by IUGS in 1985 – which explicitly did NOT give *Quaternary* a “period” status) should be adhered to. However, for now, ICS is showing the official INQUA definition of Quaternary on its posted time-scale charts, but with a footnote indicating that this Quaternary definition/ranking by INQUA-ICS has not yet been ratified by IUGS.

- GSSP proposals were prepared for base-Late Pleistocene sub-series (base of Eemian regional stage in Amsterdam-Terminal borehole) and base-Holocene (NorthGRIP ice core, at 11,784 years before AD 2000). The base-Middle Pleistocene sub-series will be close to the Matuyama/Brunhes magnetic boundary (ca. 760 ka), and there are two candidate GSSP sections in southern Italy and one in Japan.

### Neogene Subcommittee

- A vast majority of the members had voted to accept the proposal (Aubry et al., 2005, *Episodes*) that the Neogene as a Period extends to the Present, and that the *Quaternary* should be established as a Sub-Era covering the last 2.6 Ma. Unfortunately, this ranking for Quaternary was rejected by IUGS; and it appears that the last 2.6 myr of the traditional Neogene will be truncated.
- Ratification of the *Serravallian* GSSP, which was defined at the base of the Blue Clay Formation in the Ras il Pellegrin section on Malta, coincident with the younger end of the major mid-Miocene (Mi-3b) oxygen isotope event, which is ~150 kyr older than the *Sphenolithus heteromorphus* LO, previously considered as prime guiding criterion for the boundary.

### Paleogene Subcommittee

- The base-*Selandian* GSSP will be placed at the base of the Itzurun Formation in the Zumaia section at San Telmo Beach.
- The base-*Thanetian* GSSP will be placed at the base of Chron 26n in the same section.
- Full documentation for the *base-Cenozoic* (base-Paleogene; base-*Danian*) GSSP at El Kef, Tunisia, was published in *Episodes*.
- The proposed *Chattian* GSSP at Monte Cagnero in Italy has been submitted for publication, then will be prepared for voting. A synthesis of integrated stratigraphy for a potential candidate for the *Priabonian* GSSP in northeastern Italy was completed. Studies of potential *Bartonian* GSSP sections near Gubbio, Italy and at Barton-on-Sea, U.K. focused on base of polarity Chron C19n as a primary means of global correlation.

### Cretaceous Subcommittee

- A flurry of publications during this year on the three candidates for the *Santonian* GSSP should enable an informed vote decision in earliest 2008.
- The *Coniacian* working group completed a proposal for establishing the GSSP at Salzgitter-Salder (Germany) with different macrofossil and microfossil correlation methods, and a vote is anticipated within the next two months.
- The *Valanginian* will begin with the *Pertransiens* ammonite zone, and the formal GSSP proposal is expected soon.
- After a long delay, the base-*Berriasian* (base-Cretaceous) working group has been established. There was a total consensus that initially there is a need to concentrate on markers at or about the base of the Grandis (Jacobi+Grandis subzones) zone.

### Jurassic Subcommittee

- The 7<sup>th</sup> International Congress on the Jurassic System was held in Krakow, Poland, during Sept 2006, with 129 participants from 29 countries. Details of two GSSP proposals (Toarcian, Kimmeridgian) were published in *Volumina Jurassica* vol. 4 together with the Congress Abstracts.
- It was decided that the Sub-Boreal definition of the Oxfordian-Kimmeridgian boundary should take precedence over the (stratigraphically higher) Sub-Mediterranean definition. The candidate for the **Kimmeridgian** GSSP is at the Isle of Skye, (N.W. Scotland).
- Detailed formal proposals for the **Triassic/Jurassic Boundary (Hettangian GSSP)** will be voted during early 2008. There was consensus to combine New York Canyon (Nevada, USA) and Kunga Island (B.C., Canada) into a single proposal as GSSP and ASP respectively.

### Triassic Subcommittee

- It is hoped that a final decision will have been made on the **Olenekian** GSSP before the end of 2007. The first vote was inconclusive, the second is due to complete by early December.
- A ballot on the **Carnian** GSSP has been distributed to task group members with a closing date of January 5th, 2008.
- International meeting on **The Global Triassic**. May 19-25, 2007, Albuquerque, New Mexico, was the official meeting of STS and the final meeting of IGCP 467 on the *Triassic timescale and Triassic biotic events*.
- A flurry of newsletters, workshops and external publications are maintaining a high level of energy of international workers in solving the remaining boundary issues. The goal is to unite conodont, ammonite, stable isotope and magnetic stratigraphy as multiple correlation horizons for each selected GSSP. However, a byproduct of this intense activity has been discoveries that the criteria and candidate GSSP sections have proved less ideal than previously thought. This has delayed voting on the current candidates; but the final decisions will definitely be more globally precise.

### Permian Subcommittee

- Both the base-**Wuchiapingian** and the base-**Changhsingian** (Upper Permian or Lopingian Series) GSSPs were published in *Episodes* (volume 29, No. 3&4).
- There was an International Workshop in July 2007 at the probable Cisuralian GSSP sites along the west flank of the Urals. Samples for carbon isotopes, geochronology and biostratigraphy were collected. In addition the timely shipment of samples and establishment of procedures for shipping through Russian customs was a goal of this excursion in order to demonstrate accessibility.
- The **XVI International Congress on the Carboniferous and Permian** was in Nanjing, China in June 2007.

### Carboniferous Subcommittee

- The **XVI International Congress on the Carboniferous and Permian** was in Nanjing, China in June 2007.
- The Task Group to establish the **Tournaisian-Visean** boundary submitted the GSSP proposal for the Pengchong section in south China, and ICS is currently voting on it (Jan, 2008).

- Global conodont lineages for correlating potential GSSP levels for *Serpukhovian*, *Moscovian*, *Kasimovian* and *Gzhelian* were established, which is the main step toward preparing final GSSP proposals.
- High-resolution cycle-stratigraphy will be used to place the *Gzhelian* and potential *Kasimovian* GSSP event levels into an inter-regional glacial-interglacial sea-level context.

### Devonian Subcommittee

- The SDS decided formally on substage boundary levels (all entries of conodont species) for the base of the Middle Givetian (entry of *Polygnathus rhenanus* or *varcus*), base of the Upper Givetian (entry of *Schmidtnognathus hermanni*), base of the Middle Frasnian (entry of *Palmatolepis punctata*), and base of the Upper Frasnian (entry of *Palmatolepis semichatovae*).
- Papers on multidisciplinary event stratigraphy and cross-facies correlation were published as a volume on “*Devonian Events and Correlations*”, vol. 278 of the “Geological Society of London, Special Publication” series. It is the first volume that was nicely published under the auspice of the formal IUGS-Geol. Soc. co-operation.

### Silurian Subcommittee

- Study of GSSPs for both the base-Silurian and the base-Wenlockian led to recognition that these GSSP-levels are not suitable for global correlation, but another level within each GSSP site would have more global applicability. Therefore, the Subcommittee, ICS and IUGS agreed to revise the GSSP correlation criteria. The base-Silurian GSSP was kept at the same level, but should be regarded as coinciding with the first appearance of *Akidograptus ascensus*, defining the base of the *A. ascensus* Biozone at that section.
- The primary marker for the base-Wenlock was a graptolite, but the GSSP in England is notably poor in allowing exact determination of their ranges. Recent evidence has shown that the current GSSP does not coincide with the base of the *Cyrtograptus centrifugus* Biozone, as was supposed when the GSSP was defined. It was decided not to propose a new GSSP and stick for the time being to the old GSSP, although it had many shortcomings, until new studies can propose a better alternative.
- 2007 was the culmination of more than 2 years of work of the ISSS with the organization of the 3rd International Symposium on the Silurian System and the IGCP 503 4th Annual meeting both in Nanjing, China, 27 – 30 June, 2007. They were held together with the 10th International Symposium on the Ordovician System and the conference was called the “Yangtze Conference on Ordovician and Silurian”. About 140 scientists from 23 countries attended the combined conference.

### Ordovician Subcommittee

- The Yangtze Conference in Nanjing, China, 27-30 June, 2007. About 140 scientists (of whom nearly 100 came from 23 countries to visit China).
- The Subcommittee completed the GSSP research. All 7 Stage GSSPs have been established and approved by the IUGS before the Ordovician Yangtze Conference. A global suite of named Ordovician stages and series has been ratified.

### Cambrian Subcommittee

- The name “*Terreneuvian* Series” and “*Fortunian* Stage” for the lowermost series and stage of the Cambrian System was approved by ICS and ratified by IUGS.



- The *Guzhangian* Stage, with a GSSP in the Wuling Mountains, Hunan, China, was later approved by ICS and ratified by IUGS.

#### **Ediacaran and Cryogenian Subcommittee**

- Series of conferences, including Kimberley field meeting (*Neoproterozoic glaciogenic successions of NW Australia*); and IGCP 493: “*The Rise and Fall of the Vendian/Ediacaran Biota — Origin of the Modern Biosphere*” 20-31 August 2007, Russian Academy of Sciences.

#### **Precambrian Subcommittee**

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

#### **International Stratigraphic Classification Subcommittee**

- Two state-of-the-art papers were published (see ISSC report for full details): (1) Cita M. B. , 2007. New developments in stratigraphic classification. A project of the International Subcommittee on Stratigraphic Classification ISSC. *Newsletters on Stratigraphy* 42(2), p. 69-74. (2) Strasser A., Hilgen F. and Heckel P., 2007. Cyclostratigraphy - concepts, definitions, and applications. *Newsletters on Stratigraphy* 42(2), p. 75-114
- Sequence stratigraphy working group has distributed their initial summary of concepts, definitions and applications. Revision is underway to incorporate the numerous recommendations.
- Biostratigraphy, chronostratigraphy, lithostratigraphy and magnetostratigraphy working groups are in high gear preparing their documents.

#### **Stratigraphic Information System**

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

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## **7. CHIEF PROBLEMS ENCOUNTERED IN 2007**

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

#### **ICS Executive Committee**

- The Executive considers that its limited funding does not serve its membership. This theme has been emphasized by our component subcommittees (see below, and each of their annual reports).

- ICS leans too much on developed, ‘western’ universities and surveys, especially those of Europe, North America and China. Incorporation of more active participation from African, Middle East, Asian and South American nations in field meetings and workshops will require an order of magnitude increase in budget to subsidize their travel and research needs.
- Many subcommission chairs and other officers in 2006-07 and elected for 2008-12 have a retired status. As a result, although they can often maintain a more active role without interruptions by teaching and other administrative duties, they no longer enjoy a university-supported subsidy for travel, website design, and mailing.
- Progress on Global Stratotype Section and Point (GSSP) selection did not proceed in the timely manner indicated by several subcommission projections. The reports of each subcommission explain the contributing factors.
- Despite the fact that over 30 Russian stratigraphers are voting members in the ICS subcommissions, the Russian Interdepartmental Stratigraphic Committee considers that ICS is actively cooperating with their vast regional body. ICS will actively look into this, but notes that ICS invited and paid the travel for Russian stratigraphers to attend the ICS workshops on ‘Future Directions in Stratigraphy’ in 2003 in Urbino and in 2005 in Leuven. Regional membership in ICS is not a realistic option, since ICS is an international body of scientific specialists, and not of countries. Philosophical misunderstandings in Russia between the global GSSP concept and the regional unit stratotype concept should be addressed, and ICS is preparing a special set of stratigraphic charts and spreadsheets showing correlations and calibrations of regional chronostratigraphic units to the global standard.

#### **Quaternary Subcommission (joint with INQUA)**

- The IUGS has not yet ratified the definition of the Quaternary as used by the vast majority of Quaternary workers (e.g., a general assembly decision at INQUA in August, 2007 without a single dissenting vote). This delay causes unnecessary conflicts between inconsistent “Quaternary” usage. The historic ICS-INQUA recommendation to resolve this problem and attain a corresponding Pleistocene definition is still pending.
- The set of GSSPs (Holocene, Early Pleistocene, Middle Pleistocene), which were in final proposal stage in early 2007, have still not been voted upon by the Subcommission.

#### **Neogene Subcommission**

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

#### **Paleogene Subcommission**

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

- High-resolution integrated-stratigraphy studies of potential *Lutetian* GSSP sections in Spain revealed that the different events traditionally used to place the Ypresian/Lutetian boundary, hitherto thought to be almost simultaneous, actually occur at very different levels. The criterion to precisely define this boundary will be selected in 2008.

### **Cretaceous Subcommittee**

- One of the main problems encountered in 2007 concerns the delay in publishing the basic data in peer-reviewed literature for finalizing the GSSP proposals. Co-ordinate the work of several scientists from different subdisciplines (different type of paleontology, stable isotopes, magnetostratigraphy) is not an easy task and has delayed submission GSSP proposals.
- The important *Jurassic/Cretaceous boundary* WG has only now begun work, making the Jurassic the only Period without a formal definition, thereby hampering geochronology.
- Magnetostratigraphy is an important tool for Berriasian through Aptian correlations, but the best studied ammonite-rich possibilities for these GSSPs are not suitable for this method.
- The *Aptian* GSSP decisions await unambiguous ammonite to magnetic polarity correlations; and the Albian GSSP proposal has been delayed until stable isotope data can be incorporated.

### **Jurassic Subcommittee**

- The most important problem is an ongoing one and relates mainly to finance. In particular, there are widespread difficulties in obtaining grants for research on stratigraphical topics and travel to meetings. Applications are often given low priority by National grant-awarding agencies. It would be helpful if IUGS emphasized to its member countries the importance it attaches to the GSSP programme and encouraged the relevant research funding bodies to give priority to funding relevant basic research.
- The other significant problem, which has arisen this year in particular, reflects the fact that the Subcommittee can operate only through the voluntary unpaid work of individuals. The Subcommittee does not have the financial resources to pay for significant amounts of work to be done. Of course, the corollary is that any problems with those individuals have an immediate, and possibly catastrophic impact on the planned work of the Subcommittee.
- Decisions on GSSPs for Tithonian, Oxfordian and Callovian have been delayed due to slow activity within the working groups to achieve a satisfactory inter-regional correlation or GSSP that allows multiple useful correlation methods.

### **Triassic Subcommittee**

- Lack of funds and 'approval' for foreign travel have hampered full participation by the STS officers and most task group members.
- Decisions on GSSPs await completion of ongoing high-resolution studies; which have delayed most Triassic GSSP placements until 2008 or 2009.

### **Permian Subcommittee**

- The delayed Cisuralian excursion, which was finally conducted in July 2007 meant that we could not complete the base-Sakmarian GSSP proposal in 2007 as planned.

### **Carboniferous Subcommittee**

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

### **Devonian Subcommittee**

- See “Carboniferous Subcommittee” above for the major problem with the existing GSSP for the Devonian-Carboniferous boundary.
- Funding for SDS members in many countries has become so difficult that they hardly can attend SDS meetings. IUGS and ICS strongly have to consider how to improve the funding situation. For example, the very restricted funding meant that no Russian or Chinese member could be supported to attend the annual meeting and SDS field symposium.

### **Silurian Subcommittee**

- Difficulties in obtaining grants for research on stratigraphical topics and travel to meetings of Subcommittee.
- Other Silurian GSSPs need to be revisited, because some are not suitable for global correlation.

### **Ordovician Subcommittee**

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

### **Cambrian Subcommittee**

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

### **Ediacaran Subcommittee**

*The problems are mainly scientific:*

- Continuing inadequate geochronological control in key sections.

- Differences in acritarch taxonomy and mismatch in timing of the onset and extinction of large ornate, organic walled microfossils during the Ediacaran Period.
- Inconsistent correlation of the ‘Wonoka/Shuram’ negative isotope excursion(s), ‘Gaskiers’ glaciation and microfossil events for the Ediacaran Period.
- Difficulty of access to likely major candidates for the basal *Cryogenian* GSSP (Svalbard, NW Canada).

### **Precambrian Subcommittee**

- The busy schedule of W. Bleeker, the previous chair, necessitated the transfer of this position to the vice-chair, Martin Van Kranendonk, who is now the acting Chair of the Precambrian Subcommittee.

### **International Stratigraphic Classification Subcommittee**

- The subvention allocated to ISSC was very very low (*slightly below the average amount to subcommittees*) – and disproportionate to the overall importance and significance attributed to this subcommittee.
- A new website needs to be established, because the commercial-hosted version is out of space. We are moving it to a different web page (<http://users.unimi.it/issc>).
- In response to the IUGS strong unprecedented reprimand to ICS with the request to modify its statute concerning the elections and to find a dialogue with INQUA on the Quaternary, a documented letter was prepared by ISSC chair and forwarded to IUGS by ICS secretary as an annex to his report. However the later refusal by IUGS to accept the result of the ICS and INQUA votes to define and rank the Quaternary obliged the ISSC chair to concentrate on the difficult and stressful task to present shared proposals by the Italian Stratigraphic community of the marine stages defined in Italy.
- The draft report on Sequence Stratigraphy resulted in a heated debate with a past chair of NACSN (see <http://strata.geol.sc.edu/SeqStratForm.html>). This unfortunate situation resulted in critiques to the subcommittee for the biased and unbalanced presentation of the subject. The problem is still open and originates stress and tension.

### **Stratigraphic Information System**

- No major problems; other than lack of adequate time and manpower for all the desired activities and database enhancements.

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## **8. SUMMARY OF EXPENDITURES IN 2007 (ANTICIPATED THROUGH MARCH 2008):**

In May 2007, the ICS received its lowest budget in the past 8 years.

The ICS Executive Bureau established the following budget for May 2007 – March 2008 after consideration for relative needs, planned activities, and funding requests of the subcommittees; and re-allocating based on the final (drastically reduced) amount received from IUGS. All Subcommittees were limited to a maximum of \$350 for communications and administration costs. Funds and distributions are maintained by James Ogg (ICS secretary-treasurer) using a special account in the USA; but each subcommittee maintains its own account

and budgeting for its allocated funds (as listed below). Itemized financial reports of individual subcommissions are contained within their attached annual reports. Note that these budget reports include projected expenditures through March 2007 (e.g., another four months), which is the month when the next annual (“2007”) funding suite is typically received from IUGS (but was delayed until late May in 2007).

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

**(A) ICS Operating Budgets and expenditures for 2007:**

	<i>Requested by ICS 2007</i>	<b>IUGS 2007 Allocation</b>	<b>Comments on distribution</b>
Quaternary	<b>\$400</b>	<b>\$250</b>	
Neogene	<b>\$2000</b>	<b>\$975</b>	<i>GSSP-study field trip request moved to Special travel contingency</i>
Paleogene	<b>\$3000</b>	<b>\$1,600</b>	<i>Includes deficit acquired due to 2006 short-fall of funding. Unspecified travel moved to Special travel contingency.</i>
Cretaceous	<b>\$1000</b>	<b>\$0</b>	<i>Six GSSPs will undergo voting and publication. Funding suspended temporarily.</i>
Jurassic	<b>\$2500</b>	<b>\$1,500</b>	<i>Seven GSSPs will undergo voting and publication.</i>
Triassic	<b>\$2000</b>	<b>\$2,500</b>	<i>Includes travel subsidy of \$1000 for Russian participation at Triassic Congress.</i>
Permian	<b>\$1000</b>	<b>\$700</b>	<i>Major suite of GSSP preparations.</i>
Carboniferous	<b>\$500</b>	<b>\$350</b>	
Devonian	<b>\$500</b>	<b>\$350</b>	
Silurian	<b>\$500</b>	<b>\$350</b>	<i>Travel subsidies moved to "Special travel needs"</i>
Ordovician	<b>\$1500</b>	<b>\$3,200</b>	<i>Major conference and GSSP dedication in China; plus preparation of summary publications. Travel subsidies of \$2700 to Argentina.</i>
Cambrian	<b>\$3100</b>	<b>\$2,000</b>	<i>Major Working group meeting in New York. Other travel subsidies moved to "Special travel needs"</i>
Ediacaran	<b>\$3000</b>	<b>\$1,000</b>	<i>"</i>
Precambrian	<b>\$500</b>	<b>\$0</b>	<i>Funding suspended temporarily.</i>
Classification	<b>\$1000</b>	<b>\$700</b>	<i>Publication costs, and website transfer costs. There is still a \$1000 travel deficit from earlier years.</i>
Strat. Info. System	<b>\$2500</b>	<b>\$1,500</b>	<i>ICS web development support. Installation of databases to support <b>TimeScale Creator</b> hot-links.</i>
<b>Subcommission Total</b>	<b>\$25,000</b>	<b>\$18,465</b>	<i>Initial Subcomm requests totaled \$50,600. ICS had drastically reduced these to the same funding levels as in 2004; but IUGS slashed this much deeper.</i>
<i>Special travel needs (* )</i>	<b>\$7,500</b>	<b>\$6,500</b>	<i>See explanation above. Pooled requests from ALL subcommissions and executive. Mainly for China congress-travel subsidies.</i>
ICS Executive	<b>\$2500</b>	<b>\$1,725</b>	<i>Educational chart drafting/printing/mailing was the major expense.</i>
<i>Publications and Contingency</i>	<b>\$3000</b>	<b>\$2,800</b>	<i>Subcommission workshops, GSSP evaluations, posters, and other special projects.</i>
<i>Year of Planet Earth poster, IGC preparation; and INQUA participation</i>	<b>\$7,000</b>	<b>\$2,000</b>	<i>Drafting, printing/mailing of special brochures and posters on TimeScale and Earth History for Year of Planet Earth [was now subsidized by GeoScience Australia and ANU]; Special INQUA-ICS workshop at INQUA Congress in</i>

		<i>Australia (Aug, 2007) to formalize Quaternary-Pleistocene geologic scale (IUGS did not provide the special request, but INQUA eventually provided airfare to Ogg).</i>
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**TOTAL (\$ USD)**            **45,000**            **\$30,000**            [A 33% reduction from planned operating levels.]

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

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

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## **9. WORK PLAN, CRITICAL MILESTONES, and ANTICIPATED RESULTS TO BE ACHIEVED FOR April 2008-March 2009:**

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

### **ICS Executive Committee**

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



**GSSP voting schedule (as pledged by Subcommissions in 2005); updated for Nov 2007:**

<b>Subcomm</b>	<b>2008</b>	<b>2008 or 2009</b>
<i>Quaternary</i>	Holocene; Late Pleist., Ionian	
<i>Neogene</i>	Langhian,	Burdigalian
<i>Paleogene</i>	Selandian, Thanetian, Chatian, Priabonian, Lutetian, Bartonian	
<i>Cretaceous</i>	Campanian, Albian, Aptian, Barremian, Santonian, Coniacian, Hauterivian, Valanginian	Berriasian ( <i>base Cretaceous</i> )
<i>Jurassic</i>	Tithonian, Kimmeridgian, Oxfordian, Callovian, Bathonian, Toarcian, Hettangian ( <i>base Jurassic</i> )	
<i>Triassic</i>	Rhaetian, Carnian, Anisian, Olenekian,	Norian
<i>Permian</i>	Kungurian, Artinskian, Sakmarian,	
<i>Carboniferous</i>	Gzhelian, Serpukhovian, Visean	Kasimovian, Moscovian
<i>Devonian</i>	-- finished --	
<i>Silurian</i>	-- finished --	
<i>Ordovician</i>	-- finished on schedule --	
<i>Cambrian</i>	Fifth, Ninth	Tenth; lower Cambrian stages (2, 3, 4)
<i>Neoproterozoic</i>	Cryogenian	Ediacaran series
<i>Precambrian</i>	Proterozoic, Hadean	Archean

**Quaternary Subcommission**

- Formalization of GSSPs for the base of the Holocene Series/Epoch, and base of the Upper Pleistocene sub-series.
- A special issue of *Episodes* (March 2008) will be devoted to the Quaternary interval of Earth's history.
- The Regional Stratigraphic Committee of Italy is proposing to formalize a subdivision of the Mediterranean Pleistocene in regional stages, which will improve intra-Pleistocene correlations in that classical region. These stage names will become the official stage names for the Pleistocene stages -- Gelasian, Calabrian, Ionian, Tarantian.

### Neogene Subcommittee

- By the end of 2008 it will be clear whether the La Vedova section is a suitable section for defining the *Langhian* GSSP and can be proposed as such.

### Paleogene Subcommittee

- The *Selandian* and *Thanetian* GSSPs will be submitted to IUGS for ratification in early 2008.
- Complete the work on the GSSPs of the base of the *Lutetian*, *Bartonian*, *Priabonian* and *Chattian*. The target dates for these submissions are late 2008.

### Cretaceous Subcommittee

- A flurry of publications during this year on the three candidates for the *Santonian* GSSP should enable an informed vote decision in 2008.
- The *Coniacian* working group completed a proposal for establishing the GSSP at Salzgitter-Salder (Germany) with different macrofossil and microfossil correlation methods, and a vote is anticipated within the next two months.
- The *Barremian* GSSP is being proposed for southeastern Spain.
- The *Hauterivian* GSSP is proposed for La Charce (France), with Tethyan/Boreal correlation being summarized by the working group for the formal proposal.
- The *Valanginian* will begin with the *Pertransiens* ammonite zone, and the formal GSSP proposal is expected soon.
- Therefore, nearly the entire suite of Cretaceous GSSP proposals will be completed for voting by the Subcommittee and ICS during 2008. A consensus appears to be formulated on the important definition of base-Cretaceous in the classical section of the type Berriasian.

### Jurassic Subcommittee

The timetables for completion and submission of proposals to the Jurassic Subcommittee have been agreed between the Executive and most of the Working Groups. With the possible exception of the Tithonian, the year 2008 should be marked by the completion of the GSSP project at Stage level.

- *Hettangian* (*Tr-Ju boundary*) expected submission to Subcommittee March/April 2008;
- *Toarcian* proposal being reconstructed, expected April 2008;
- *Bathonian* expected submission to Subcommittee in December 2007;
- *Callovian* details being published and proposal prepared, expected March 2008;
- *Oxfordian* expected proposal to Subcommittee February 2008;
- *Kimmeridgian* section selected and confirmed by WG vote; expected January 2008.
- *Marine and non-marine Jurassic: Global correlation and major geological events* symposium at Oslo IGC 33.

### Triassic Subcommittee

- Voting on *Anisian* GSSP candidates in Spring 2008.
- Resolution of the *Rhaetian* GSSP datum levels should be resolved in early 2008. The GSSP locality at Steinbergkogel, Austria is generally agreed.

### Permian Subcommittee

- 1. Report of results of sampling from Cisuralian field excursion in early 2008.

- 2. Completion of base-*Sakmarian* GSSP proposal by July 2008.
- 3. Completion of base-*Artinskian* GSSP proposal by December 2008.

### **Carboniferous Subcommission**

- *Tournaisian* GSSP (Pengchong, China) will be submitted to ICS in early 2008 for approval.
- The remaining task groups are to wrap up discussions and vote on candidate GSSPs.

### **Devonian Subcommission**

- Submit proposals for the formal definition of *Givetian* and *Frasnian* substages to ICS for ratification. Publication of the use of substages of the Givetian, Frasnian and Famennian in *Episodes* and *Geological Quarterly*.
- Founding of joint SDS/SCS Working Group on D/C boundary; first WG discussion at IGC in Oslo.

### **Silurian Subcommission**

- Work on the Llandovery/Wenlock boundary and base of the Ludlow
- Integrated chemostratigraphy and biostratigraphy in different palaeocontinents and facies
- Substage Working Groups to propose GSSPs for Substages as appropriate,

### **Ordovician Subcommission**

- Publish the **Ordovician Chronostratigraphy** chart in *Lethaia* and the Chinese version in *Journal of Stratigraphy in China* before the Oslo IGC.

### **Cambrian Subcommission**

- Cambrian Stage Subdivision Working Group in 2008 (Siberia) and in 2009 (Kazakhstan).
- Vote on at least two proposals for stage-level GSSPs (stages **5** and **9**).

### **Ediacaran Subcommission**

- Preliminary Towards the end of the year, there will be calls for full proposals for *Cryogenian* Period basal GSSP and for Ediacaran subdivision.

### **Precambrian Subcommission**

- Results on survey done in 2007 on GSSP-definitions for Precambrian and formalizing Archean divisions will form the basis for a paper in *Precambrian Research* and a shorter report in *Episodes*.
- Workshop of the Subcommission at the Australian Earth Sciences Convention, July 2008.
- Firming up Indian and Russian participation in the Subcommission.
- Investigation of a possible Archean-Proterozoic boundary GSSP at the top of the Hamersley Basin, Western Australia.

### **International Stratigraphic Classification Subcommission (ISSC)**

- Publish chemostratigraphy and magnetostratigraphy chapters as formal articles.
- Complete preprint drafts for the other chapters, including sequence stratigraphy.

### Stratigraphic Information Services

- Produce school-level educational material in both printed and Internet form for the INTERNATIONAL YEAR OF PLANET EARTH.
- Establish an on-line “booklet” for the geological time scale
- Add new sub-sites to host the ISSC, Cretaceous and possibly another subcommission site.
- Promote *TimeScale Creator* visualization package for exploring Earth history.
- Place databases on-line to support “hot-link” version of TimeScale Creator, and create a “TimeScale Creator Pro” version to obtain industrial contributions.
- RMS feed to provide updated GSSP and numerical time-scale information to national geological surveys.

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

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

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

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## **10. BUDGET REQUEST TO IUGS FOR 2008 (\$ US)**

The following budget request is for operations and special initiatives through March 2009 (funds are generally transferred from IUGS to ICS in April; which implies ICS subcommissions must operate on an April-to-March fiscal year).

***Oslo International Geological Congress activities*** – Every ICS subcommission will be sponsoring IGC symposia, field trips, and other activities during the IGC of August 2008 (see above). In addition to preparing posters to be distributed to IGC participants, the ICS Executive has several other activities, share a booth, and other publications to be distributed (see Work Plan of Section #9). Each subcommission will be holding business meetings, and the ICS will have a general open meeting to emphasize its progress during the past 4 years, and future plans. However, this extensive participation at the IGC will be very expensive (registration, travel, hotel, publication printing, etc.). Therefore, the ICS is requesting a special IUGS allocation to partially cover registration costs of incoming and continuing subcommission officers, the special printing costs (\$1000), and a fund for partially reimbursing the travel costs of some ICS participants who are on pension status or require support to be able to attend (\$4000). **This Oslo IGC request (\$14,000) is a one-time special request from IUGS, and is not a continuing budget item for future years.**

**Budget Summary:**

The initial total of all submitted Subcommittee and ICS Executive budget requests is **\$73,000**. These amounts have already been adjusted for external funding sources, and includes requests to attend the IGC. As can be seen in the following table, each subcommission requested substantially more than it received in 2006 or 2007. This partially reflects the financial hardships that each subcommission suffered when their 2006 and 2007 budgets were forced to be cut to less than half of their submitted needs; as is often dramatically emphasized in their Annual Reports. This was the third consecutive year of severe budget reduction for the subcommissions and other ICS activities. Therefore, the subcommissions wish to recover some of their personal out-of-pocket debts and regain their pre-2005 level of activities.

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 2008 (as indicated in the above comments). We have also tried to make the request for 2008 similar to the funding in 2007; but with the additional desire to adequately participate in the International Geological Congress in Oslo during August 2008.

We therefore request a total allocation of **\$36,000** (*return to ICS funding levels before 2005*) + **\$14,000** (*for IGC participation by volunteer officers on pensions or from less-affluent nations*) from IUGS for the 2008 fiscal year = **\$50,000** total (USD).

	<b>Final 2007 Allocation (Item#8 above)</b>	<b>Initial Subcomm Requests 2007</b>	<b>ICS recommended allocation</b>	<b>Comments on “<i>ICS recommended allocation</i>” to initial subcommission requests</b>
Quaternary	\$250	1000	<b>\$400</b>	
Neogene	\$975	2175	<b>\$2000</b>	GSSP-study field trip request moved to Special travel contingency
Paleogene	\$1,600	4495	<b>\$3000</b>	IGC and other travel moved to Special travel contingency
Cretaceous	\$0	4060	<b>\$1000</b>	Includes deficit acquired due to 2007 short-fall of funding. Six GSSPs will undergo voting and publication. IGC travel (\$3000) moved to Special request.
Jurassic	\$1,500	1827	<b>\$1500</b>	Six GSSPs will undergo voting and publication. IGC and other travel moved to Special travel contingency
Triassic	\$2,500	2900	<b>\$2000</b>	Completion of Upper Triassic GSSPs
Permian	\$700	1000	<b>\$1000</b>	Major suite of GSSP preparations, plus Congress.
Carboniferous	\$350	800	<b>\$500</b>	
Devonian	\$350	500	<b>\$500</b>	
Silurian	\$350	500	<b>\$500</b>	IGC travel (\$1000) moved to Special request. <i>needs</i> ”
Ordovician	\$3,200	1000	<b>\$1500</b>	IGC travel (\$1000) moved to Special request. <i>needs</i> ”
Cambrian	\$2,000	7100	<b>\$3100</b>	Major Working group meeting in Siberia. IGC and other travel moved to Special travel contingency
Ediacaran	\$1,000	1000	<b>\$3000</b>	IGC travel (\$1000) moved to Special request.

Precambrian	\$700	6000	<b>\$500</b>	<i>needs</i> IGC travel (\$3000) moved to Special request.
Classification	\$250	400	<b>\$1000</b>	<i>needs</i> GSSP-study field trip request moved to Special travel contingency
Strat. Info. System	<b>\$1,625</b>	3000	<b>\$2500</b>	ICS web development support. Installation of databases to support <b>TimeScale Creator</b> hot-links.
<i>Subcommission Total</i>	<b>\$18,465</b>	47,950	<b>\$25,000</b>	<i>NOTE: This is AFTER moving all IGC travel requests (\$14,000) to SPECIAL (below)!</i>
<i>Special travel needs</i>	<b>\$8,500</b>	8500	<b>\$7,500</b>	<i>See explanation above. Pooled requests of 16 subcommissions and ICS Executive.</i>
ICS Executive	<b>\$1,235</b>	3500	<b>\$2,500</b>	Educational chart drafting/printing will be a major expense
<i>Year of Planet Earth publications; Contingency; etc.</i>	<b>\$1,800</b>	4000	<b>\$3,000</b>	<i>Drafting, printing/mailing of special brochures and posters on TimeScale and Earth History for Year of Planet Earth, and other special projects.</i>
<b>SPECIAL – International Geological Congress participation</b>		14,000	<b>\$14,000</b>	<i>Subsidy for registration/travel, especially for participation by officers on pensions or from less-affluent nations.</i>
<b>TOTAL (in USD)</b>	<b>30,000</b>	<b>73,157</b>	<b>50,000</b>	<i>[NOTE: We have trimmed this to be the identical level received in 2004, including IGC special items.]</i>

### **Budget Explanation:**

It is important to note that the previous allocations in 2007 to all subcommissions and other programs had been reduced by IUGS by almost 30% below their already-slashed requests (subcommissions had requested \$60,000; ICS had lowered these for a total of \$40,000; and IUGS granted all categories only a total of \$30,000 – see re-allocation table and other remarks in Item #8 above).

The column of "Initial Subcomm Request 2008" is taken from each Subcommission annual report of 2007 (*already adjusted for projected residual balances through March 2008; with Nov 2008 exchange ranges of 1Euro=\$1.45 or 1 Pound=\$2.00, which includes conversion costs*). We (ICS Executive) have added an additional column of "ICS recommended allocation" based on past budgets and performances of each subcommissions and their itemized work plans for the next fiscal year.

### **Special Budget Categories:**

We have grouped some aspects of the subcommission requests into aggregate categories of "*Special travel needs*" and "*Contingency*" categories. The funds will be redistributed by the ICS secretary-treasurer according to the final budget received from IUGS and needs of the subcommissions as their activities occur during 2007 and early 2008. The ICS *Contingency* supports special and unanticipated needs of subcommission as these arise in the later part of

2007-2008. The *Special Travel Needs* fund is explained in Section #8 (see above), and pools the travel requests by the various subcommissions – this fund is usually exhausted by the mid-point of the budget year.

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## 11. REVIEW CHIEF ACCOMPLISHMENTS SINCE 2000

A combined 4-year review was compiled as part of the ICS report for 2004, and the accomplishments for 2007 are listed in Item #7 above. A subset of major accomplishments is reproduced here. More details are in the individual subcommission reports.

### A. GSSPs (boundary-stratotypes) created since 2000 (*listed in stratigraphic order*)

#### Quaternary

- agreed with (2005) INQUA's scientific definition that the base of *Quaternary* coincides with base of Gelasian Stage (*hence, a revised base of Pleistocene epoch/series*). This INQUA-ICS agreement allowed the Quaternary to be established as a Period/System (2007). The *Calabrian* became the second stage in the Quaternary. [*Defining and ranking the Quaternary is still pending formal IUGS ratification.*]

#### Neogene

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

#### Paleogene

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

#### Cretaceous

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

#### Jurassic

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

#### Triassic

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

## Permian

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

## Carboniferous

- agreement on Series-level divisions (2004)
- ratification of Series names, and Stage names (2006)

## Devonian

- all Devonian stage boundaries are defined by a GSSP
- publication of two volumes (*Courier Forschungsinstitut Senckenberg*, 220 (205 pp.) and 225 (347 pp.) in 2000, in which the GSSPs of all Devonian stages have been updated and their correlative value for worldwide correlation is demonstrated.

## Silurian

- all Silurian stage boundaries are defined by a GSSP; however, some of these appear to be more useful for regional correlation, rather than having global applicability.

## Ordovician

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

## Cambrian

- base of the *Paibian* Stage and the **Furongian Series** (uppermost series of Cambrian) in the Paibi section, NW Hunan province, south China (2003).
- base of *Guzhangian* Stage (Series 3) in China (2007)
- base of *Drumian* Stage (Series 3) in USA (2007)
- vote to subdivide the Cambrian into **four series** and **10 stages**.

## Proterozoic Era

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

## B. The International Stratigraphic Chart

The International Stratigraphic Chart (divisions of geologic time) highlights all units that are formally defined by a GSSP or anticipated by a future GSSP decision, plus presents the ratified nomenclature of global chronostratigraphy. Two color schemes are available: the



International Geological Map of the World conventions or those of the U.S. Geological Survey. This chart is continually updated, and public graphics can be downloaded in either color scheme at [www.stratigraphy.org](http://www.stratigraphy.org).

### C. Geologic Time Scale 2004

This major achievement that involved all the subcommissions compiled the current status of all ratified divisions of geologic time, diagrammed the main biologic, magnetic and geochemical events within each system, and indicated the best-available interpolation of ages for all major events in the Phanerozoic.

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## 12. OBJECTIVES AND WORK PLAN FOR NEXT 5 YEARS (2008-2012)

The following is a summary of objectives of the ICS Executive Commission and a selection of key goals noted in the detailed reports of each subcommission. See Section 9 for a summary of objectives for 2007-2008.

### ICS Executive Committee

- Define GSSP sections for all stages of the Phanerozoic Era, and solidify subdivisions of the Precambrian. **All GSSPs were to be ratified by 2008** (IUGS mandate in 2000; but IUGS Ad Hoc review indicated in 2006 that a strict deadline should not be enforced.). The optimistic schedules for ICS/IUGS voting/ratification of the remaining GSSPs in each period is detailed below.
- Develop a suite of web-accessible international databases on all aspects of chronostratigraphy (paleontology, isotopes, cycles, magnetics, etc.).
- Produce the ‘*Atlas of the Geologic Time Scale*’ in pocket (A4) book and digital formats.
- Produce a comprehensive “*Geologic Time Scale 2010*” that will involve the expertise of all subcommissions. The details of Earth’s history will be encapsulated in the *TimeScale Creator* visualization system.
- Compile summaries of all major sedimentary basins, continental shelves and deep-sea deposits in conjunction with national geologic surveys, ocean drilling program and other groups. These will be incorporated into a GIS-query system that extends the dimensions of the displays of *TimeScale Creator*. This program will be under a new Subcommission for Stratigraphic Information (databases, visualization systems, etc.).

### Quaternary Subcommission

- GSSPs for base of Holocene Epoch and for Pleistocene subdivisions.
- Compiling regional sequences throughout the Quaternary.
- Classify and formalize, where necessary, divisions based on very short-term events.
- Detailed correlation charts for specific time periods or specific regions, e.g. Weichselian Late-glacial to Holocene (15 ky); or the last 250 ky in Europe.

### Neogene Subcommittee

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

### Paleogene Subcommittee

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

### Cretaceous Subcommittee

- 2008 - Finalize proposals for the base of Valanginian, Hauterivian, Barremian, Aptian, Albian, Coniacian, Santonian, and Campanian
- 2009 - Finalize proposal for the base of Berriasian (Jurassic/Cretaceous boundary)
- 2010 to 2012 – Definition of substages.
- To communicate the results as widely as possible.
- To develop new directions for the Subcommittee as GSSP proposals are completed.

### Jurassic Subcommittee

- Stage Working Groups to standardise and propose GSSPs for Substages as appropriate, but named ONLY as Lower/Middle/Upper. We do not want to clutter up the nomenclature with named Substages such as Carixian, Domerian etc. These will be approved by the Jurassic Subcommittee, but ICS and IUGS have no current plans for involvement with Substages.
- Asking the Stage Working Groups to define the bases of the Standard (Ammonite) Zones in terms not only of the correlation marker event but also to propose a stratotype point for the basal boundary in the same way as for the Stages. Similar definition of Regional Zones and maximising the detail of correlation with the Standard Zones would be very valuable.
- Involvement in the aims and objectives of IGCP Project 506, targetted on developing means of correlation between marine and non-marine Jurassic successions. In recent decades, the latter have been recognised to be very widespread and economically important in several regions, with exciting terrestrial faunas and floras.
- Developing and expanding the Thematic Working Groups, some of which have been very successful. For this to work they need to be given more specific projects and targets - for example searching for and interpreting data from all sources relevant to reconstructing the palaeobiogeography or the climate of one or more specific time-intervals. In part, this will be given further impetus by involvement in IGCP Project 506.
- Investigate the establishment of **data-bases** which would bring together and make available information from all sources associated with the "members and friends" of the Jurassic.

### Triassic Subcommittee

- Completion of Triassic GSSPs
  - 2008 – Olenekian, Anisian, Carnian and Rhaetian
  - 2009 –Norian.

- 2009 – Summary volume of all Triassic GSSPs. Emphasis switches to choice of non-marine auxiliary sections; and standardized substages.

### **Permian Subcommittee**

- Completion of Permian GSSPs
  1. Sakmarian proposal will be conducted prior to IGC in 2008.
  3. Artinskian is anticipated during late 2008 or early 2009.
  4. Kungurian is anticipated during 2009.
- Correlations into Continental deposits, and across provincial boundaries.
- Detailed documentation of the geologic evolution of the Earth during the Permian with respect to the established chronostratigraphic framework.

### **Carboniferous Subcommittee**

- Selecting all GSSPs by 2009.

### **Devonian Subcommittee**

- Formalize the substage subdivision of stages.

### **Silurian Subcommittee**

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

### **Ordovician Subcommittee**

- Publication of an Ordovician time table.
- Publication of the special volume of “*The global Ordovician Earth system*”.
- Refocusing of Subcommittee to address the global Ordovician Earth system.

### **Cambrian Subcommittee**

- The principal objective of the Subcommittee over the next four years is the identification of the best horizons for establishing stage-level and series-level GSSPs within the Cambrian System.
- All stages of the upper half of the Cambrian will be defined by GSSPs by 2008 or 2009. Stages of the lower half of the Cambrian are expected to be defined by GSSPs by 2012.
- A secondary objective of the Subcommittee is to develop and publish regional correlation charts for the Cambrian.

### **Ediacaran Subcommittee**

- Beginning of 2009, vote on full proposals for criteria used to subdivide the Ediacaran Period and to define the base of the Cryogenian Period.
- End 2009 (ratification in 2010), define the base of the Cryogenian Period; and subdivide Ediacaran into two or more epochs.

### **Precambrian Subcommittee**

- A complete Precambrian time scale in place, with formalized Hadean and Archean eons.
- Formal GSSP for the base of the Proterozoic.
- Natural subdivisions of the Archean Eon, with GSSPs for each era-rank subdivision, where possible (Eo-, Paleo-, Meso-, and Neoarchean).
- Creation and formal definition of an Eoproterozoic Era.
- Full incorporation of latest insights from planetary science in the earliest part of the terrestrial Precambrian time scale. Compare and contrast the time scales of Earth with those of other planetary bodies, specifically the Moon and Mars.

### **International Stratigraphic Classification Subcommittee**

- The FINAL GOAL of ISSC is the publication of a new *International Guidebook* for stratigraphic classification printed for the 33th IGC (Oslo, 2008). The book is conceived as a user's friendly, simple, very well illustrated manual with schemes and color photographs full of real examples from various continents and from various parts of the stratigraphic column.

### **Stratigraphic Information Services**

- Comprehensive and authoritative user-friendly time-scale charts (and plotting tools), GSSP databases, and stratigraphic software will make the ICS website a popular "one-stop-shopping" hub for global geoscientists, educators and the public.

# INTERNATIONAL COMMISSION ON STRATIGRAPHY (ICS)

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15 Nov 2007

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# International Commission on Stratigraphy Subcommission on Quaternary Stratigraphy

## ANNUAL REPORT 2007

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

#### Subcommission on Quaternary Stratigraphy (SQS)

Philip GIBBARD; *Chairman, SQS*

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

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

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

### 3. ORGANISATION

ISQS is a Subcommission of the International Commission on Stratigraphy.

Officers (chairman, two vice-chairmen, secretary), voting members (18). (*see Appendix for complete listing*). There are currently three Working Groups established the remit of which is

there definition of GSSPs for the Early-Middle, Middle/Late Pleistocene and Late Pleistocene/Holocene boundaries.

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

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

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

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

## **5. CHIEF ACCOMPLISHMENTS IN 2007**

Three GSSP Working Group are fully functioning:

**Lower-Middle Pleistocene boundary** (base of tentative "Ionian" Stage) -- The Working Group began in November 2002 and currently comprises 13 members: Brad Pillans (Australia, Chair), Thijs Van Kolfschoten (The Netherlands), Andrei Dodonov (Russia), Anastasia Markova (Russia), Lui Jiaqi (China), Charles Turner (UK), Luc Lourens (The Netherlands), Martin Head (UK), Cesare Ravazzi (Italy), Craig Feibel (USA), Tom Meijer (The Netherlands), Luca Capraro (Italy) and Hisao Kumai (Japan).

Following a Working Group resolution at the 32<sup>nd</sup> IGC in Florence in 2004, that the boundary be defined in a marine section at a point "close to" the Matuyama/Brunhes boundary, three candidate GSSPs are being evaluated: two in southern Italy (Montalbano Jonico section and Valle di Manche section), and a third in Japan (Chiba section).

At the 17<sup>th</sup> INQUA Congress in Cairns in late July/early August 2007, some Working Group members participated in a symposium on definition and subdivision of the Quaternary

(convenors: P. Gibbard/B. Pillans). It had been hoped that a formal recommendation on the preferred GSSP could be announced in Cairns, however, we are still evaluating the merits of the respective candidate sections. Brad Pillans gave an overview talk at the conference, entitled "Defining the Lower-Middle Pleistocene boundary", to assist the evaluation process. A significant publication by N. Ciaranfi and others, on the astronomical calibration of the Montalbano Jonico section, is about to be published in *Terra Nova*.

We plan to have our evaluations completed before the 33<sup>rd</sup> IGC in Oslo in mid 2008.

**Middle-Upper Pleistocene** -- As a result of a workshop in 2005, the material presented and discussed has been used to formulate an official GSSP proposal which should be sent to the SQS voting members. Caused by the substantial input of the working group members we have been prepared a manuscript during the last year which is almost finished. It is proposed in this manuscript that the Saalian-Eemian stage boundary, and thus the Middle-Upper Pleistocene Subseries boundary-stratotype be defined from a terrestrial locality (Amsterdam-Terminal borehole). The working group members agreed that it has been satisfactorily demonstrated that the Amsterdam Terminal borehole is supported by an exceptionally wide and varied range of biostratigraphical, lithological and geochemical/isotopic data. In the manuscript we describe and discuss the global correlation and the advantage of using parastratotypes in both marine and terrestrial facies. The material presented and discussed in the workshop report will be used to formulate an official GSSP proposal which should be sent to the SQS voting members in 2007. After the decision of the voting members, the manuscript will be submitted to *Episodes* before the Geological Congress 2008.

**Pleistocene-Holocene boundary** -- The Working Group has defined the Pleistocene-Holocene boundary in the new Greenland NorthGRIP (NGRIP) ice core. This core contains a proxy climate record across the boundary of unusual clarity and resolution. Analysis of a number of different physical and chemical parameters within the ice enables the base of the Holocene, as reflected in the first signs of climatic warming at the end of the Younger Dryas/Greenland Stadial 1 cold phase, to be located with a high degree of precision. This climatic event is reflected first in a shift in deuterium excess values, followed consecutively by changes in  $\delta^{18}\text{O}$ , dust concentration, a range of chemical species, and by a change in annual layer thickness. A timescale based on multi-parameter annual layer counting provides an age of 11,703 yr b2k (before AD2000) for the base of the Holocene, with a maximum counting uncertainty estimated at 99 yr. It is proposed that an archived core from this unique sequence should constitute the Global Stratotype Section and Point (GSSP) and Global Standard Stratigraphic Age (GSSA) for the base of the Holocene Series/Epoch (Quaternary System/Period). The Report of the Working Group has been close to completion for over 20 months but it will be completed within 1-2 months. It will be circulated for approval early in 2008. The proposal will be published in two articles, a full-length justification will appear in the *Journal of Quaternary Science*, whilst an abbreviated version will be submitted to *Episodes*, once ratification has been received from IUGS.

In addition to the Working Group activities noted above, the Subcommittee website continues to be expanded at: <http://www.quaternary.stratigraphy.org.uk> This site is used as the main line of communication for the Subcommittee. It continues to be supported by the *Journal of Quaternary Science* (published by J.Wiley & Sons). The pages are maintained by Phil Gibbard.

An open meeting was convened at the INQUA Congress in Cairns, Australia in August 2007 to report and discuss progress, solicit advice and to inform Quaternary colleagues of the developments regarding definition of the Quaternary Period definition. The meeting was attended by 45 people and there was a lively discussion of the various topics. In addition a joint session of ISQS and the INQUA Commission on Stratigraphy was held. This included a series of talks on the theme of Quaternary stratigraphy and was again well attended. Presentations on the division and definition of the Quaternary were given by Philip Gibbard, Jim Ogg and Brad Pillans.

A final vote on the definition of the Quaternary Period took place in the closing ceremony of INQUA at the end of the Congress at which the INQUA President Professor John Clague invited participants to vote on their preferred basal boundary. There was a unanimous vote in support of the boundary being placed at 2.6 Ma. The meeting was attended by over 500 people.

#### **6. SUMMARY OF EXPENDITURE IN 2007:**

Maintenance of website (address) @ £10.00 annually:	£10.00
Contribution to travel by participants to Cairns INQUA Congress meeting	<u>£150.00</u>
TOTAL	£160.00

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

All three working groups will continue to function in 2008. The Working Group on the Pleistocene-Holocene Boundary are about to submit its proposal in the new year. Other groups will also continue their deliberations but all understand that they must complete their assigned tasks by mid-2008.

No additional working groups have been established.

#### **8. BUDGET FROM ICS IN 2007 AND REQUESTED FOR 2008**

*Currency in British Pounds (£), based on an exchange rate of £1.00 = 2.015 US\$ (17.12.07)*

##### *Actual costs 2007*

Amount carried over from 2005	£1073
Amount received from ICS	£99.22 (\$200)
General office expenses	£20.00
Contribution towards cost of web-site	£10.00
Travel costs	£400.00
Current bank balance	£742.22

##### *Proposed costs for 2007*

General office expenses	£25.00
Contribution towards cost of website	£10.00
Contributions to Working Groups	£100.00
Support for travel meetings	<u>£100.00</u>

Total 2008 budget	£507.22 (\$1021.65)
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### **Potential funding sources outside IUGS**

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

### **9. OBJECTIVES AND WORK PLAN FOR REMAINING YEAR (2003-2008)**

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

- a. Formalization of Global Stratotype section and Points (GSSP) for the Lower/Middle and for the Middle/Upper subseries/subepoch boundaries of the Pleistocene Series/Epoch. The formal nomenclature for the subseries/subepoch divisions of the Pleistocene will be Lower/Early, Middle/Mid, and Upper/Late.
- b. Formalization of a GSSA for the base of the Holocene Series/Epoch.
- c. An international correlation chart for the most commonly used regional stratigraphic units and isotope stages. *This has now been completed and was published in early 2005, as noted above.* An updated version is currently in press in *Episodes*.
- d. The voting members, and make-up of each GSSP task group, should strive to provide a uniform coverage of terrestrial, shallow-marine and pelagic settings with global coverage.
- e. Progress and discussions within the Subcommittee will be summarized through an active SQS website.

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

PL GIBBARD  
Cambridge  
12.12.07

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

#### *Nominated officers*

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### *Working group leaders and corresponding members*

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

convenor: Professor M.J.C. Walker (Lampeter)  
 members: INQUA-INTIMATE group members

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

convenor: Professor Thomas Litt (Bonn, Germany)

#### members:

Professor Art Bettis (Iowa, USA) art-bettis@uiowa.edu  
 Dr. Aleid Bosch (Zwolle, The Netherlands) A.Bosch@nitg.tno.nl  
 Dr. Andrey Dodonov (Moscow, Russia) dodonov@geo.tv-sign.ru  
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 Professor Jerry McManus (Wood's Hole, USA) jmcmanus@whoi.edu  
 Professor Tim Partridge (Johannesburg (South Africa)  
 Dr. Charles Turner (Milton Keynes, UK) c.turner@open.ac.uk convenor:

**Working Group on the Early/Middle Pleistocene Boundary**  
convenor: Professor Brad Pillans (Canberra)

members:

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



# **SUBCOMMISSION ON NEOGENE STRATIGRAPHY**

ANNUAL REPORT 2007

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

Subcommission on Neogene Stratigraphy (SNS)

Frederik J. Hilgen, Chairman SNS

Faculty of Geosciences, Utrecht University

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

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

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

## **3. ORGANIZATION**

The SNS is a subcommission of the ICS, founded in 1971. Reference is made to the annual report of 1995 for a brief historical resume of the SNS. The subcommission has four regional committees (Mediterranean, Pacific, Atlantic and Nordic) and keeps close contacts with the Russian Neogene Commission chaired by Prof. Yuri B. Gladenkov. Apart from the executive bureau, the SNS has 17 voting members and 38 corresponding members (*see Appendix for full list of officers and voting members*). The SNS has presently one active working group for defining the GSSP remaining for the Langhian and Burdigalian chaired by Isabella Raffi. The SNS web site ([www.geo.uu.nl/SNS](http://www.geo.uu.nl/SNS)) is used for news release and contains the following sections: Home, News, Board, Members, Newsletters, GSSPs, and Links.

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

**Chair:** Frits Hilgen, Utrecht, The Netherlands

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

**Secretary:** Elena Turco, Parma, Italy

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

**4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS**

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

**5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2007**

The proposal for the *Serravallian* GSSP was formally ratified by IUGS. It is defined at the base of the Blue Clay Formation in the Ras il Pellegrin section on Malta, coincident with the younger end of the major mid-Miocene (Mi-3b) oxygen isotope event and relatively close to the *Sphenolithus heteromorphus* LO, previously considered as prime guiding criterion for the boundary was formally ratified. A short paper about the Serravallian GSSP will be published in *Episodes*.

A pilot study has been carried out on the downward extension of the La Vedova section near Ancona (central Italy), one of the most promising potential boundary stratotype sections for defining the *Langhian* GSSP. This study is also part of an ongoing Italian research project (PRIN 2006 - prot. 2006047534 - "In search of the Global Stratotype Sections and Points of the Burdigalian and Langhian Stages and paleoceanographic implications") directed at defining the remaining GSSPs (Langhian, Burdigalian) in the Neogene.

**6. CHIEF PROBLEMS ENCOUNTERED IN 2007**

An important signaled problem is the possible lack of suitable sections in the Mediterranean for defining the *Burdigalian* GSSP, now that the La Vedova section might be suitable for defining the Langhian GSSP. This is certainly the case if we prefer to have the Burdigalian GSSP defined in astronomically tuned deep marine sections that underlie the geologic time scale. The alternative option to have this boundary defined in ODP cores is being seriously considered by the Working Group on the Langhian and Burdigalian GSSPs.

Serious problems were also encountered in maintaining the SNS website. The first unfortunate problem were a number of successive webmasters that changed job position soon afterwards. The other more serious problem is the fact that the new version of Windows *Internet Explorer* does not

support frames anymore. As a consequence, the SNS website can not be opened with Explorer but the site can still be visited using Mozilla Firefox and other browsers. This problem is presently being solved by the GeoMedia facilitating office for cartography and graphic assistance of the Faculty of Geosciences of the Utrecht University, and an updated and revised SNS website will again be fully operational before the end of the year.

## 7. SUMMARY OF EXPENDITURES IN 2007:

Credit on Nov 2006	Euro	3502,59
Contribution 2007 ICS to SNS	Euro	+751,17
Working visit Italy	Euro	-416,92
<b>Credit on Nov 2007</b>	<b>Euro</b>	<b>3836,84</b>

## 8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2008):

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

By the end of 2008 it will be clear whether the La Vedova section is a suitable section for defining the Langhian GSSP and can be proposed as such. Special attention will thereby be paid to the magnetostratigraphy and magnetostratigraphic calibration to the polarity time scale, the calcareous plankton biostratigraphy and the astronomical tuning of the section. The Italian project on this older interval of La Vedova is linked to ongoing Dutch PhD research directed at the interval between 13.5 and 15.5 in the same section.

In absence of suitable Mediterranean sections for defining the Burdigalian GSSP, the option to formally designate this boundary in an ODP core will be seriously explored.

## 9. BUDGET AND ICS COMPONENT FOR 2008

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

## 10. SUMMARY OF CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2003-2007)

*See Accomplishments in 2007 (above) for additional details.*

2003

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

2004

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

2005

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

2006

Serravallian GSSP proposal was sent out to SNS voting members; a quorum of about 86% was reached and all votes were positive except for one which was positive but with reservations. Submission of revised proposal to ICS and acceptance of proposal by ICS with a 83% majority. Submission of the Serravallian GSSP proposal to IUGS for formal ratification.

2007

Ratification of the ***Serravallian*** GSSP proposal by the IUGS. Pilot study of the La Vedova section, a candidate section for the ***Langhian*** GSSP. Revision and update of SNS website.

## 11. OBJECTIVES AND WORK PLAN FOR NEXT 2 YEARS (2008-2009)

Organization of a workshop on the selection of boundary criteria and sections for defining the two remaining stage boundaries in the Miocene, namely the base-Langhian and the base-Burdigalian. A potentially suitable section in the Mediterranean region that may serve as ***Langhian*** GSSP has been identified (La Vedova). Crucial questions to be addressed during the workshop are: 1) is La Vedova suitable to be proposed as Langhian GSSP, and 2) should we abandon the ambition of having the Burdigalian GSSP directly tied within an astrochronologic framework in order to have the GSSP defined in a Mediterranean landbased section, or should we have this GSSP defined in drilled ODP sequences at Ceara Rise or any other tuned sequence drilled by (I)ODP.

Selection of most suitable section/ODP core and guiding criteria for defining the Langhian and Burdigalian GSSPs in 2008. Writing of proposals for the Langhian and Burdigalian GSSPs in 2008-2009.

\*\*\*\*\*

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

***Subcommission officers***

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

**Vice Chairmen:** David Hodell, Department of Geological Sciences, University of Florida, Gainesville, FL 32611, USA. Email: [dhodell@geology.ufl.edu](mailto:dhodell@geology.ufl.edu)

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**Secretary:** Elena Turco, Dipartimento di Scienze della Terra, Università degli Studi di Parma, Viale G.P. Usberti 157A, 43100, Parma, Italia. Email: [elena.turco@unipr.it](mailto:elena.turco@unipr.it)

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## **International Commission on Stratigraphy Subcommission on Paleogene Stratigraphy**

**ANNUAL REPORT 2007**

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

#### **International Subcommission on Paleogene Stratigraphy**

*Submitted by:*

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

#### **Mission statement**

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

#### **Goals**

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

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

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

- 1) Establishment of an internationally agreed scale of chronostratigraphic units, fully defined by GSSPs. A set of Paleogene stages has been voted and agreed on by the ISPS in 1989. Subsequently, Working Groups have been set up to find a Global Stratotype Sections and Points (GSSPs) for the boundary of each of these stages.
- 2) Establishment of frameworks and mechanisms to encourage international collaboration in understanding the evolution of the Earth during the Paleogene Period.
- 3) Working toward an international policy concerning conservation of geologically and paleontologically important sites such as GSSPs. This relates to, inter alia, the IUGS Geosites Programme and the UNESCO Geoparks Programme.

### **3. ORGANIZATION**

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

Under the umbrella of the Subcommittee, we set up Working Groups and Regional Committees. At present are active the following:

- 1) Paleocene Working Group. Chairman: B. Schmitz, Sweden.
- 2) Ypresian/Lutetian Boundary Stratotype Working Group. Chairman: E. Molina, Spain. Secretary: S. Ortiz, Spain.
- 3) Lutetian/Bartonian Boundary Stratotype Working Group. Chairman: R. Fluegeman, USA.
- 4) Bartonian/Priabonian Boundary Stratotype Working Group. Chairwoman: I. Premoli Silva, Italy.
- 5) Rupelian/Chattian Boundary Stratotype Working Group. Chairwoman: I. Premoli Silva, Italy.
- 6) Paleogene Planktonic Foraminifera Working Group. Chairman: B. Wade, USA. Secretary: H. Coxall, UK.
- 7) Paleogene Larger Foraminifera Working Group. Chairman: L. Hottinger, Switzerland.
- 8) Paleogene Deep-Water Benthic Foraminifera Working Group. Chairman: M. Kaminski, UK. Secretary: L. Alegret, Spain.
- 9) Paleogene Calcareous Nannofossils Working Group. Chairwoman: Simonetta Monechi, Italy.
- 10) Regional Committee in North-European Paleogene Stratigraphy. Chairman: G. Vestegaard Laursen, Norway. Secretary: J.W. Verbeek, Netherlands.
- 11) South-American Regional Committee on Paleogene Stratigraphy. Chairman: N. Malumian, Argentina. Secretary: C. Nañez, Argentina.

- 12) Russian Paleogene Commission. Chairman: M.A. Akhmetiev, Russia. Secretary: G.N. Aleksandrova.
- 13) Working Group on Paleogene Stratigraphy of the North Pacific. Chairman: Y.B. Gladenkov, Russia.

Furthermore, the Subcommittee sponsors and International Meeting on the Paleogene about every two years: Zaragoza, Spain (1996); Göteborg, Sweden (1999); Powell, USA (2001); Leuven, Belgium (2003); Luxor, Egypt (2004); Bilbao, Spain (2006); Wellington, New Zealand (2009).

**Officers for 2008-2012:**

Chair: Prof. Eustoquio Molina. Departamento de Ciencias de la Tierra. Universidad de Zaragoza. Calle Pedro Cerbuna, 12. E-5009 Zaragoza. Spain. [emolina@unizar.es](mailto:emolina@unizar.es)

Vice-Chair: Prof. Noël Vandenberghe. Department Geografie-Geologie. Afdelig Geologie. Redingenstraat, 16. B-3000 Leuven. Belgium. [noel.vandenberghe@geo.kuleuven.be](mailto:noel.vandenberghe@geo.kuleuven.be)

Secretary: Prof. Simonetta Monechi, Dipartimento di Scienze della Terra. Università di Firenze. 4, Via la Pira. I-50121. Italy. [monechi@unifi.it](mailto:monechi@unifi.it)

**Procedure used for selection:** The procedure was the suggested by the Secretary of ICS. Consequently, we sent an e-mail to all Subcommittee voting members that invites nominations for Chair and Vice-Chair: *“In order to comply with the ICS procedures for the composition of the board of ISPS, in the light of the IGC 2008 next year, ISPS needs to communicate to ICS the composition of its board. At present Eustoquio Molina is chairman, Jan Hardenbol is vice chairman and the secretary is Noël Vandenberghe. The secretary being a non elected office, we have to propose to ICS only a chairman and a vice-chairman. The present board proposes to reappoint Eustoquio Molina for a second 4 years term (2008-2012). Jan Hardenbol having served 8 years would like to be replaced as vicechairman. The present Chair and vice Chair nominate Noel Vandenberghe, the current secretary, to the position of Vice Chair. If you concur or want to nominate someone else let us know ASAP and at the latest before 11/15. We will inform you of the nominations obtained and the consequent proposition the present board will do to ICS, who needs our proposition by 15th of November”*. The result was: No other nominees apart from us, 12 responded supporting our nominations and 8 did not respond. The new Secretary is appointed with the support of the current Chairman, Vicechairman and Secretary.

**Website status and activities:** The Web address for ISPS site is: <http://wzar.unizar.es/isps/index.htm> The web site content is the following: Home (overall objectives, organization), Past & Future (accomplishments, problems and plans), Working Groups and Regional Committees (annual reports), Literature (a selection of monographies on the Paleogene). News/Books (two monographies on Paleogene Stratigraphy edited by Luterbacher and Vandenberghe in 2004) and News/Events (Meeting on *Climatic and Biotic Events of the Paleogene* in Wellington, New Zealand, January 2009).

#### 4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

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

Ocean Drilling Programme.

International Subcommissions on Cretaceous and Neogene Stratigraphy.

International Geoscience Programme (IGCP).

ProGEO, Geosites and Geoparks Initiatives.

UNESCO World Heritage Sites.

#### 5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2007

The main events in 2007 have been the International Workshop of the Paleocene Working Group, which was held in Zumaya (Spain) in June 18-20 and the Penrose Conference on The Late Eocene Earth, which was held in Ancona (Italy) in September 3-6.

##### 5a. International Workshop of the Paleocene Working Group, Zumaya (Spain), June 18-20.

The Meeting was organized by Victoriano Pujalte and Xabier Orue-Etxebarria, Department of Stratigraphy and Paleontology, University of the Basque Country, Spain and by Birger Schmitz (Chairman of the Working Group), Department of Geology, University of Lund, Sweden. A total of 16 papers were presented and edited in a volume of abstracts.

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

In the web site of ISPS can be found the annual reports of the Working Groups and Regional Committees and some other accomplishments and information. The progress with the selection of GSSPs for Paleogene Stages is the following:

**Danian (Cretaceous/Paleogene boundary).** The GSSP for the base of the Danian was defined in the El Kef Section (Tunisia) and ratified by the IUGS in 1991. However, this GSSP was not officially published in a prestigious stratigraphical journal of wide distribution. Since that time, some problems arose because the detailed proposal was unknown to many scientists working on the K/Pg boundary, new sections in Mexico were found and controversial interpretations were proposed. Therefore, in order to resolve these problems, the ICS has required the ISPS to finally publish the proposal and it was published in *Episodes*: Molina E., Alegret L., Arenillas I., Arz J.A., Gallala N., Hardenbol J., Von Salis K., Steurbaut E., Vandenbeghe N. & Zaghib-Turki D. (2006). The Global Boundary Stratotype Section and Point for the base of the Danian Stage (Paleocene, Paleogene, "Tertiary", Cenozoic) at El Kef, Tunisia - Original definition and revision. *Episodes*, 29(4), 263-278.

In 2007 a second paper has been submitted to *Episodes*: Molina, E., Alegret, L., Arenillas, I., Arz, J.A., Gallala, N., Grajales-Nishimura, J.M., Murillo-Muñetón, G. & Zaghib-Turki D. (submitted). The Global Boundary Stratotype Section and Point for the base of the Danian Stage (Paleocene Series, Paleogene System, "Tertiary Sub-Era", Cenozoic Era): auxiliary sections and correlation. *Episodes*.

**Paleocene (Selandian and Thanetian).** The Paleocene Working Group was commissioned by the International Subcommission on Paleogene Stratigraphy in 1993 to define Global Stratotype Sections and Points (GSSPs) for the bases of the Selandian and Thanetian stages. After 14 years of research, the time was ripe to conclude the activities, and a meeting was held in Zumaia, Spain, from June 19 to 20, 2007, to discuss the stage GSSPs and to decide whether it is possible to reach a decision on the Paleocene stages. The meeting was attended by 23 scientists, including a majority of the scientists that participated in the founding meeting in 1993 in Göteborg, Sweden (Schmitz, 1994). In addition participated an important group of younger researchers having taken up this research path later. After constructive discussions during two days the attending scientists held a vote that gave the unanimous result that the GSSPs for the Paleocene stages shall be placed in the Zumaia section in Spain. The Danian/Selandian boundary will be placed at the base of the Itzurun Formation in the Zumaia section at San Telmo Beach. The Selandian/Thanetian will be placed at the base of magnetochron 26n in the same section. A detailed voting document for the International Subcommission on Paleogene Stratigraphy is being prepared by Schmitz et al.

**Ypresian (Paleocene/Eocene boundary).** The Working Group directed by M.P. Aubry (Rutgers University) successfully completed its task and proposed to place the GSSP for the base of the Eocene Series in the Dababiya Section near Luxor in Upper Egypt. The GSSP is located at the base of the Carbon Isotope Excursion, which has been selected as the criterion for the recognition of the Paleocene/Eocene boundary in 2002. The proposed boundary section has a good chemostratigraphic (stable isotopes) and biostratigraphic record. The "Benthic Foraminiferal Extinction Event", the peculiar planktonic foraminiferal and calcareous nannoplankton assemblages linked to the Initial Eocene Thermal Maximum are well represented in connection with the Carbon Isotope Excursion. The proposal for this GSSP was accepted by the ISPS (May 2003) and the ICS (August 2003) and ratified by the IUGS (August 2004). A complete documentation of the proposed GSSP was published by Micropaleontology Press and the official publication was recently submitted to Episodes.

**Lutetian.** A suitable GSSP candidate for the Lutetian Stage is the Gorrondatxe beach section, W Pyrenees, Basque country (Spain). A multi-disciplinary study, including physical stratigraphy (lithostratigraphy, sequence stratigraphy and magnetostratigraphy) and biostratigraphy (calcareous nannofossils, planktic and larger foraminifera) carried out over the 700 m thick Gorrondatxe section has been published by Payros et al. (2007). Another suitable candidate is the Agost section, Betic Cordillera, Alicante province (Spain), which has been intensively studied. Biostratigraphy by means of planktic foraminifera, calcareous nannofossils, small benthic foraminifera and larger foraminifera indicated that the section is continuous and quite expanded. The magnetostratigraphical study reveals a series of reversed and normal chrons, which are now being interpreted and integrated with the biostratigraphical data. A paper by Larrasoña et al. was recently submitted to *Lethaia* and another paper is in progress, including trace fossil and mineralogical data, to be submitted to *Marine Micropaleontology*. The results of both sections show that the different events traditionally used to place the Ypresian/Lutetian boundary, hitherto thought to be almost simultaneous actually occur at very different levels. The criterion to precisely define the Ypresian/Lutetian boundary will be selected in 2008 after the publication of the Agost results. Finally the best section will be chosen and the GSSP defined and proposed as soon as possible.

Reference: Payros, A. Bernaola, G., Orue-Etxebarria, X., Dinares-Turel, J., Tosquella, J. and Apellaniz, E. (2007) Reassessment of the Early-Middle Eocene biomagnetostratigraphy based on evidence from the Gorrondatxe section (Basque Country, western Pyrenees). *Lethaia*, Vol. 40, pp. 183-195.

**Bartonian.** The work of the Lutetian-Bartonian Boundary Working Group during 2007 has continued its focus on the base of magnetic polarity Chron 19N as a guide horizon for the base of the Bartonian. For the base of Chron 19N to be a useful guide horizon for the base of the Bartonian Stage, its correlation potential must be demonstrated. The working group has continued to focus field and laboratory studies on the correlation potential of this horizon.

The Contessa Highway Section, Central Apennines, Italy: The section along the Contessa Highway near Gubbio, Italy is the primary candidate for a GSSP. Historically, this section has been the focus of important biostratigraphic studies of planktonic foraminifera and calcareous nannofossils. The Contessa Highway section also contains an excellent magnetic stratigraphy record in the Paleocene and Eocene. Detailed paleontologic and geochemical studies are underway on the Contessa Highway section by a research team within the framework of the International PALIS (Paleogene Integrated Stratigraphy) Project coordinated by Rodolfo Coccioni. This team is a working group of different specialists (foraminifera, calcareous nannofossils, magnetostratigraphy, geochemistry) and is involved in the study of the Lutetian-Bartonian Boundary at the Contessa Highway section. The Contessa Highway section has been sampled at a very high-resolution (every 5 cm). It is anticipated that a high-resolution biostratigraphic framework and details of the paleoecological and paleoceanographic conditions that accompanied the deposition of the Contessa Highway succession will be the result of this work.

Studies at Barton-on-Sea, U.K: Field work on the Barton Clay and adjacent beds at Barton-on Sea, southern England were conducted in 2006 by Andy Gale and colleagues. This section is the traditional Bartonian unit Stratotype. The primary purpose of this work was to collect paleomagnetic data from the Barton Clay. Magnetic stratigraphy has been completed on the underlying Bracklesham beds on the Isle of Wight and correlated with polarity chronozones through the use of calcareous nannofossils. To date, no paleomagnetic data has been collected from the Barton. Results from this work will enhance our understanding of the chronostratigraphy of the type Bartonian and enable better decision-making when selecting a final GSSP.

**Priabonian.** Tasks of the Italian scientific community were to search for GSSPs of the Middle-Upper Eocene Transition. Investigations on both transitions have been undertaken by a number of researchers from several Italian Universities (i.e. Padua, Ferrara, Urbino, Milan) and CNR Institutes as well as from some European and USA Universities and Institutions of the "ALANO NET" and by the numerous scientists of the OLIS Working Group coordinated by Rio (University of Padua). During 2007 studies on the Alano di Piave section (Veneto region, NE Italy), the potential candidate for defining the GSSP of the Middle/Upper Eocene, equated to the base of the Priabonian Stage, have progressed. Calcareous plankton (nannofossils and foraminifera) high-resolution quantitative biostratigraphies have been completed and correlated to magnetostratigraphy and to oxygen and carbon stable isotopes across the critical interval, while dinocyst biostratigraphical and benthic foraminiferal studies are close to completion. A paper on integrated multiple stratigraphies of the Alano di Piave section is to be submitted for publication early in 2008.

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

**Chattian.** Tasks of the Italian scientific community were to search for GSSPs of the Lower-Upper Oligocene Transition. Investigations on both transitions have been undertaken by a number of researchers from several Italian Universities (i.e. Padua, Ferrara, Urbino, Milan) and CNR Institutes as well as from some European and USA Universities and Institutions of the “ALANO NET” and by the numerous scientists of the OLIS Working Group coordinated by Coccioni (University of Urbino).

The paper on “Integrated stratigraphy of the Oligocene pelagic sequence in the Umbria-Marche basin (Northeastern Apennines, Italy): A potential GSSP for the Rupelian/Chattian boundary” by Coccioni and others, was finally accepted for publication (after several revisions) on the *Geological Society of America Bulletin* in September 2007. Following this acceptance the formal proposal designating the Monte Cagnero (MCA) section as GSSP for the Rupelian/Chattian boundary, out of the three sections studied, is in preparation.

### 5c. Paleogene Subcommittee Directory.

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

## 6. CHIEF PROBLEMS ENCOUNTERED IN 2007

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

## 7. SUMMARY OF EXPENDITURES IN 2007 (ANTICIPATED THROUGH MARCH 2008):

### INCOME

Carried forward from 2006	Euro 0
ICS Allocation for 2007	Euro 1165
TOTAL	Euro 1165

### EXPENDITURE FROM 2007 BUDGET

General office expenses	Euro 165
Professional help with the website	Euro 400

Support for Working Groups and Regional Committees	<u>Euro 600</u>
TOTAL	Euro 1165

## 8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2008):

Complete the work on the GSSPs of the base of the Lutetian, Bartonian, Priabonian and Chattian. Screen and rejuvenate the list of the Voting and Corresponding Members. Reactivate or close those Regional Committees and Working Groups which are asleep. Update periodically the ISPS website. Organize a Symposium in the next 33th Geological Congress in Oslo: *Oligocene Series: A time of change in Earth and life history*. Conveners: Yuri Gladenkov and Noël Vandenberghe.

## 9. BUDGET AND ICS COMPONENT FOR 2008

Projected Budget for 2008:

General office expenses	Euro 400
Professional help with the website	Euro 700
Contributions to Officers travel costs	Euro 800
Support for Working Groups and Regional Committees	Euro 2000
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TOTAL BUDGET PROJECTED	Euro 3900
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Please note that the financial situation has deteriorated in recent years, particularly in Latin America and the former Soviet Union; an increase would help us to support the corresponding Regional Committees more actively. We also will need some seed money to start new regional committees or working groups.

## 10. SUMMARY OF ACTIVITIES OVER PAST FOUR YEARS (2004-2007)

At present, the GSSPs of the base of the *Danian* (= Cretaceous/Paleogene Boundary), the base of the Ypresian (= Paleocene/Eocene 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.

In 2007, the base of the *Selandian* and *Thanetian* stages has been defined by the Paleocene Working Group by unanimous majority, and we are waiting for the proposal in order to be voted by ISPS. Regarding the rest of the Paleogene Stages, good progress has been made in the search for the remaining GSSPs.

The detailed reports of activities during the past four years of the Working Groups and Regional Committees are included in the ISPS website: <http://wzar.unizar.es/isps/index.htm>



## 11. OBJECTIVES AND WORK PLAN FOR NEXT 4 YEARS (2008-2011)

Complete and publish the GSSPs of the Paleogene. The proposal for the Selandian and Thanetian stages will be voted in 2008. We hope to present proposals for most of the remaining GSSPs as soon as possible.

Produce an updated version of an integrated Paleogene time scale.

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

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

Organize a Symposium in the next 33th Geological Congress in Oslo: *Oligocene Series: A time of change in Earth and life history*. Conveners: Yuri Gladenkov and Noël Vandenberghe.

Support the organization of the next Meeting on Climatic and Biotic Events of the Paleogene in Wellington, New Zealand, January 2009. The Meeting will be organized by Christopher Hollis and Liz Kennedy and members of the GNS Science in Wellington, assisted by researchers from other institutions and will be supported by a prestigious Scientific Committee and the ISPS.

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

### *Subcommission officers*

#### **Chairman:**

**Eustoquio Molina**, Departamento de Ciencias de la Tierra, Universidad de Zaragoza, Calle Pedro Cerbuna, 12, E-50009 Zaragoza, Spain.

[emolina@unizar.es](mailto:emolina@unizar.es)

#### **Vice-Chairman:**

**Jan Hardenbol**, Global Sequence Chronostratigraphy Inc. 826, Plainwood Drive, Houston, Texas 77079-4227, USA.

[jhardenbol@aol.com](mailto:jhardenbol@aol.com)

#### **Secretary:**

**Noël Vandenberghe**, Departement Geografie-Geologie, Afdeling Geologie, Redingenstraat, 16, B-3000 Leuven, Belgium.

[noel.vandenberghe@geo.kuleuven.be](mailto:noel.vandenberghe@geo.kuleuven.be)

### ***List of Working (Task) Groups and their officers***

**Paleocene Working Group.** Chairman: B. Schmitz, Sweden. [birger.schmitz@geol.lu.se](mailto:birger.schmitz@geol.lu.se)

**Ypresian/Lutetian Boundary Stratotype Working Group.** Chairman: E. Molina, Spain. [emolina@unizar.es](mailto:emolina@unizar.es)

Secretary: S. Ortiz, Spain. [silortiz@unizar.es](mailto:silortiz@unizar.es) Website: <http://wzar.unizar.es/perso/emolina/ypresian.html>

**Lutetian/Bartonian Boundary Stratotype Working Group.** Chairman: R. Fluegeman, USA. [fluegem@bsu.edu](mailto:fluegem@bsu.edu)

- Bartonian/Priabonian Boundary Stratotype Working Group.** Chairwoman: I. Premoli Silva, Italy. [isabella.Premoli@unimi.it](mailto:isabella.Premoli@unimi.it)
- Rupelian/Chattian Boundary Stratotype Working Group.** Chairwoman: I. Premoli Silva, Italy. [isabella.Premoli@unimi.it](mailto:isabella.Premoli@unimi.it)
- Paleogene Planktonic Foraminifera Working Group.** Chairman: B. Wade, USA. [bwade@rci.rutgers.edu](mailto:bwade@rci.rutgers.edu). Secretary: H. Coxal, UK. [hkc@gso.uri.edu](mailto:hkc@gso.uri.edu)
- Paleogene Larger Foraminifera Working Group.** Chairman: L. Hottinger, Switzerland. [lukas.hottinger@bluewin.ch](mailto:lukas.hottinger@bluewin.ch)
- Paleogene Deep-Water Benthic Foraminifera Working Group.** Chairman: M. Kaminski, UK. [m.kaminski@ucl.ac.uk](mailto:m.kaminski@ucl.ac.uk) Secretary: L. Alegret, Spain. [laia@unizar.es](mailto:laia@unizar.es)
- Paleogene Calcareous Nannofossils Working Group.** Chairwoman: Simonetta Monechi, Italy. [monechi@unifi.it](mailto:monechi@unifi.it)
- Regional Committee in North-European Paleogene Stratigraphy.** Chairman: G. Vestegaard Laursen, Norway. [gila@statoil.com](mailto:gila@statoil.com) Secretary: J.W. Verbeek, Netherlands. [j.verbeek@nitg.tno.nl](mailto:j.verbeek@nitg.tno.nl)
- South-American Regional Committee on Paleogene Stratigraphy.** Chairman: N. Malumian, Argentina. [n.malumian@yahoo.com](mailto:n.malumian@yahoo.com) Secretary: C. Nañez, Argentina. [cnañez@fullzero.com.ar](mailto:cnañez@fullzero.com.ar)
- Russian Paleogene Commission.** Chairman: M.A. Akhmetiev, Russia. [akhmetiev@ginras.ru](mailto:akhmetiev@ginras.ru) Secretary: G.N. Aleksandrova.
- Working Group on Paleogene Stratigraphy of the North Pacific.** Chairman: Y.B. Gladenkov, Russia. [gladenkov@ginras.ru](mailto:gladenkov@ginras.ru)

### List of Voting Members

- Mikhail Akhmetiev, Russian Academy of Science, Moscow, Russia, [akhmetiev@ginras.ru](mailto:akhmetiev@ginras.ru)
- Mary Pierre Aubry, Rutgers University, New Jersey, USA, [aubry@rci.rutgers.edu](mailto:aubry@rci.rutgers.edu)
- Vlasta Cosovic, University of Zagreb, Croatia, [Vlasta1501@yahoo.com](mailto:Vlasta1501@yahoo.com)
- Richard H. Fluegeman, Ball State University, Indiana, USA, [fluegem@bsu.edu](mailto:fluegem@bsu.edu)
- Jean Pierre Gély, Museum d'Histoire naturelle Paris, France [jean-pierre.gely@gazdefrance.com](mailto:jean-pierre.gely@gazdefrance.com)
- Philip D. Gingerich, University of Michigan, USA, [gingeric@umich.edu](mailto:gingeric@umich.edu)
- Yuri B. Gladenkov, Russian Academy of Science, Moscow, Russia, [gladenkov@ginras.ru](mailto:gladenkov@ginras.ru)
- Jan Hardenbol, Global Sequence Chronostratigraphy, Houston, USA, [jhardenbol@sbcglobal.net](mailto:jhardenbol@sbcglobal.net)
- Jerry J. Hooker, Natural History Museum, London, UK, [jjh@nhm.ac.uk](mailto:jjh@nhm.ac.uk)
- Lukas Hottinger, Naturhistorisches Museum Basel, Switzerland, [lukas.hottinger@bluewin.ch](mailto:lukas.hottinger@bluewin.ch)
- Norberto Malumian, Servicio Geológico, BuenosAires, Argentina, [n.malumian@yahoo.com](mailto:n.malumian@yahoo.com)
- Kenneth G. Miller, Rutgers University, New Jersey, USA, [kgm@rci.rutgers.edu](mailto:kgm@rci.rutgers.edu)
- Eustoquio Molina, Universidad de Zaragoza, Spain, [emolina@unizar.es](mailto:emolina@unizar.es)
- Simonetta Monechi, Università di Firenze, Italy, [monechi@unifi.it](mailto:monechi@unifi.it)
- Isabella Premoli Silva, Università di Milano, Italy, [isabella.Premoli@unimi.it](mailto:isabella.Premoli@unimi.it)
- Birger Schmitz, University of Lund, Sweden, [birger.schmitz@geol.lu.se](mailto:birger.schmitz@geol.lu.se)
- Percy Strong, Institute of Geological Sciences, Lower Hutt, New Zealand, [p.strong@gns.cri.nz](mailto:p.strong@gns.cri.nz)
- Amin Strougo, Ain Shams University, Cairo, Egypt, [aminstrougo@yahoo.com](mailto:aminstrougo@yahoo.com)
- Ellen Thomas, Yale University, Connecticut, USA, [ellen.thomas@yale.edu](mailto:ellen.thomas@yale.edu)
- Noël Vandenberghe, K.U. Leuven, Belgium, [noel.vandenberghe@geo.kuleuven.be](mailto:noel.vandenberghe@geo.kuleuven.be)

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### APPENDIX #2 - Summary Reports of GSSP Working Groups

[Detailed reports of <b>GSSP Working Groups</b> , and other task groups are found on the webpage of the International Subcommittee on Paleogene Stratigraphy: <a href="http://wzar.unizar.es/isps/index.htm">wzar.unizar.es/isps/index.htm</a> ].
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## International Commission on Stratigraphy Subcommission on Cretaceous Stratigraphy

ANNUAL REPORT 2007

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

International Subcommission on Cretaceous Stratigraphy (SCS)

#### *SUBMITTED BY*

Prof. Isabella Premoli Silva, Chair

University of Milano

Dipartimento di Scienze della Terra “Ardito Desio”

Via Mangiagalli, 34, 20133 MILANO, Italy

**telephone:** 39-02 5031 5528 (direct line)

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

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

### 3. ORGANIZATION

SCS is a Subcommission of the International Commission on Stratigraphy.

*Membership:* Chair: Prof. Isabella Premoli Silva, Italy  
 Vice Chair: Dr. Irek Walaszczyk, Poland  
 Secretary: Dr. Silvia Gardin, France

There are an additional 15 Voting Members of the Subcommission, from all the continents. Over 130 Cretaceous scientists from all over the world and in many different disciplines belong to one or

more of the 9 Stage Working Groups of the SCS still active, or to the Kilian Group. All WG members are treated as Corresponding Members of the Subcommittee. Effectively, anyone with interest and expertise that can contribute to our objectives is welcome to do so. *The great bulk of the Subcommittee's work is carried out by these Working Groups.*

### 3a. Officers for 2008-2012:

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

## 4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

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

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

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

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

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

## 5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2007

### General Contributions

Of general interest to the Cretaceous Subcommittee is the paper by J.M. McArthur and co-authors on “Palaeotemperatures, polar ice-volume, and isotope stratigraphy (Mg/Ca,  $\delta^{18}O$ ,  $\delta^{13}C$ ,  $^{87}Sr/^{86}Sr$ ): The Early Cretaceous (Berriasian, Valanginian, Hauterivian), published in 2007 in *Palaeo* 3 (v. 248).

A review the Tithonian-Valanginian stratigraphy of Kyuquot Group exposed at Grassy Island, off west coast of Vancouver Island, British Columbia, was recently undertaken. About 350 stratigraphically-constrained fossil collections have been made at Grassy Island since the 1950s, primarily by George Jeletzky (deceased 1988) in the 1950s and 1960s. Molluscan biostratigraphy

provided by these collections (primarily buchiid bivalves) will be integrated with ongoing studies of foraminifers, radiolarians, calcareous nannofossils, and dinoflagellates from the section, along with stable isotopes, to better characterize this J/K boundary section. Some of the data are now in press and will be published in 2008.

#### Reference

Grey, M., Haggart, J.W., Jeletzky, J.A. , 2007. Uppermost Jurassic (Tithonian) to Lower Cretaceous (Valanginian) section at Grassy Island, west coast Vancouver Island, British Columbia. Geological Survey of Canada, Open File 5666, 52 p.

### **The Kilian Group (Lower Cretaceous Ammonite Working Group).**

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

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

Following the decision taken at Neuchâtel, proposing to organize several workshops to work on the zonation of a particular stage/substage or on the boundary of some stages/substages, the 1st workshop, held in Lyon (Nov. 2005), was dedicated to the Aptian zonation. The discussion mainly focused on the ammonite faunal turnovers and the Lower/Middle Aptian (Bedoulian/Gargasian) boundary in relation to the position of the Furcata Zone.

The 2<sup>nd</sup> Workshop of the Kilian Group, chaired by Stéphane Reboulet with the participation of the French members, was held in Digne-les-Bains (Mai 2007), for discussing the Hauterivian – Barremian zonation.

The zonal scheme, established at Neuchâtel in 2005 (Reboulet, Hoedemaeker *et al.*, 2006), has been discussed from the **Radiatus** (base Hauterivian) to the **Sarasini** (top Barremian) zones. The main points of the discussion were about the zones located on both parts of the Lower-Upper Hauterivian (Cruasense and Sayni zones), the Hauterivian/Barremian (Ohmi, Angulicostata, Hugii and Cassida zones) and Lower/Upper Barremian (Darsi, Ouachensis, Uhligi and Vandenheckii zones) boundaries. The proposals of changes concern (3 points):

#### **(1) The uppermost Hauterivian and the Ohmi/Angulicostata zone.**

J. Vermeulen suggested to divide this biostratigraphic interval into two zones: the Seitzii (with the Seitzii and Ohmi subzones) and Mortilleti (with the Mortilleti and Picteti subzones) zones. For other members, the "Ohmi" zone could be defined by the appearance of *P. seitzii*, that is by the appearance of the genus *Pseudothurmannia*. The "Ohmi" zone would be divided in three subzones: Seitzii, "Ohmi" and Mortilleti. This last one includes the Mortilleti and Picteti horizons.

**(2) The Compressissima zone** could be divided into two subzones: Fallax and Defayae.

#### **(3) The Upper Barremian zonation.**

D. Bert and G. Delanoy proposed a new ammonite zonal scheme based on their study of the Upper Barremian ammonite turnovers (Bert, Delanoy and Bersac, *in prep.*).

For all participants, **the base of the Vandenheckii zone** would be used to characterize the base of the Upper Barremian.

All participants agreed to consider the Feraudianus biostratigraphic unit as the third subzone of the **Sartousiana zone**. Most participants considered the Sarasini biostratigraphic unit as a subzone of

the **Giraudi zone**. In this case, the Upper Barremian could be divided into three zones (Vandenheckii, Sartousiana and Giraudi), each of them including three subzones. This new zonal scheme would correspond to the ammonite turnovers. For Vermeulen, the Upper Barremian is composed by four zones: Vandenheckii, Sartousiana, Giraudi and Sarasini.

**These results must be considered as a proposals which will be discussed again during the next international meeting of the Kilian's group (Vienna, mid-April 2008).**

#### References

Bert, D., Delanoy, D. and Bersac, S. Propositions pour un nouveau découpage bio-zonal ammonitique du Barrémien supérieur (in preparation).

Reboulet, S. and Hoedemaeker, P.J., (reporters) *et al.*, 2006. Report on the 2nd International Meeting of the IUGS Lower Cretaceous Ammonite Working Group, the "Kilian Group" (Neuchâtel, Switzerland, 8 September 2005). *Cretaceous Research*, 27: 712-715.

#### **The Berriasian GSSP and the J/K boundary.**

The Chair of the newly formed Berriasian Working Group, W. A. P. Wimbledon, called the first meeting that was held in Bristol (UK) the 8th July 2007 and hosted within the IGCP 506 Symposium on "Marine – Non Marine Jurassic: Global correlation and major geological events" at Bristol (UK), thanks to Prof. Sha Jingeng, co-leader of the project.

At IGCP 506 Symposium some oral presentations and posters concerned specifically the Jurassic-Cretaceous transition in marine settings from Arctic, Boreal, Eastern Europe, and Tethyan regions, thus of interest of the working group. As premise to the official meeting, the chairman of the WG presented an exhaustive overview on the correlation problems, criteria for selecting a useful boundary level, and then choosing a GSSP.

In preparation to the meeting, the Chairman sent a letter to the WG members suggesting to concentrate on useful correlations and not historical preoccupations such as old zonal definitions. On this an agreement was reached at the plenary meeting in Bristol.

Particularly, all attendees agreed to try to identify useful biological datums and other events so as to make use of these as effective tools for interregional correlation. There was a total consensus that initially there is a need to concentrate on markers at or about the base of the Grandis (Jacobi+Grandis subzones) zone. All presents voted to maintain continuity in this way. Moreover, some colleagues, who could not attend the WG meeting, independently agreed strongly with this by letter. Other written comments from WG members, on the unsuitable nature as a GSSP of the Berrias section were not discussed, but they will be considered later in prospective of GSSPs.

So, for the moment, all other potential levels have been formally put to one side. If the WG fails to find something useful and widespread in this chosen interval (correlatives of topmost Tithonian (Durangites)-top Grandis subzone), then the WG will look to another level. This hopefully opens the door for concentration on practical and effective correlations.

A second decision was to work in regional groups (N. Sea basin, Russian platform, S. England, Italy, S. France, Carpathians, etc.) to develop charts with datums/markers. The following colleagues were identified to lead a group on each area, as follows: Russian platform - Viktor Zakharov; North Sea Basin - Oscar Abbink; Italy - Elisabetta Erba; north Africa - Mabrouk Boughdiri; middle Europe - Josef Michalik; S. France - Luc Bulot; Russian far east - Eugenia Bugdaeva; China - Sha Jingeng; S. Britain-N. France – W. Wimbledon; more to follow. These groups will each present a report to the next WG meeting.

The Working Group is scheduled to meet in Marseilles next April to discuss and finalise ideas on useful J/K boundary markers. The meeting will be held at the University of Provence on 12-13 April, 2008, followed by two days (14-15 April) of optional field trips. Dr. Luc Bulot has

kindly agreed to make the local arrangements.

### **Base Valanginian GSSP.**

The activities in 2007 concentrated on the section at Montbrun-les-Bains (S. France) that was logged again in more detail by Bulot and Reboulet in order to provide a reliable correlation to the Sr and 13C curves established by McArthur et al. (2007, see above). For the same section detailed data of ammonites, calpionellids, and calcareous nannofossils (unpublished) are also available. In the alternate section at Rio Argos (Spain), originally studied by Ph. Hoedemaeker and revised by Aguado et al. (2000, *Cret. Res.*, v. 21), although richer in ammonites, the calpionellid record is "weak" compared to Montbrun-les-Bains, mainly for preservation problems. Being the Chairman of the Valanginian WG, Luc Bulot, deeply involved also in problems concerning the Berriasian and J/K boundary, the GSSP proposal will be not submitted probably until the end of 2008.

### **Base Hauterivian GSSP.**

Luc Bulot has now received the various contributions from colleagues who have been analysing data from the intended GSSP at La Charce, France. He is collating the data to send to P. Rawson so that he can then put the whole draft report together, then send it to the chair of the group, Joerg Mutterlose, for him to check and send to members of the WG. The whole procedure is expected to be completed and the report sent to Voting members within the next 6 months.

### **Base Barremian GSSP.**

The Spanish colleagues (led by Miguel Company) have prepared data on the proposed section in Spain and as far as the chair, P. Rawson, knows it is more or less complete. Beginning in December after returning from Argentina, Peter Rawson will put the whole draft report together expecting to submit the GSSP proposal over the next year.

### **Base Aptian GSSP.**

A wealth of data have been added and published in 2007 by our French colleagues on the stratotype sections of Bedoulian and Gargasian substages including revised biostratigraphies,  $\delta^{13}\text{C}$  curve and cyclostratigraphy (published mainly in *Notebooks on Geology*). A memoire edited by Moullade et al., synthesizing all the gathered data is in press in *Notebooks on Geology* (on-line). However, as magnetic signature in the French stratotype sections cannot be detected, the correlation to the base of magnetic chron M0, recommended at the 1995 Brussels Meeting for identifying the base of the Aptian, is still prevented. A formal proposal is expected soon by the chair of the WG.

### **Base Albian GSSP.**

A new version of the formal proposal has been prepared early in 2007 by J. Kennedy and distributed to the members of the WG for comments. Although the Chairman, M. Hart, has received only few answers so far, the proposal will be soon sent to Voting Members for approval and hopefully publication in 2008.

### **Base Coniacian GSSP.**

New studies of sections in southern England (Bridgewick Pit, Downley, Shoreham Cement Works Quarry), eastern England (Kiplingcotes Station Quarry, Arras Road Pit), Germany (Salzgitter-Salder Quarry, a potential candidate GSSP for the Coniacian Stage) and central Poland (Slupia Nadbrzena, another potential candidate GSSP), have enabled a re-evaluation and refinement of the

inoceramid biostratigraphy of the higher part of the Upper Turonian and the Turonian/Coniacian boundary transition. The inoceramid record at Slupia Nadbrzena, below the terminal Turonian entry of *Cremonoceras*, is shown to be more complete than at the Salzgitter-Salder Quarry. In fact, a new inoceramid event (*Inoceramus lusatae* Event) identified at Slupia Nadbrzena is inferred to be present at the Sonnenberg Quarry, Waltersdorf, the type locality of *Inoceramus lusatae*, as well as of *I. glatziae* and *Cremonoceras waltersdorfensis*, and it is possibly represented in the condensed Navigation Hardgrounds in southern England. The absence of this event at Salzgitter-Salder suggests a significant hiatus preventing to recommend this section as a GSSP for the Coniacian (a “negative” report on the Salzgitter-Salder section is in preparation).

Consequently, a new section has been considered, the Pueblo section (Colorado), which spans the whole Turonian as well as the transition to the Coniacian. In Fall 2007 the chair, Irek Walaszczyk, sampled the Pueblo section for isotopes and microfossils and made further collections of inoceramids, ammonites, and of *Didymotis*. In addition, he made further collecting in the nearby Wagon Mound/Springer section. The study of the new materials is underway.

The report on the Pueblo section will be completed by Jim Kennedy (ammonites), Jackie Lee (nannofossils), Danuta Peryt (foraminifera), Silke Voigt (isotopes) and Walaszczyk (inoceramids). It is expected to be ready late Winter or early Spring.

Moreover, another section, the Hot Springs Trail in Texas, was recently proposed by Dee Ann Cooper and co-authors as a possible candidate for the base of the Coniacian. According to Irek Walaszczyk, the Turonian part is paleontologically quite well documented, but no convincing fossil from the Coniacian have been detected suggesting that the Coniacian part may be not very fossiliferous. This section will be considered after the full data-set will be made available to the WG.

### **Base Santonian GSSP.**

The special issue concerning the Santonian from the Bilbao meeting 2002 has been finally published in *Cretaceous Research* (2007, v. 28/1, 11 contributions). On the basis of this issue, the candidate sections for the Santonian GSSP are Olazagutia (Spain) and Ten Mile Creek (US). In fact, according to Hampton et al. (2007), the Seaford Head section (UK) is no longer a candidate GSSP for the base of the Santonian. In addition, in 2007 a thorough study on Ten Mile Creek section was published by Gale et al. in *Acta Geologica Polonica* (v. 57/2), that updates the previous study by Howe et al. (2007, special issue). In particular, Gale et al. provided, aside micro- and macrofossil precise identifications and distributions, a detailed isotopic curve that contains several of the isotopic events identified by Jarvis et al. (2006, *Geol. Mag.*, v. 143).

In September 2007 the Chairman, Marcos Lamolda, produced a report (rather synthetic) on the basis of available data (mainly published in the special issue). The report emphasizes the merits of the Olazagutia section versus those of Ten Mile Creek section resulting in the identification of the former as the best of the candidates. According to the Chairman, this choice follows the line of the ICS 2002 annual report for the Santonian, in which “The Olazagutia section near Bilbao (Spain) is the leading candidate for the GSSP section”. The report, in which the Olazagutia section, in the eastern border of the Cantera de Margas, is proposed as the Santonian Stage GSSP, was distributed for consideration to the Santonian Working Group. However, the report was strongly contested by several Santonian WG members and specialists, because (1) the presentation of the two candidate sections was not objective and very much in favor of Olazagutia; at Olazagutia (2) the only horizoned *Magadiceramus* records (incomplete and poorly preserved specimens) are c. 30 m below the entry of *Cladoceras*, and (3) no Coniacian ammonites are recorded, and the Santonian



ammonite record starts 33 m above the boundary.

In the next few months the Chairman will produce a full proposal with all the comments received in the first round to be submitted to the Voting members for the final approval and hopefully publication on *Episodes*.

#### *Publications*

- Dhondt, A. V., Lamolda, M. A., Pons, J. M., 2007. *Stratigraphy of the Coniacian–Santonian transition*, Meeting organised by the Santonian working group of the Subcommittee on Cretaceous Stratigraphy. Bilbao, Spain, 13–17 September 2002. *Cretaceous Research* 28, 1–4.
- Gale, A. S., Kennedy, W. J., Lees, J. A., Petrizzo, M. R., Walaszczyk, I., 2007. Integrated study (inoceramid bivalves, ammonites, calcareous nannofossils, planktonic foraminifera, stable carbon isotopes) of the Ten Mile Creek section, Lancaster, Dallas, north Texas, a candidate Global boundary Stratotype Section and Point for the base of the Santonian Stage. *Acta Geologica Polonica* 57, 113–160.
- Gallemlí, J., López, G., Martínez, R., Pons, J. M., 2007. Macrofauna of the Cantera de Margas section, Olazagutia: Coniacian/Santonian boundary, Navarro-Cantabrian Basin, northern Spain. *Cretaceous Research* 28, 5–17.
- Gallemlí, J., López, G., Martínez, R., Pons, J. M., 2007. Macrofauna of the Villamartín section: Coniacian/Santonian boundary, North Castilian Platform, Burgos, Spain. *Cretaceous Research* 28, 93–107.
- Hampton, M. J., Bailey, H. W., Gallagher, L. T., Mortimore, R. N., Wood, C. J., 2007. The biostratigraphy of Seaford Head, Sussex, southern England; an international reference section for the basal boundaries for the Santonian and Campanian Stages in chalk facies. *Cretaceous Research* 28, 46–60.
- Howe, R. W., Sikora, P. J., Gale, A. S., Bergen, J. A., 2007. Calcareous nannofossil and planktonic foraminiferal biostratigraphy of proposed stratotypes for the Coniacian/Santonian boundary: Olazagutia, northern Spain; Seaford Head, southern England; and Ten Mile Creek, Texas, USA. *Cretaceous Research* 28, 61–92.
- Kopaevich, L. F., Beniamovski, V. N., Sadkov, A. Yu., 2007. Middle Coniacian–Santonian foraminiferal bioevents around the Mangyshlak Peninsula and Russian Platform. *Cretaceous Research* 28, 108–118.
- Lamolda, M. A., Paul, C. R. C., 2007. Carbon and oxygen stable isotopes across the Coniacian/Santonian boundary at Olazagutia, northern Spain. *Cretaceous Research* 28, 37–45.
- Lamolda, M. A., Peryt, D., Ion, J., 2007. Planktonic foraminiferal bioevents in the Coniacian/Santonian boundary interval at Olazagutia, Navarra province, Spain. *Cretaceous Research* 28, 18–29.
- Melinte, M. C., Brustur, T., Jipa, D., Szobotka, S. A., 2007. Upper Cretaceous Red Beds in the Romanian Carpathians: a tool for climatic changes. *Eitura Eikon*, Cluj-Napoca, 125 pp.
- Melinte, M. C., Lamolda, M. A., 2007. Calcareous nannofossil biostratigraphy of the Coniacian/Santonian boundary interval in Romania and comparison with other European regions. *Cretaceous Research* 28, 119–127.
- Peryt, D., Lamolda, M. A., 2007. Neoflabellinids (benthic foraminifera) from the Upper Coniacian and Lower Santonian at Olazagutia, Navarra province, Spain; taxonomy and correlation potential. *Cretaceous Research* 28, 30–36.
- Toshimitsu, S., Hasegawa, T., Tsuchiya, K., 2007. Coniacian–Santonian stratigraphy in Japan: a review. *Cretaceous Research* 28, 128–131.
- Walaszczyk, I., Cobban, W. A., 2007. Inoceramid fauna biostratigraphy of the upper Middle Coniacian–lower Middle Santonian of the Pueblo Section (SE Colorado, US Western Interior). *Cretaceous Research* 28, 132–142.

#### **Base Campanian GSSP.**

The paper on the base of the Campanian at the Waxahachie dam spillway section (north-central Texas), prepared by Jim Kennedy on the basis of the data partially assembled by late Jack Hancock, was revised, submitted and accepted for publication on *Cretaceous Research*. Galley-proofs are expected at the end of November 2007. The problem concerning who owns the land where the Texas section is situated is still unsolved.

The other possible candidate section, west of Seaford Head (Sussex, England), was studied by Hampton and co-authors and the data are now published in *Cretaceous Research* (2007, special issue, see above).

#### **Reference**

- Gale A. S., Hancock J. M., Kennedy W. J., Petrizzo M. R., Lees A. J., Walaszczyk I., and Wray D. S. (in press). An integrated study (geochemistry, stable oxygen and carbon isotope, nannofossils, planktonic foraminifera, inoceramids bivalves, ammonites, and crinoids of the Waxahachie Dam Spillway, north Texas: a possible boundary stratotype for the base of the Campanian. *Cretaceous Research*.

## 6. CHIEF PROBLEMS ENCOUNTERED IN 2007

The need nowadays for a high-resolution framework to be exportable worldwide resulted in the necessity of re-visiting several candidate sections, already studied paleontologically, by implementing multiple biostratigraphies and stratigraphic tools other than fossils, profoundly affected by bioprovincialism in several intervals, like magnetostratigraphy, stable isotope stratigraphy, etc. To co-ordinate the work of several scientists from different subdisciplines was not an easy task and delay in submitting GSSP proposals was inevitable.

## 7. SUMMARY OF EXPENDITURES IN 2007 (ANTICIPATED THROUGH MARCH 2008):

### I. INCOME

ICS subvention for 2007	Euro 0,000
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Total income	Euro 0,000

### II. EXPENDITURE

Contribution for the J/K meeting, Bristol (650 £)	Euro 983.06
Chairman (IPS) participation (travel, lodging) to the J/K meeting, Bristol	Euro 513.17
Office (chair & secretary) expenses	Euro 400.00
	-----
Total expenditure	Euro <b>1796.23</b>

## 8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2008):

### Membership of Cretaceous Subcommittee.

The present Chair, I. Premoli Silva, and ViceChair, I. Walaszczyk, have been re-elected almost unanimously for the 2008-2012 term, with >60% of the votes.

The Voting Membership of the Cretaceous Subcommittee will be renewed during the next few months. In fact, the mandate for 5 of them will expire in 2008. Nominations have already been requested.

The Corresponding Membership of the Berriasian - J/K boundary WG is now in action.

### Meetings

- The 2<sup>nd</sup> meeting of the Berriasian and J/K boundary WG is planned for 12-13 April, 2008 in Marseille, France.
- The 3<sup>rd</sup> International Meeting of the Kilian Group is planned for 15-18 April, 2008 in Vienna.
- 33<sup>o</sup> Geological Congress, August 2008, Oslo: ICS Symposium on "Stratigraphic subdivisions of the Cretaceous System: State of the Art". (Conveners: I. Premoli Silva, F.

Surlyk & I. Walaszczyk).

### Work Plan and anticipated Results

- To bring recommendations for 8 of the remaining GSSPs to ICS as soon as possible, and before the 33° IGC in Oslo.
- To advance considerably on definition of criteria for identifying the base of the Berriasian and the J/K boundary.

## 9. BUDGET AND ICS COMPONENT FOR 2008

Office expenses (Fax, phone, postage etc)	Euro	300
Support to participants to the J/K Marseille Meeting	Euro	500
Contributions to help costs of participants to 33° IGC in Oslo	Euro	2,000
		-----
<b>Total estimated expenditure</b>		<b>Euro 2,800</b>

## 10. SUMMARY OF CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2003-2007)

*See Accomplishments in ICS Annual Reports 2003 to 2007 (above) for additional details.*

- Renewed research by WG members (resulting in a great number of publications, still ongoing), based on research needs pinpointed by the 1995 Brussels and 2005 Neuchâtel meetings.
- Ratification of 2 GSSPs: **Cenomanian** (ratified 2002) and **Turonian** (ratified 2003).
- Presentation of the latest results to 7<sup>th</sup> *International Cretaceous Symposium*, Neuchâtel, Switzerland. September 4-9, 2005.
- Workshop on the Aptian ammonite zonation, held in Lyon (Nov. 2005) focused the discussion mainly on the ammonite faunal turnovers and the Lower/Middle Aptian (Bedoulian/ Gargasian) boundary in relation to the position of the Furcata Zone.
- Set up of the renewed Working Group on the Berriasian GSSP and the J/K boundary, chaired by W.A.W. Wimbledon (Dec. 2006-Spring 2007).
- Workshop on the Hauterivian-Barremian zonation, held in Digne-les-Bains (Mai 2007), from the **Radiatus** (base of the Hauterivian) to the **Sarasini** (top of the Barremian) zones.
- First official meeting of the renewed Working Group on the Berriasian GSSP and the J/K boundary, chaired by W.A.W. Wimbledon in Bristol (July 2007).

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

SCS session at 32<sup>nd</sup> *International Geological Congress*, Florence, August 2004

SCS meeting during the 7<sup>th</sup> *International Cretaceous Symposium*, Neuchâtel, Switzerland, September 2005

1<sup>st</sup> meeting of the *Berriasian and J/K boundary Working Group*, Bristol (UK), July 2007

## 11. OBJECTIVES AND WORK PLAN FOR NEXT 4 YEARS (2008-2012)

### *Meetings*

April 2008 – 2nd official meeting of the Berriasian and J/K boundary WG is planned in Marseille, France

April 2008 - Workshops of the Kilian Group in Vienna.

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

2009 - 7<sup>th</sup> International Cretaceous Symposium, Plymouth (UK)

Details of other meetings are not yet available.

### *Objectives*

- To bring recommendations for 8 of the remaining GSSPs to ICS as soon as possible, and before the 33<sup>o</sup> IGC in Olso (2008).
- To advance considerably on definition of criteria for identifying the base of the Berriasian and the J/K boundary.
- To communicate the results as widely as possible.
- To develop new directions for the Subcommission as GSSP proposals are completed. Specifically, future objectives will concern the subdivision of stages, with definition of substages and related GSSPs.

### *Work Plan*

2008 - Finalize proposals for the base of Valanginian, Hauterivian, Barremian, Aptian, Albian, Coniacian, Santonian, and Campanian

2009 - Finalize proposal for the base of Berriasian (Jurassic/Cretaceous boundary)

2010 to 2012 – Definition of substages.

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

### ***Subcommission officers (with addresses)***

**Chair:** Prof. I. Premoli Silva

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**Vice Chair:** Dr. Ireneusz Walaszczyk

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**Secretary:** Dr. Silvia Gardin

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*List of Voting Members*

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\* to be replaced

*List of Task Groups and their officers*

<b>Maastrichtian WG:</b>	<i>GSSP ratified.</i> Giles Odin, France. <a href="mailto:gilodin@moka.ccr.jussieu.fr">gilodin@moka.ccr.jussieu.fr</a>
<b>Campanian WG:</b>	jim.kennedy@oum.ox.ac.uk, Andy Gale (UK) <a href="mailto:asg@nhm.ac.uk">asg@nhm.ac.uk</a>
<b>Santonian WG:</b>	Marcos Lamolda, Spain. <a href="mailto:gpplapam@lg.ehu.es">gpplapam@lg.ehu.es</a>
<b>Coniacian WG:</b>	Irek Walaszczyk, Poland. <a href="mailto:walas@geo.uw.edu.pl">walas@geo.uw.edu.pl</a>
<b>Turonian WG:</b>	<i>GSSP ratified.</i> No chairman at present.
<b>Cenomanian WG:</b>	<i>GSSP ratified.</i> No chairman at present.
<b>Albian WG:</b>	Malcolm Hart, UK. <a href="mailto:mhart@plymouth.ac.uk">mhart@plymouth.ac.uk</a>
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<b>Valanginian WG:</b>	Luc Bulot, France. <a href="mailto:lucgbulot@aol.com">lucgbulot@aol.com</a>
<b>Berriasian (J/K boundary) WG:</b>	William A.P. Wimbledon, UK. <a href="mailto:B.Wimbledon@ccw.gov.uk">B.Wimbledon@ccw.gov.uk</a>

**Kilian Group** [formerly Lower Cretaceous ammonite WG]:

Chairman: Stéphane Reboulet, France. [stephane.reboulet@univ-lyon1.fr](mailto:stephane.reboulet@univ-lyon1.fr)  
 Vice-chairmen: Peter Rawson, UK. [peter.rawson1@btinternet.com](mailto:peter.rawson1@btinternet.com),  
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## **International Commission on Stratigraphy Subcommission on Jurassic Stratigraphy**

**ANNUAL REPORT 2007**

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

**International Subcommission on Jurassic Stratigraphy**

*SUBMITTED BY*

Dr Nicol MORTON, Chairman  
Le Chardon, Quartier Brugière,  
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### **2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY**

#### **2a. Mission statement**

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

#### **2b. Goals**

These fall into four main areas:

- (a) The definition of basal boundary stratotypes (GSSPs) and the refinement of standard and regional hierarchical chronostratigraphical scales down to zonal and subzonal level, through the establishment of multidisciplinary Working Groups;
- (b) Application, where possible, of cyclic stratigraphy to develop orbital tuning estimates of durations of chronostratigraphic units, and integration of radiometric dates to improve the linear time-scale of the Jurassic;
- (c) During IGCP Project 506, initiated by the Subcommission, the development of methods of correlation between the units of the standard chronostratigraphic scale, established in

marine Jurassic successions, and non-marine successions, to enable reconstruction of the history of the global biosphere and the lithosphere during the Jurassic Period;

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

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

### **2c. Fit within IUGS Science Policy**

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

- (1) The development of an internationally agreed scale of chronostratigraphic units, fully defined by GSSPs at Series and Stage levels and related to a hierarchy of units (Substages, Standard Zones, Subzones etc.) to maximize relative time resolution within the Jurassic Period. It is emphasised here that for Jurassic stratigraphers the Stage is NOT regarded by most as the basic unit of chronostratigraphy, but as a group of Standard (Normally ammonite-based) Zones;
- (2) Establishment of frameworks and mechanisms to encourage international collaboration in understanding the evolution of the Earth during the Jurassic Period;
- (3) Working towards an international policy concerning conservation of geologically and palaeontologically important sites such as GSSPs. This relates to, *inter alia*, the IUGS Geosites Programme and the UNESCO Geoparks Programme. The Subcommittee also has links to the Management Group of the UNESCO East Devon and Dorset Coast (The Jurassic Coast) World Heritage Site.

## **3. ORGANIZATION**

The Subcommittee has an Executive consisting of Chairman, Vice-Chairman and Secretary, who are all Voting Members of the Subcommittee. There are normally twenty other Voting Members, and it is emphasised that they are not elected to represent a country or region, but for their personal expertise and experience. Each has agreed defined areas of responsibility, which are published in the Subcommittee Directory. *The untimely death earlier this year of Serge ELMI (Lyon, France) is a great loss to the Subcommittee and the wider community.*

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

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

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

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

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

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

### 3b. Officers for 2008-2012:

Chairman Jozsef PALFY,  
 Hungarian Natural History Museum,  
 H-1431 BUDAPEST, Hungary  
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 Department of Earth Sciences,  
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 email [Stephen.Hesselbo@earth.ox.ac.uk](mailto:Stephen.Hesselbo@earth.ox.ac.uk)

## 4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

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

### 4a. International Geoscience Programme (IGCP).

**4a (i) IGCP Project 458: Triassic - Jurassic Boundary Events.** This Project terminated officially in 2005 but remained active until after the 2006 International Jurassic Congress in Kraków, Poland, contributing valuable material to the ISJS Working Group on the Triassic/Jurassic Boundary and to the publications associated with the Congress (see below).

**4a (ii) IGCP Project 506: Marine and Non-marine Jurassic: Global correlation and major geological events.** This Project, which is associated with the Jurassic Subcommittee, is led by Voting Member SHA Jingeng (China), with one Voting Member (Nicol MORTON, France) and five Corresponding Members as Co-Leaders. The first Symposium and first Project business



meeting was held in Nanjing, China, November 2005, and further symposia were held in June 2006 as part of the International Palaeontological Congress in Beijing, China, in September 2006 and as a Special Session of the 7<sup>th</sup> International Congress on the Jurassic System in Kraków, Poland and in July 2007 in Bristol, UK. The 5<sup>th</sup> Symposium will be held in Hammamet, Tunisia in March 2008.

#### **4b. ProGEO, Geosites and Geoparks Initiatives.**

**4b (i) ProGEO and Geosites.** The Subcommittee Geoconservation Working Group (Convenor Voting Member Kevin PAGE, UK) has several links with international and national Geoconservation bodies and advisory groups (including himself and Corresponding Members Maria Helena HENRIQUES, Portugal, Platon TCHOUMATCHENKO, Bulgaria and Bill WIMBLEDON, UK). The Working Group organised a special session on conservation issues during the 7<sup>th</sup> International Jurassic Symposium in Kraków, Poland, in September 2006 (see below). A particular success this year was the declaration by the Portuguese Government that the coastal area at Cabo Mondego, important for Jurassic research from Upper Toarcian to Tithonian levels and including the Bajocian GSSP, classified as a National Natural Monument of Portugal in June 2007.

**4b (ii) European and UNESCO Geoparks Programme.** National systems of Geoparks have been established in several countries. The Subcommittee representatives for those that feature Jurassic sites include Bulgaria (Platon TCHOUMATCHENKO) and Portugal (Maria Helena HENRIQUES). GeoParks in other countries, some with Jurassic rocks as a significant interest, are being considered.

#### **4c. UNESCO World Heritage Sites.**

**4c (i) “Jurassic Coast” World Heritage Site.** Several UK members of the Subcommittee, including Voting Member Kevin PAGE, Corresponding Members Robert CHANDLER, John CALLOMON, and William WIMBLEDON, and others, are members of the Science and Conservation Advisory Group (SCAG) advise and support the work the Management of the UNESCO East Devon and Dorset Coast (informally known as the Jurassic Coast) World Heritage Site. There are ongoing consultations and discussions about the balance of public outreach (with, for example, guided fossil-collecting days for the public) and the geoconservation of important sensitive sites. The Earth Sciences manager of the Site, Richard EDMONDS, reports regularly with articles in the International Subcommittee on Jurassic Stratigraphy Newsletter.

**4c (ii) Possible Serial World Heritage Site.** One of the suggestions by members of the Geoconservation Working Group to the Krakow Congress was for existing and forthcoming Jurassic GSSP sites to be classified as a “Serial World Heritage Site”. This is a new concept that should be discussed further within the appropriate international bodies, including ICS, IUGS and UNESCO.

### **5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2007**

The most important events for the Jurassic community are the International Congresses/Symposia on the Jurassic System, held every four years. These are especially significant because of their

multidisciplinary character, bringing together researchers in all fields of Jurassic geology. The 7<sup>th</sup> Congress was held in Kraków, Poland, in September 2006, and had also been set by the Subcommission as the deadline for submission of Stage GSSP proposals.

### **5a. 7<sup>th</sup> International Congress on the Jurassic System, Kraków, Poland, September 2006.**

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

**5a (1) Report on Congress by Andrzej WIERZBOWSKI.** This was the first Jurassic Congress/Symposium for which the place was chosen by participants of the previous Symposium, by vote after presentations of the candidates. In the same way it was decided during this Congress that the next one, the 8<sup>th</sup> International Congress on the Jurassic System, will be held in towns Suining and Shekong in Sichuan Province, southern China, in August 2010.

The 7<sup>th</sup> International Congress on the Jurassic System was held in Krakow, a magnificent medieval town and former capital of Poland. It is a scientific and cultural centre recognized by UNESCO as a gem of world's cultural heritage. The Congress was arranged by collaboration of the geological departments and institutes of Poland - University of Warsaw, AGH University of Science and Technology in Krakow, Polish Geological Institute, Polish Academy of Sciences, Jagellonian University in Krakow, University of Silesia, Polish Oil and Gas Company and others. The Organizing Committee included representatives from most centres: A.Wierzbowski and B.A.Matyja (Faculty of Geology, University of Warsaw); J. Golonka and M.Krobicki (Faculty of Geology, Geophysics and Environmental Protection, AGH University of Science and Technology); J. Gutowski and G.Pienkowski (Polish Geological Institute); M.Lewandowski (Institute of Geological Sciences, Polish Academy of Science); A. Uchman (Institute of Geological Sciences, Jagellonian University); A. Boczarowski (Faculty of Natural Sciences, University of Silesia); J. Zacharski (Polish Oil and Gas Company). The Committee also included from Slovakia R.Aubrecht (Faculty of Natural Sciences, Comenius University in Bratislava) giving the Congress a really international character. The Congress Secretaries were M.Barski and M.Sidorczyk, and the scientific programme was arranged by E.Glowniak (all Faculty of Geology, University of Warsaw).

A total of 195 participants from 29 countries and six continents took part in the Congress. The Congress sessions were held in the main building of AGH University of Science and Technology in Krakow. The presentations of 133 talks and 93 posters were organised in nine scientific sessions (two of which were meetings of IGCP projects):

- (1) Geodynamics and evolution of different areas (convenors F.T. Fürsich, and J.Kutek)
- (2) Facies analysis and reconstruction of palaeoenvironments (convenor N.Morton);
- (3) Palaeoecology, palaeobiogeography (convenor A.Hallam);
- (4) Integrated stratigraphy (convenors J.Callomon, S.Elmi, R.Enay, H.C.Jenkyns, G.Pavia, P.Smith);
- (5) Jurassic organism in space and time (convenor F. Cecca);
- (6) Geoconservation and palaeontological heritage (convenor K.Page);
- (7) Organic geochemistry (convenor J.Golonka);
- (8) IGCP 506: Marine and non-marine Jurassic: global correlation and major geological events (convenor J.Sha);
- (9) IGCP 458: Triassic/Jurassic boundary events (convenors S. Hesselbo, J. Palfy, G. Warrington).

The abstracts of all the presentations were published in *Volumina Jurassica* no.4 (2006), a new geological journal directed towards problems of the Jurassic System. During the Congress a special presentation of the Oxfordian ammonites of the 19th century collection of the Physiographic Commission, described by J. Siemiradzki (1893), and housed in the Museum of the Institute of Geological Sciences of the Polish Academy of Sciences, was presented by Ewa Glowniak together with her revision of the collection, especially prepared for the Congress. This will be published in *Volumina Jurassica* (no 5 for 2007). It will consist of two parts – a revision of the Siemiradzki ammonite (perisphinctids) collection from the Krakow area described originally in 1891 (in Polish) by Eva Glowniak (Oxfordian Perisphinctidae), and by Andrzej Wierzbowski (Ataxiocerata and Aulacostephanidae), and a biography of Siemiradzki by Ewa Glowniak. The number will include also the photocopy of the original Siemiradzki text.

Some 35 papers submitted during the Congress have been peer-reviewed and after editing will be published in *Volumina Jurassica* (no.6 in two parts, for 2008) which will appear at the beginning of 2008.

A varied Congress social programme was arranged by M.Krobicki and J.Zacharski. It included an ice-break party in the Congress Centre of the Royal Castle on Wawel Hill (of Upper Oxfordian limestones), and the Conference Dinner organized in the underground scenery of the restaurant in the 900-year old Wieliczka Salt Mine (salt of Miocene Age). A special programme for accompanying persons visited places of interest in Kraków and its neighbouring areas.

Seven Working Groups of the Jurassic Subcommittee held meetings during the Jurassic Congress, and discussed the problems of the Stage boundaries and location of their GSSPs. The two proposals dealing with the lower boundaries of the Toarcian Stage and the Kimmeridgian Stage were published in the Congress Abstracts *Volumina Jurassica*, and together with other proposals especially for the Hettangian Stage, the Callovian Stage and the Oxfordian Stage were discussed during the Congress.

A varied field trip programme consisting of one pre-Symposium field trip (A), and four post-symposium field trips (B1, B2, B3, B4) was prepared. This was possible due to location of the Krakow close to interesting outcrops of Jurassic in southern Poland – in the Gory Swietokrzyskie (Holy Cross Mts), the Krakow-Czestochowa-Wielun Upland (Polish Jura) and in the Polish and Slovakian Carpathians. The field trip guidebook “*Jurassic of Poland and adjacent Polish Carpathians*” (235 pp) prepared for the Congress gives detailed descriptions of the most classical outcrops of Jurassic rocks, and their stratigraphical, sedimentological and palaeostructural interpretation. This book includes the results of many new studies, some presented for the first time during the Congress. Its publication was sponsored by the Ministry of the Environment of Poland, and edited by Polish Geological Institute (2006) (ref. ISBN 83-7372-909-7).

The pre-Congress field trip (A) “*From Tethyan to platform facies*” was led by J. Golonka and M.Krobicki and demonstrated the Pieniny Klippen Belt in Poland (a highly complex tectonic zone in the Carpathians), and then the classical Carpathian flysch of the Outer Carpathians. The field trip visited also the Krakow Upland with typical platform Jurassic deposits, mostly condensed Callovian deposits and overlying deposits of the sponge megafacies, both representing a deep neritic zone of the northern Tethyan shelf.

The post-Congress field-trips demonstrated the highly diverse deposits of the platform facies (field-trips B1, B2, B4), and of the Carpathians in both Poland and Slovakia (field-trip B3 organized jointly by Polish and Slovakian colleagues): Field-trip B1 (*Biostratigraphical framework from Bajocian to Oxfordian*), led by A.Wierzbowski presented the biostratigraphical problems of Middle Jurassic (Bajocian to Callovian) and Oxfordian deposits rich in fossils in the Polish Jura Chain;

Field-trip B2 (*Upper Jurassic shallow-water carbonate platform and open shelf facies*), led by J. Gutowski and B.A.Matyja, focused mainly on sedimentological aspects of the progradation of a shallow marine carbonate platform over open shelf sponge facies (from Holy Cross Mts to Polish Jura Chain) during Oxfordian/early Kimmeridgian time; Field-trip B4 (*Lower Jurassic marginal-marine and continental deposits: sedimentation, sequences and ecosystems*), led by G.Pienkowski, demonstrated the diverse sediments cropping out along the northern slopes of the Holy Cross Mts.;

Field-trip B3 (*Inside Tethys*), led by R.Aubrecht, M.Krobicki and A.Uchman demonstrated the Jurassic deposits of different palaeogeographic units of the Inner Carpathians in Poland and north-western Slovakia.

Organization of the 7<sup>th</sup> International Congress on the Jurassic System would not have been possible without the generous support of several institutions, especially: International Subcommittee on Jurassic Stratigraphy, Ministry of Environment of Poland, Orlen Group, Polish Oil and Gas Company, Warsaw University Foundation. Other institutions supporting the Congress included Ojców National Park, Pieniny National Park, Tatry National Park, Baltow Jurassic Park, Archeological Museum and Reserve at Krzemionki, Lhoist S.A. Poland, “Jurajska” Natural Mineral Water. Radio and television publicity and patronage included programmes on TV Krakow, Academic Radio “Kampus” and Radio Krakow.

#### **5b. Open meeting of Jurassic Subcommittee:**

A meeting of the Jurassic Subcommittee was held during the 7<sup>th</sup> International Congress on the Jurassic System, to which all were welcome. After a welcome by the Chairman, Convenors of the Working Groups gave brief reports summarising the main conclusions of their discussions and to indicate future plans. The Chairman then explained the

procedures for proposal and ratification of GSSP proposals, the deadlines proposed by IUGS and ICS and those that would be required for the Working Groups and the Subcommittee. Convenors were asked to regard 1<sup>st</sup> July 2007 as the deadline for submission to the Jurassic Subcommittee.

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

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

### **5c. Progress with selection of GSSPs for Jurassic Stages.**

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

**5c (i) Hettangian and Triassic/Jurassic Boundary.** Of the four previously-proposed GSSP candidates, that in Peru was withdrawn during the Working Group discussion session, and there was consensus to combine New York Canyon (Nevada, USA) and Kunga Island (B.C., Canada) into a single proposal as GSSP and ASP respectively. The fourth previous candidate, St. Audries' Bay (Somerset, UK) remains.

Perhaps the sensations of the Krakow Congress were the presentation of two new candidate proposals for the base-Jurassic GSSP, Kuhjoch (Austria) and Waterloo Bay (Northern Ireland). The first had already been announced (e.g. in *ISJS Newsletter* **33** for 2006) and was more advanced; the second was new and preliminary and a complete surprise to almost everyone present! Comments were made as to how surprising it was that such a section could have remained so unknown in a well-explored country like Great Britain. Another new proposal was for a carbon isotope excursion to be the primary marker.

During post-Congress fieldtrip B1, the idea of a special Newsletter for rapid publication of details of the new proposals was born. Subsequently Convenor Geoff WARRINGTON and Secretary Gert BLOOS proposed inclusion of updates of existing proposals. These were published electronically, with the editorial help of Jackie LEES, as *International Subcommittee on Jurassic Stratigraphy Newsletter* **34 (1)** in July 2007. With 69 pages and a large number of figures and plates in colour, the file proved too large for general transmission in the normal way as email attachment, so it was posted on the website for free download. Paul BOWN arranged this so that various downloading options of different sizes are available. Unfortunately illness and family problems for the principle author of the St. Audries' Bay proposal meant that the update of this was delayed, but this will be available soon. Thanks to Chris McROBERTS a special website, password

protected to be available for posting discussions to only the Working Group members, was established to facilitate the work of the Group.

**5c (ii) Sinemurian.** The Sinemurian GSSP in Somerset (S.W. England) was ratified by IUGS in 2000 and published in *Episodes* **25/1**, 22-28, 2002. Involvement of the Convenor, Gert BLOOS and most members of the Working Group in the Hettangian Working Group has meant that investigation of formal subdivisions of the Sinemurian Stage has been delayed.

**5c (iii) Pliensbachian.** The Pliensbachian GSSP in Wine Haven section in Yorkshire (E. England) was ratified by IUGS in 2005 and published in *Episodes* **29/2**, 93-106, 2006. The Convenor, Christian MEISTER, following the objectives and the recommendations of the Jurassic Subcommittee, has started work on the next step, which is to standardize and propose a GSSP for the Substages (Lower - Upper Pliensbachian) (see *ISJS Newsletter* **34 (2)**). The Lower-Upper Pliensbachian boundary is quite well known in Euroboreal, Western Tethys and Pacific areas. However, even if the biostratigraphy based on ammonites seems to be quite precise in all these different paleogeographical domains, the main problem is strong provincialism and consequently correlation between the different regions. Further investigations to improve documentation in these areas and to document the magnetostratigraphy, isotope stratigraphy and biostratigraphy are required.

**5c (iv) Toarcian.** As reported by the Convenor, Serge ELMI, in *ISJS Newsletter* **33** (2006) and in the Abstracts Volume for the Krakow Congress (*Volumina Jurassica* **4**, 5-16, 2006), the GSSP for the base of the Toarcian in the Peniche section (Portugal) had been identified and agreed informally by the members of the Working Group. Several further communications on the Peniche section were also presented during the Congress. No significant problems emerged during the Working Group session, so that it was only a matter of preparation of the formal proposal for voting within the Working Group and then the Subcommittee.

Unfortunately, Serge ELMI became seriously ill (the last communication received, in mid October 2006, gave no indication of any problems with preparation of the GSSP proposal) so it was an immense shock to everyone to hear of his death on 27th January 2007, it is a great loss to us all. His colleague in Lyon, Pierre HANTZPERGUE, has been able to recover from Serge ELMI's computer what appear to be all the files relevant to the Peniche section and efforts are being made to reconstruct posthumously his proposal.

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

**5c (vi) Bajocian.** Proposal of GSSP at Cabo Mondego section (Portugal) and ASP at Bearreraig, Isle of Skye section (NW Scotland) was ratified by IUGS in 1996 and published in *Episodes* **20/1**, 16-22, 1997. The enhanced conservation status of the Cabo Mondego site is reported above (this report **section 4 (b) (1)**).

**5c (vii) Bathonian.** The Working Group meeting during the 7<sup>th</sup> International Jurassic Congress in Krakow, chaired by the Convenor Sixto Rafael FERNANDEZ LOPEZ, agreed to submission of the proposal of the Ravin du Bès section as GSSP for vote in the Working Group. Members of the Working Group have completed the further investigations of both the Ravin du Bès near Digne,

Hautes-Alpes (S.E. France) and Cabo Mondego (Portugal) sections. A formal proposal to select the Ravin du Bès section near Digne as GSSP, together with the Cabo Mondego section as ASP, has been submitted to Working Group members for an approval vote and will be followed by a submission to the Jurassic Subcommittee.

**5c (viii) Callovian.** Research by the Working Group, Convenor John CALLOMON, to select the best marker for the base of the basal zone and subzone of the Callovian Stage, and of the best section for GSSP were completed in the early 1990s. The marker and section selected are the *Keplerites kepleri* horizon in the Albstadt-Pfeffingen, Swabia (S. Germany) section. A description and discussion were published in the Proceedings of 5<sup>th</sup> International Jurassic Symposium (*GeoResearch Forum* **6**, 41-54, 2000). Unfortunately, the paper work leading to a formal proposal was never completed at the time, but is now under way. At the Working Group meeting during the 7<sup>th</sup> International Jurassic Congress in Krakow some minority reservations were expressed and it was agreed that a possible alternative section on the Russian Platform should be examined. A proposal for discussion has been submitted to the Working Group.

**5c (ix) Oxfordian and Middle/Upper Jurassic Boundary.** The Working Group, Convenor Guillermo MELENDEZ, has over the past five years decided to focus attention on two candidate sections, at Savouron, Provence (S.E. France) and Redcliff Point, Dorset (S.W. England). Descriptions of both sections were presented at the Krakow Congress. Most of the multidisciplinary work on the Redcliff Point section has been completed and will be published in *Volumina Jurassica* **no. 6** (2008). Only part of the work on the Savouron section has been published; the rest has not yet been submitted to the Working Group. Detailed comparative work on the critical ammonite faunas across the boundary in both sections was carried out at Lyon and in the field during the summer of 2007. This proved that the detailed succession of ammonites established at Redcliff Point could also be recognised in the Savouron section, confirming the suitability of the *Cardioceras redcliffense* Horizon as the primary marker for the base of the Oxfordian Stage. Recent objections by some French colleagues to the elimination from consideration of another section in France seem difficult to justify. The situation remains that as soon as the results of work on the Savouron section are available, details of both sections will be submitted to members of the Working Group for selection and a proposal for the GSSP and ASP submitted.

**5c (x) Kimmeridgian.** The basal boundary of the Kimmeridgian Stage has been, historically, a difficult problem because of faunal provincialism so that it became clear some time ago that the Boreal/Subboreal boundary was significantly older than the Submediterranean/Mediterranean boundary. The former has several advantages, not least historical precedent. Therefore, a vote was held within the Working Group to use the Subboreal base of the Kimmeridgian as the level at which the GSSP should be placed and this was approved by a strong majority (67%) of the members of the Working Group. It was decided that, to avoid any future problems, the same proposition should be put to the Voting Members of the Jurassic Subcommittee and approved by an even larger majority (77%). Therefore, the base of the Kimmeridgian Stage should be defined at the base of the Baylei Zone. On this basis a description of the Flodigarry section was given in the Abstracts Volume for the Krakow Congress (in *Volumina Jurassica* **no. 4**, 2006). The Working Group members were then asked in a two-point ballot:

(1) That the Flodigarry section, Staffin Bay, Isle of Skye, Scotland be proposed as the GSSP section and

(2) Either the *Pictonia flodigarriense* Horizon or the *Pictonia densicosta* Horizon should be the primary marker for recognition and correlation of the base of the Baylei Zone and the Kimmeridgian Stage.

Of the members of the Working Group who voted (71%), a majority (78%) voted for selection of the Flodigarry section as the section for the GSSP, but a small majority, only 52%, voted for *Pictonia flodigarriense* Horizon as the primary marker.

As a result, a final decision on the GSSP for the base of the Kimmeridgian Stage was deferred until further investigations could be undertaken as to whether the *Pictonia flodigarriense* Horizon could be recognised beyond the Flodigarry section. This was completed during the summer of 2007, and it was confirmed that this Horizon **can** be recognised also in Poland and Russia, and possibly elsewhere. These results will be submitted to the Working Group members for a new vote.

**5c (xi) Tithonian.** Progress in identifying a possible GSSP for the base of the Tithonian is the least advanced of any of the Jurassic Stages. The Working Group faces difficulties of precise correlation between sections as a result of extreme provincialism of the ammonite faunas has caused problems with finding and selecting potential candidate sections for the Kimmeridgian-Tithonian boundary. Only the Contrada Fornazzo section, Sicily (S. Italy) has been formally proposed as candidate GSSP, published in *Revista Italiana di Paleontologia e Stratigrafia* **110**, 329-338, 2004 (Proceedings of 6<sup>th</sup> International Jurassic Symposium). Completion of work on other possible candidate sections, notably Canjuers, is urgent.

**5c (xii) Berriasian and Jurassic/Cretaceous boundary.** Although this boundary is not technically the responsibility of the Jurassic Subcommittee, it is reported here briefly because many members of the Jurassic Subcommittee, including the Convenor William WIMBLEDON, are involved in this newly reformed group. The Convenor is also a Co-Leader of IGCP Project 506 and it was agreed that an augural meeting of the Working Group be held during the IGCP Project 506 symposium in Bristol (July 2007). This was a closed meeting (i.e. members only) during one evening and although there are still hangovers of entrenched views on "which ammonites should rule" there was enough new momentum for the group to be prepared to try to get somewhere, maybe even to abandon the ammonites and try other criteria. The Group decided to concentrate on the critical stratigraphical interval, effectively jacobi/grandis zones and equivalents and that various regional groups should urgently gather all the relevant biostratigraphical and other key data on the sections in their areas, preferably in a standard format (to be developed). These should be brought to the next meeting, which is planned for April 2008 in Marseilles, France. It was felt that it was unlikely that the August 2008 deadline, would be met but at least there should be some significant progress to show by then.

#### **5d. Jurassic Newsletter no. 34.**

The *International Subcommittee on Jurassic Stratigraphy Newsletter* is the principle organ of communication between the Subcommittee and those with an interest in the Jurassic.

Contributions are solicited from all members and associates of the Subcommittee. These are edited carefully for content and language by Nicol MORTON and put into a standard format. The files are then emailed to Paul BOWN who checks them again and assembles them into a single document which integrates the figures with the text, using A4 size pages and two columns for the text. The Newsletter is distributed electronically, normally as an email attachment to all Voting, Corresponding and Honorary members of the Subcommittee, with a request that it be forwarded to

all in their region who have an interest in the geology of the Jurassic. The success of the last part of the distribution is variable.

This year there have been exceptional circumstances with the presentation during the Krakow Congress in September 2006 of two new candidate sections for GSSP of the base of the Hettangian Stage and the Jurassic System. Detailed descriptions and discussions of both of these had not been published, so that it was decided to produce an additional special Newsletter devoted to the Triassic/Jurassic boundary GSSP, as Part 1 of the Newsletter no. 34 for 2007. This would contain the details of the new candidate sections and updates of the proposals for the previously proposed sections. Interactive editing began in December 2006 and the Newsletter was published electronically as *International Subcommission on Jurassic Stratigraphy Newsletter 34 (1)* in July 2007, edited by Paul BOWN, Nicol MORTON and Jackie LEES. There are 6 articles on the sections and proposals plus a list of the members of the Triassic-Jurassic Boundary Working Group, totalling 69 pages, with 46 figures (many in colour) and 4 plates. The size of the pdf file, at over 20 Mb proved to be too large to distribute in the usual way, therefore the email which was sent as the normal “cover” message gave details for free downloading from the Jurassic Subcommission website (see section 5f. below for details). Options were given to download the complete file with figures in colour, the complete file in black and white, or individual files for each of the articles.

The editing and preparation of the “normal” Newsletter has almost been completed at this time (mid November) and it is planned to have this ready for electronic publication in the normal way with distribution in early December as *International Subcommission on Jurassic Stratigraphy Newsletter 34 (2)*. With 27 articles, this will contain the usual reports from the Chairman and from the Working Group Convenors, 9 correspondence articles, obituaries of two colleagues and a tribute to a third.

One article on the Triassic-Jurassic Boundary, with an update of the proposal for St. Audries’ Bay (SW England), was not available for inclusion in Newsletter 34 (1) of July 2007. This file is too large for inclusion in the “normal Newsletter” which will be Newsletter 34 (2), so it will be published as *International Subcommission on Jurassic Stratigraphy 34 (3)*.

#### **5e Jurassic Subcommission Directory.**

A revised *ISJS Directory 2006* of members of the Jurassic Subcommission for 2004–2008 was distributed, also as an email attachment, in July 2006. This gives the addresses, telephone/fax numbers and email addresses of all members of the Subcommission, including Voting, Corresponding and Honorary Members. For the Subcommission Bureau and the Voting Members the research interests and Subcommission responsibilities are also listed. Also listed are the details of the Convenors of the Working Groups (who are all Voting or Corresponding Members). The next update of this Directory will be prepared after the new membership of the Subcommission for the period 2008-2012 has been finalised.

#### **5f. ISJS Website.**

The website for the International Subcommission on Jurassic Stratigraphy was established in August 2005 by Paul BOWN (UK), Secretary of the Subcommission, and is updated whenever possible. The content of the site includes information on the goals and objectives of the



Subcommission, details (with photographs) of the Voting Members and recent Jurassic Newsletters. The current address is <http://www.es.ucl.ac.uk/people/bown/ISJSwebsite.htm>.

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

The Leaders of this Project are all members of the Jurassic Subcommission – Jingeng SHA (China) and Nicol MORTON (France) as Voting Members, Paul OLSEN (USA, Grzegorz Pienkowski (Poland), Alberto RICCARDI (Argentina), Yongdong WANG (China) and Bill WIMBLEDON (UK) as Corresponding Members. The proceedings of the opening (1<sup>st</sup>) Symposium on *Jurassic Boundary Events*, held in Nanjing, China (November 2005) have now been published in *Progress in Natural Science* **16 (Special Issue)** 1-322, 2006.

During the year 2006 two Symposia were held. The 2<sup>nd</sup> Symposium was Topical Symposium T12: *Marine and non-marine Jurassic: biodiversity and ecosystems* during the 2<sup>nd</sup> International Palaeontological Congress in Beijing, China (June 2006), and was followed by a post-Congress field excursion C7. *Terrestrial Triassic-Jurassic sequence and biota in the Junggar Basin, Xinjiang*. The 3<sup>rd</sup> Symposium was Session 8: *Marine and non-marine Jurassic – global correlation and major geological events* during the 7<sup>th</sup> International Congress on the Jurassic System in Kraków, Poland (September 2006) which was followed by related post-Congress field trip B4: *Lower Jurassic marginal-marine and continental deposits – sedimentation, sequences, and ecosystems*. The Abstracts for this are published in *Volumina Jurassica* no. 4 (2006) and the fieldtrip guide published by the Polish Geological Institute (2006) (see section **5a (i)** above).

The 4<sup>th</sup> Symposium was held in Bristol (UK) in July 2007, with two days of oral and poster presentations and two days of fieldtrips, one to the Jurassic-Cretaceous boundary sections in Dorset and the second to the Triassic-Jurassic boundary sections in Somerset. The Abstracts volume prepared by the University of Bristol contains 33 abstracts.

## **6. CHIEF PROBLEMS ENCOUNTERED IN 2007.**

The most important problem is an ongoing one and relates mainly to finance. In particular, there are widespread difficulties in obtaining grants for research on stratigraphical topics and travel to meetings of Working Groups. Applications are often given low priority by National grant-awarding agencies. It would be helpful if IUGS emphasized to its member countries the importance it attaches to the GSSP programme and encouraged the relevant research funding bodies to give priority to funding relevant basic research. For example, recent applications for projects on the palaeomagnetic stratigraphy of key sections, including those selected as GSSPs, have been refused funding.

The other significant problem, which has arisen this year in particular, reflects the fact that the Subcommission can operate only through the voluntary unpaid work of individuals. The Subcommission does not have the financial resources to pay for significant amounts of work to be done. Of course, the corollary is that any problems with those individuals have an immediate, and possibly catastrophic impact on the planned work of the Subcommission. The most severe cases this year concern the work of the Working Groups.

In the case of the Triassic-Jurassic Boundary W.G. preparation of the update for one of the proposed candidate sections has been delayed by nearly a year because of the prolonged health problems of the principle author.

With the Toarcian Working Group final agreement (though not a formal vote) on the GSSP to be proposed to the Subcommittee was reached during the Krakow Congress in September 2006, but the unexpected illness and sudden death of the Convenor in January 2007 has delayed the proposal until the files can be accessed and the proposal reconstructed by others. An emergency allocation of €200 has been set aside to help with this, resulting in a small deficit in this year's finances.

## 7. SUMMARY OF EXPENDITURES IN 2007 (ANTICIPATED THROUGH MARCH 2008): INCOME

Surplus carried forward from 2006	€	15	
ICS Allocation	US\$1500 converted to €1124.73		
	less bank charges	=	€1078
	<b>TOTAL</b>		<b>€1093</b>

## EXPENDITURE FROM 2005 BUDGET

General office expenses	€	240	
ISJS Newsletter 34 preparation	€	200	
Contributions to travel costs	€	450	
Allocation for Toarcian WG, preparation of GSSP proposal *	€	200	
Floral tribute for S. Elmi funeral	€	90	
	<b>TOTAL</b>		<b>€1180</b>

Deficit to be carried forward to 2008	€	87
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\* see section 6 of this Report.

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

### 8a. Proposals for GSSPs of Jurassic Stages.

Completion of the project to define the basal boundaries of all eleven Jurassic Stages is the priority of the Jurassic Subcommittee, with seven remaining to be defined. With the possible exception of the Tithonian, the year 2008 should be marked by the completion of the GSSP project at Stage level.

The GSSP section, level and primary marker have been selected for the Toarcian, Bathonian, Callovian and Kimmeridgian and formal proposals are being prepared; final selections for Hettangian (and Triassic-Jurassic boundary) and Oxfordian are under way in the Working Groups:

- (i) *Hettangian (Tr-Ju boundary)* Working Group discussions under way in preparation for vote, expected submission to Subcommittee March/April 2008;

- (ii) *Toarcian* delayed by death of Convenor, proposal being reconstructed, expected April 2008;
- (iii) *Bathonian* being voted on by the Working Group (November 2007), expected submission to Subcommission in December 2007;
- (iv) *Callovian* details being published and proposal prepared, expected March 2008;
- (v) *Oxfordian* final details of two candidate sections being prepared for comparison and Working Group vote, expected proposal to Subcommission February 2008;
- (vi) *Kimmeridgian* section selected and confirmed by WG vote; precise level and marker not yet decided, expected January 2008.
- (vii) *Tithonian* further work on candidate sections required, timetable uncertain.

#### **8b. Proceedings of 7<sup>th</sup> International Congress on the Jurassic System, Krakow, Poland, 2006.**

Abstracts of all communications submitted for the 7th International Jurassic Congress on the Jurassic System, held in Krakow, Poland, in September 2006 were published in 2006 (*Volumina Jurassica* **no. 4**, 2006). 35 papers submitted for publication in the Proceedings Volume have been peer reviewed and those accepted will be published by the Faculty of Geology of Warsaw University in *Volumina Jurassica* **no 6** (early 2008).

#### **8c. Revision of Siemiradzki's Ammonite Collection.**

During the Kraków Congress a visit was arranged for participants to the classical collection of ammonites (mainly Oxfordian) described originally by Józef Siemiradzki in 1891 and now housed in the Museum of Geological Sciences of the Polish Academy of Sciences in Kraków. In connection with the Congress the revision of the Siemiradzki monograph by Ewa GŁOWNIAK and Andrzej WIERZBOWSKI (Warsaw University) and will be published in *Volumina Jurassica* **no. 5** (late 2007 or early 2008).

#### **8d. Membership of Jurassic Subcommission.**

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

Several Voting Members will be due to retire during 2008 having completed three terms or for other reasons. The new Executive of the Subcommission who will serve from 2008 to 2012 were elected in October 2007, as reported below. During 2008 there will be discussions between the Executive and Executive-elect of the Subcommission to prepare a revised list of Voting Members for 2008-2012.

#### **8d Website for Jurassic Subcommission.**

The website for the Jurassic Subcommission was established by Paul BOWN (UK) in August 2005 and continues to be updated from time to time with, for example, new volumes of the *International Subcommission on Jurassic Stratigraphy Newsletter*. These can be freely downloaded from the website. During 2008 the future arrangements for managing the website will be reviewed.

### **8e. Publication of Jurassic Newsletters:**

The principle organ of communication is the ISJS Jurassic Newsletter, which publishes (electronically) reports of all the Working Group and other articles, of varying length. This is emailed to all Honorary, Voting and Corresponding Members and should be forwarded to others who have an interest in Jurassic geology. Two Newsletters, nos. 34 (1) and 34 (2) will have been published electronically in 2007 (July and December), and a third Newsletter, 34 (3) in December 2007 or January 2008. With so many GSSP proposals to be finalised during 2008 it is difficult to predict a timetable or number of Newsletters that will be published during the year 2008. In addition to these there will be the “normal” Newsletter material with contributions from members and associates of the Subcommittee and there will be a review of the Jurassic of China (to follow up selection of China for the 8<sup>th</sup> International Congress on the Jurassic System in 2010).

### **8e. IGCP Project 506 Marine and Non-marine Jurassic: Global Correlation and Major Geological Events: plans for 2008**

This Project is being pursued at many stratigraphical levels, from the Triassic/Jurassic Boundary to the Jurassic/Cretaceous Boundary, and applying all relevant disciplines. There are numerous examples in Lower, Middle and Upper Jurassic where calibration of the sequences of continental floras and faunas against marine faunal changes will provide valuable insights into the geological and biological evolution of Earth during the Jurassic Period. Four Symposia/Workshops have been held to date, in Nanjing, China (November 2005, papers published in *Progress in Natural Science* vol. 16, 2006 and see *Episodes* 29 (3)), in Beijing, China (June 2006), in Krakow, Poland (September 2006, papers to be published in *Volumina Jurassica* no 6, 2008), and in Bristol (July 2007, publication of papers being planned).

*8e (i) 5<sup>th</sup> International Symposium in Hammamet, Tunisia on 28<sup>th</sup> to 31<sup>st</sup> March 2008.* The discussion sessions will be held at the Hammamet Club, with an opening conference on the Economic Potential of the Jurassic Petroleum Systems of North Africa and the Middle East, four Plenary Sessions with Keynote Talks, and oral communications and posters on eight planned topics over two days. Two parallel fieldtrips, each of two days, are planned on the theme *Marine and Non-marine Jurassic of Tunisia; The State of the Art*. The Symposium Chairmen are Mabrouk BOUGHDIRI (Bizerte) and Mohammed SOUSSI (Tunis).

*8e (ii) Symposium during IGC33, Oslo, Norway and fieldtrip in southern Sweden in August.* The proposal for Special Session during the 33<sup>rd</sup> International Geological Congress in Oslo, Norway in August 2008 has been accepted. The title: *Marine and non-marine Jurassic: Global correlation and major geological events*. The organisers are Jingeng SHA, Yongdong WANG and Vivi VAJDA. A fieldtrip to the Jurassic of southern Sweden is planned.

### **8f. Participation in 33<sup>rd</sup> International Geological Congress**

The Jurassic Subcommittee arranged a Symposium entitled The Jurassic World during the 32<sup>nd</sup> IGC in Florence, Italy in August 2004. Therefore, during the Subcommittee meeting in Krakow in September 2006 the question of participation in the 33<sup>rd</sup> IGC in Oslo, Norway in 2008 was discussed. There was no support for official participation, for three reasons:

- (i) International Geological Congresses are extremely expensive (inevitable given their scale) and it was difficult to obtain financial support for participation;

- (ii) The 32<sup>nd</sup> IGC was held in a country where there are important outcrops of Jurassic rocks so that there was more local interest in the Congress among members and associates of the Subcommittee and more general interest in the fieldtrip programme. These positive factors do not apply to the 33<sup>rd</sup> Congress.
- (iii) In any case the IGCP Project 506 Marine and Non-marine Jurassic, which is closely associated with the Jurassic Subcommittee, will be organising a Special Session [see **8e (ii)** above] and a fieldtrip so there is no need to duplicate this with a similar or related symposium.

### **8g. Participation in International Year of Planet Earth**

The Jurassic Subcommittee does not have the human or financial resources to participate internationally in this event. It is thought that it would be generally better to concentrate on events at a local level.

## **9. BUDGET AND ICS COMPONENT FOR 2008**

For the year 2008 the main activities of the Jurassic Subcommittee will be focussed on:

- (i) With a few exceptions, most of the Stage Working Groups appear to have completed the fieldwork related to the investigation of candidate GSSP sections and selection of preferred section to be proposed to the Subcommittee. However, some associated problems remain to be resolved which involve travel;
- (ii) Stage Working Groups which have completed Stage GSSP procedures will continue work on definitions of Substages and Standard Zones;
- (iii) Preparation of the Jurassic Newsletters;
- (iv) Preliminary planning of the 8<sup>th</sup> International Congress on the Jurassic System to be held in Suining City, Shedong County, Sichuan province, China in 2010. Much of the Jurassic in China is non-marine and, while this and correlation with the marine Jurassic will be significant aspects of the Congress, special attention will also be given to the marine Jurassic in eastern Asia – in Tibet and possibly Viet Nam and Thailand. Pre- and post-Congress fieldtrips are an extremely important part of all Jurassic Congresses and those to the areas with marine Jurassic will require careful consultation and planning, even at this apparently early stage.
- (v) Meeting of members of the current Executive and of the Executive-elect to discuss future membership and main areas of focus for the Jurassic Subcommittee after completion of the Stage GSSPs project.

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

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

## Projected Budget for 2008:

General office expenses	€ 260
Preparation and production of Newsletter 35	€ 200
Contributions to Officers' travel costs	€ 1200
Support for Working Groups (meetings etc.)	€ 800
	-----
TOTAL BUDGET PROJECTED	€ 2460
	-----

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

### 10. REVIEW CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2002-2007).

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

For each Congress/Symposium the resultant Field Trip Guidebooks are important reference publications, often with much new previously unpublished information, while the Congress/Symposium Proceedings are frequently quoted basic references on Jurassic geology. Within the five-year period 2002-2006, such publications include the following publications.

(a) From the Mondello Symposium (2002):

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

(b) From the Kraków Congress (2006):

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

presented during the 7<sup>th</sup> International Congress on the Jurassic System, September 6-18, 2006, Kraków, Poland. *Volumina Jurassica* **4**, 1-304. Institute of Geology, Warsaw University, Warsaw.

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

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

MORTON, N. & BOWN, P. (eds.) 2002 (June). *Newsletter* **29**, 30 pages, with 16 reports and 3 correspondence items;

MORTON, N. & BOWN, P. (eds.) 2003 (July). *Newsletter* **30**, 42 pages, with 17 reports, 10 correspondence items and 3 obituaries;

MORTON, N. & BOWN, P. (eds.) 2004 (August). *Newsletter* **31**, 32 pages, with 14 reports and 8 correspondence items;

MORTON, N. & BOWN, P. (eds.) 2005 (August). *Newsletter* **32**, 45 pages, with 19 reports, 9 correspondence items and 3 obituaries;

MORTON, N. & BOWN, P. (eds.) 2006 (July). *Newsletter* **33**, 41 pages, with 16 reports, 11 correspondence items and 1 obituary;

BOWN, P., MORTON, N. & LEES, J. (eds.) *Newsletter* **34 (1)** 2007 (July) 69 pages, with 1 report, 5 new or updated proposals for GSSP of the base of the Hettangian Stage and Jurassic System, list of members of Triassic-Jurassic Working Group;

MORTON, N. & BOWN, P. (eds.) 2007 (December). *Newsletter* **34 (2)**, xx pages, with 15 reports, 9 correspondence items and 3 obituaries.

## **11. OBJECTIVES AND WORK PLAN FOR NEXT 4 YEARS (2008-2011)**

It must be emphasised that during the year 2008 the new Executive of the Jurassic Subcommittee will take office. They were elected only recently so have not yet had the opportunity to formulate their own objectives and plans for the future. These will be reported in the next Annual Report, for 2008.

The primary objectives for the immediate future for the Jurassic Subcommittee remain the completion of the long-standing project for definition of the Stages, hierarchically by their basal Standard (Ammonite) Zones/Subzones and by GSSPs. This will be completed during 2008. The next tasks for the Stage Working Groups, which some have already begun, will be the definition of smaller chronostratigraphic units, at Substage and Standard (Ammonite) Zone level, coordination of parallel biostratigraphic scales and regional scales. The Subcommittee aims to enable coordination of multidisciplinary work on stratigraphical calibration, including geophysical and geochemical

techniques as well as biostratigraphy, and use of Milankovic cyclicity to estimate time durations of chronostratigraphical units.

The association with IGCP Project 506 can be expected to become even closer, with the Leader of IGCP Project 506 becoming Vice-Chairman. There are shared objectives to improve correlations between the marine and non-marine realms, to resolve problems of, to give just one example, the ages of famous dinosaur faunas.

***Box 11a Objectives of Jurassic Subcommittee***

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

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

1. Stage Working Groups to standardise and propose GSSPs for Substages as appropriate, but named ONLY as Lower/Middle/Upper. We do not want to clutter up the nomenclature with named Substages such as Carixian, Domerian etc. These will be approved by the Jurassic Subcommittee [As far as is known, ICS and IUGS have no current plans for involvement with Substages].
2. I suggest also asking the Stage Working Groups to define the bases of the Standard (Ammonite) Zones in terms not only of the correlation marker event but also to propose a stratotype point for the basal boundary in the same way as for the Stages. Similar definition of Regional Zones and maximising the detail of correlation with the Standard Zones would be very valuable.
3. Involvement in the aims and objectives of IGCP Project 506, targetted on developing means of correlation between marine and non-marine Jurassic successions. In recent decades the latter have been recognised to be very widespread and economically important in several regions, with exciting terrestrial faunas and floras.
4. Developing and expanding the Thematic Working Groups, some of which have been very successful. For this to work they need to be given more specific projects and targets - for example searching for and interpreting data from all sources relevant to reconstructing the palaeobiogeography or the climate of one or more specific time-intervals. In part this will be given further impetus by involvement in IGCP Project 506.
5. Investigate the establishment of data-bases which would bring together and make available information from all sources associated with the "members and friends" of the Jurassic.



The schedule of meetings already planned includes the following:

1. March 2008 – Hammamet, Tunisia, Symposium and fieldtrips, 5<sup>th</sup> meeting of IGCP Project 506 with particular reference to Jurassic in North Africa and Middle East as well as global problems;
2. August 2008 – Oslo, Norway and Scania, southern Sweden – symposium and fieldtrip of IGCP Project 506, with particular reference to Triassic/Jurassic boundary successions and to correlation of Middle Jurassic in northern North Sea and adjacent regions.
3. August 2010 (provisional date) – Suining City, Shehong County, Sichuan, China - 8<sup>th</sup> International Congress on the Jurassic System, with fieldtrips planned to the T/J boundary in the Junggar Basin (Xinjiang), the marine Jurassic in southern Tibet, the non-marine Jurassic in the Sichuan Basin, the Jurassic and the J/K boundary and the Jehol Biota in Western Liaoning, as well as the Jurassic sequences in Vietnam and/or Thailand.

Details of other meetings are not yet available.

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## APPENDIX

### INTERNATIONAL SUBCOMMISSION ON JURASSIC STRATIGRAPHY Voting Members 2004 - 2008

#### *Subcommission officers*

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

#### *List of Working (Task) Groups and their officers*

- Hettangian (base Jurassic):**  
Convenor Geoffrey WARRINGTON, Radcliffe-on-Trent, UK [gwarrington@btinternet.com](mailto:gwarrington@btinternet.com)  
Secretary Gert Bloos, Stuttgart, Germany [bloos.smns@naturkundemuseum-bw.de](mailto:bloos.smns@naturkundemuseum-bw.de)
- Sinemurian:** Convenor Gert Bloos, Stuttgart, Germany [bloos.smns@naturkundemuseum-bw.de](mailto:bloos.smns@naturkundemuseum-bw.de)
- Pliensbachian:** Convenor Christian Meister, Geneva, Switzerland [christian.meister@ville-ge.ch](mailto:christian.meister@ville-ge.ch)
- Toarcian:** Convenor [replacement for Serge Elmi not yet decided]
- Aalenian:** Convenor Maria Helena Henriques, Coimbra, Portugal [hhenriq@dct.uc.pt](mailto:hhenriq@dct.uc.pt)
- Bajocian:** Convenor András Galacz, Budapest, Hungary [galacz@ludens.elte.hu](mailto:galacz@ludens.elte.hu)
- Bathonian:** Convenor Sixto Fernandez Lopez, Madrid, Spain [sixto@geo.ucm.es](mailto:sixto@geo.ucm.es)
- Callovian:** Convenor John Callomon, London, UK [j.h.callomon@ucl.ac.uk](mailto:j.h.callomon@ucl.ac.uk)
- Oxfordian:** Convenor Guillermo Melendez, Zaragoza, Spain [gmelende@posta.unizar.es](mailto:gmelende@posta.unizar.es)

**Kimmeridgian:** Convenor Andrzej Wierzbowski, Warszawa, Poland

[Andrzej.Wierzbowski@uw.edu.pl](mailto:Andrzej.Wierzbowski@uw.edu.pl)

**Tithonian:** Convenor Federico Oloriz, Granada, Spain [foloriz@goliat.ugr.es](mailto:foloriz@goliat.ugr.es)

Secretary Guenter Schweigert, Stuttgart, Germany [schweigert.smns@naturkundemuseum-bw.de](mailto:schweigert.smns@naturkundemuseum-bw.de)

**Geoconservation:** Convenor Kevin Page, Plymouth, UK [kevin.page@plymouth.ac.uk](mailto:kevin.page@plymouth.ac.uk)

**Liaison:** Convenor Robert Chandler, Whyteleafe, UK [aalenian@blueyonder.co.uk](mailto:aalenian@blueyonder.co.uk)

**Microfossils:** Convenor Susanne Feist Burkhardt, London, UK [S.Fiest-Burkhardt@nhm.ac.uk](mailto:S.Fiest-Burkhardt@nhm.ac.uk)

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**Time Scale:** Convenor Jozsef Palfy, Budapest, Hungary [palfy@nhmus.hu](mailto:palfy@nhmus.hu)

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### INTERNATIONAL SUBCOMMISSION ON JURASSIC STRATIGRAPHY Proposed Subcommittee officers for 2008 - 2012

**Chairman:** **Jozsef PALFY**, Hungarian Museum of Natural History,  
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**Secretary:** **Stephen P. HESSELBO**, University of Oxford,  
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**Webmaster:** to be arranged

### **Selection procedures:**

During the Jurassic Subcommittee open meeting held at the end of the 7<sup>th</sup> International Congress on the Jurassic System in Krakow, Poland in September 2006, it was decided that a Nominations Committee should be established. The members were Paul L. SMITH (Canada), Vice-Chairman of the Jurassic Subcommittee (retiring in 2008), James OGG (USA), Secretary General of the International Commission on Stratigraphy, and Giulio PAVIA (Italy), former Chairman of the Jurassic Subcommittee. It was explained to the meeting that suggested names for nomination should be sent to the Chairman of the Nominations Committee. This was later confirmed by email messages from Paul SMITH to all Voting and Corresponding Members of the Jurassic Subcommittee.

Several names were suggested to the Committee by members of the Subcommittee and all were carefully considered by the Committee. The unanimous decision of the Committee was to propose one candidate as Chairman, Jozsef PALFY. Two candidates were selected for proposal as Vice-Chairman, but one declined the invitation after consideration leaving one proposal, that of Jingeng SHA. The Committee's proposals were sent to the Subcommittee Chairman who conducted by email a ballot of the Voting Members. In addition to a ballot form and personal statements by the nominees, the Chairman sent a statement outlining the role of the Subcommittee and of the Subcommittee Chairman. The same information was also sent to all Corresponding Members (with the reminder that they were not technically entitled to vote, but with an invitation to send their views).

The proposed nominees were approved by the Voting Members (and supported by many Corresponding Members). The election of Jozsef PALFY as Chairman and Jingeng SHA as Vice-Chairman was confirmed by email to all members of the Jurassic Subcommittee, to the Chairman of the International Commission on Stratigraphy and to the President of IUGS.

After consultations with the Subcommittee Chairman and the Vice-Chairman-elect, the Chairman-elect nominated the Secretary, in accordance with the normal procedure.



## SUBCOMMISSION ON TRIASSIC STRATIGRAPHY

### ANNUAL REPORT 2007

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

International Subcommittee on Triassic Stratigraphy

*SUBMITTED BY (with contact information)*

Dr Michael ORCHARD, Chairman

Geological Survey of Canada  
625 Robson Street, Vancouver,  
BC, V6B 5J3, Canada  
Tel. \*\* 604 666 0409  
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#### 2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

Rationalization of global chronostratigraphical classification.  
Intercalibration of fossil biostratigraphies, integrated zonations, and recognition of global datums.  
Establishment of magneto- and chemo-stratigraphic scales.  
Definition of Stage boundaries and 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 Subcommittee of the Commission on Stratigraphy.  
Officers (chairman, two vice-chairmen, secretary), Editor/ Webmaster of newsletter *Albertiana*, voting members (25), and corresponding members (~100). The Secretary hosts a web site for STS announcements and task group discussions.

Subcommission members represent a broad spectrum of specialized stratigraphical disciplines from those countries or regions where Triassic rocks are extensively studied in relation to fundamental and/or applied geological research. Current research activities and future plans are communicated through publication of the bi-annual STS newsletter *Albertiana* as both hardcopy and web release.

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

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

**3b. Officers for 2008-2012:**

Chair: Prof. Marco Balini, Italy  
 Vice-Chair: Dr. Mark Hounslow, UK  
 Vice-Chair: Prof. Jinnan Tong, China  
 Secretary: Prof. Christopher R. McRoberts, USA

*Include WEB address for Subcommission site; and indication of contents*

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

<http://paleo.cortland.edu/sts/> - STS information, task group discussions. This site has recently been updated.

#### 4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

IGCP Project 467: Triassic time and trans-Panthalassan correlations

#### 5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2007

##### Publications

Three volumes arising from STS co-sponsored meetings were published in 2007; a fourth is in press. The *New Mexico Museum of Natural History and Science, Bulletins* 40 and 41 are now available free on line at: <http://paleo.cortland.edu/globaltriassic/>

Contributed papers from the Chaohu meeting, 2005.

2007: The Permian-Triassic Boundary Event and Early Triassic Biotic Recovery. Special Issue, *Palaeogeography, Palaeoclimatology, Palaeoecology*, v. 252 (1-2), 381 pp. Algeo, T., Lehrmann, D., Orchard, M.J., and Tong, J. (eds.).

Contributed papers from the Svalbard meeting, 2006.

2008. Boreal Triassic 2008. Special Issue, *Polar Research*.

Field guide, Albuquerque meeting, 2007.

2007. Triassic of the American West. *New Mexico Museum of Natural History and Science, Bulletin 40*: 247 pp.

Contributed papers from the Albuquerque meeting, 2007.

2007. The Global Triassic. *New Mexico Museum of Natural History and Science, Bulletin 41*: 415 pp.

Two volumes of *Albertiana* appeared in 2007.

#35. Published March 2007, 95 pp.

#36. Published (due) November 2007.

The primary aim of *Albertiana* is to promote the interdisciplinary collaboration and understanding among members of the Subcommittee and within this scope serves as a platform for announcements, meeting reports, business minutes, reviews, and Triassic literature compilations as well as preliminary notes, progress reports, and articles on Triassic research. Electronic versions are also available in PDF format at <http://www.bio.uu.nl/%7Epalaeo/Albertiana/Albertiana01.htm>.

### **Meetings:**

**23-25 May, 2007. Albuquerque, New Mexico, USA.** International meeting on *The Global Triassic*. <http://museums.state.nm.us/nmmnh/globaltriassic.html>. This international symposium focussed on the Triassic Timescale and outstanding Triassic GSSPs. A pre-meeting fieldtrip (19-21 May) visited classic marine Middle-Upper Triassic sections in Nevada, including New York Canyon in the Gabbs Valley Range, a potential GSSP for the base of the Hettangian (Triassic-Jurassic boundary). The symposium in Albuquerque was attended by 63 scientists from 15 countries. Three days of talks and posters focused on definition of the Triassic GSSPs (first day), Triassic numerical ages, cyclostratigraphy, magnetostratigraphy and isotope stratigraphy (second day) and Triassic bio-events and nonmarine biostratigraphy (third day). A post-meeting fieldtrip examined classic nonmarine Triassic sections (Moenkopi and Chinle groups) in New Mexico and Arizona. The proceedings of the conference and its fieldtrips have been published as Bulletins 40 and 41 of the New Mexico Museum of Natural History and Science..

**27-31 May 2007. Williston Lake, British Columbia, Canada.** Field workshop on the *Carnian-Norian boundary*, Williston Lake, NE BC, Canada. Participation in this trip was reduced due to a lack of funds but nevertheless key players sampled for macro- and micro- fossils and for C-isotopes; preliminary results were very encouraging.

### **Progress on outstanding Triassic GSSPs:**

#### **Induan-Olenekian:**

A second proposal for an IOB GSSP at Mud in Spiti, was published in *Albertiana* #35, March 2007 (Krystyn et al.). This was accompanied by an account of the conodont and C-isotope data. A paper documenting the conodonts of the Chaohu candidate was published in *Palaeo3* (Zhao et al.). Final arguments in support of the Chaohu and Mud candidates were presented at the Albuquerque meeting in May 2007, following which a formal vote of the working group took place during June-July; results were inconclusive. Discussions amongst the STS executive and IOB task group arrived at a consensus to hold a second vote after a finite period during which time issues around the C-isotope records, the sequence-stratigraphy at Mud, and the magnetostratigraphy in Chaohu were

addressed. Revised dossiers, including a report on additional conodonts from Mud, a reinterpretation of the magnetostratigraphy at Chaohu, and various position papers were distributed in early October with a new ballot; some of this new data will appear in *Albertiana* #36 (Sun et al.). Lively discussions continue within the task group, with the vote results due in early December.

#### **Olenekian-Anisian:**

A taxonomic reappraisal of species of the conodont *Chiosella*, published in *Albertiana* #34 (Kozur et al.) and these revisions applied in studies of conodont material from both Desli Caira, Romania (Orchard et al.) and Guandao, China (Orchard et al.); results were published in the *New Mexico Bulletin* in May, 2007. Continued delay in the tabling of a proposal for Desli Caira (DC) as GSSP was addressed with the imposition of a final Fall 2007 deadline. Meanwhile, the reliability of *Chiosella timorensis* as a boundary definer was questioned once again based on apparent anomalies in relation to magnetostratigraphic correlations. However, taxonomic studies on older material are necessary to resolve this. Two proposals were submitted for inclusion in *Albertiana* #36: a multidisciplinary proposal from the main task group at Desli Caira (Gradinaru et al.), and an alternative for a magnetozone-based datum in the same locality (Hounslow et al.).

#### **Ladinian-Carnian**

Summaries of the ammonoid and conodont successions at New Pass in Nevada were completed and published in the *New Mexico Bulletins* (Balini et al., Orchard et al.), as was an account of the ammonoid-conodont intercalibration in western Canada, the type area for *Daxatina* (Orchard). This resulted in an alignment of the upper Sutherlandi Zone with the Desatoyense Zone, and broad acceptance of the proposed *Daxatina* datum by those task group members present at the Albuquerque meeting. An updated GSSP proposal for Stuoeres in the Italian Dolomites was circulated to the task group with a ballot on November 5<sup>th</sup>, 2007, and published in *Albertiana* #36 (Mietto et al.).

#### **Carnian-Norian**

Following discussions of alternative conodont species as GSSP datums, renewed efforts were made to find a suitable conodont datum that was more closely aligned with the traditional basal Norian macrofossil indicators. This was achieved in the recognition of a key taxon in the form of *Metapolygnathus echinatus*, which had formerly been submerged in a second species, *Metapolygnathus communisti*. New collecting on Williston Lake in British Columbia demonstrated precise equivalence of bivalve and conodont FADs close to the base of the Kerri Zone. The GSSP candidate and definitive datum at Black Bear Ridge, B.C., in Canada was presented in the context of a new conodont zonation in *Albertiana* #36 (Orchard), as will a summary account of the Pizzo Mondello section in Sicily (Nicora et al.).

#### **Norian-Rhaetian**

The section at Steinbergkogel in Austria was proposed as a GSSP site in the Albuquerque meeting volume (Krystyn et al.) and updated in *Albertiana* #36 (Krystyn et al.). Two options for definitive datums were based on the Tethyan endemic conodont *Misikella* as well as a variety of macrofossil proxies and a distinctive magnetostratigraphic profile. The correlation of these datums with North American successions is through proxies discussed in *Albertiana* #36 (Carter & Orchard).

## 6. CHIEF PROBLEMS ENCOUNTERED IN 2007

As in recent years, the Chair's ability to fulfil his STS duties is compromised by the new limitations in his work place and a general lack of funds. Similar financial problems face most task group members.

## 7. SUMMARY OF EXPENDITURES IN 2007

<i>Global Triassic</i> meeting, carried forward	€ 500
ICS FUNDING	
Subcommission allocation	€ 2000
Travel/ contingency	€ 500
TOTAL	€ 3000
STS EXPENDITURES	
<i>Global Triassic</i> meeting	€ 700
Secretary's travel expenses	€ 900
Albertiana	€ 1000
Upper Triassic workshop 2008, carried forward	€ 400
TOTAL	€ 3000

## 8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2008):

### Meeting/field workshop schedule

September, 28-October, 2, 2008. "*Upper Triassic Subdivisions, Zonations and Events*". Bad Goisern UNESCO world heritage site Dachstein-Hallstatt/Salzkammergut), Austria.

Correspondence:

L. Krystyn, U. of Vienna.

Two session days will particularly focus on all aspects of Upper Triassic stratigraphy (bio-, chrono-, chemo-, event-, cyclo-, magnetostratigraphy); Upper Triassic extinctions and faunal turnovers, marine to non-marine respectively Alpine to Germanic/Western Europe correlations; Upper Triassic palaeobiogeography and Tethys – Panthalassa – Boreal correlations.

Excursions will include visit of the Rhaetian candidate GSSP Steinbergkogel, classical Upper Triassic ammonoid and pelagic bivalve sites, sequence and cyclostratigraphy of lagoonal Dachstein limestone, rise and demise of Upper Triassic reefs.

### GSSP deliberations

*The I-O Boundary*: It is hoped that a final decision will have been made on this GSSP before the end of 2007. The first vote was inconclusive, the second is due to complete by early December.

*The O-A Boundary*: The candidate section at Desli Cairra has two competing proposals, one based largely on fossil fauna, the other on a magnetozone. These will form the basis of discussions



amongst an enlarged task group. A comprehensive GSSP proposal based on the first is promised to be ready in December 2007 with a vote to take place early in 2008.

*The L-C Boundary:* A ballot has been distributed to task group members with a closing date of January 5th, 2008.

*The C-N Boundary:* A full proposal for Black Bear Ridge is anticipated in the next few months. The alternative candidate at Pizzo Mondello, Sicily remains under study.

*The N-R Boundary:* A GSSP locality at Steinbergkogel, Austria is generally agreed and discussions about the alternative datum levels are in progress. This should be resolved early in 2008.

## 9. BUDGET AND ICS COMPONENT FOR 2008

<i>Albertiana</i> - STS Newsletter production	€1000
Support, Upper Triassic task groups, esp. Vienna meeting	<u>€1000</u>
TOTAL	€2000

### *Potential funding sources outside IUGS*

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

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

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

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

### *Organization*

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

### *Meetings/workshops*

1. Field meeting in Tulcea, Dobrogea, Romania, 7-10 June, 2000. Prospective O-A boundary.
2. International Symposium on the Global Stratotype of the Permian-Triassic boundary and the Paleozoic-Mesozoic events. Changxing, South China, August 2001
3. International Conference in Oman: Permo-Triassic deposits: from shallow water to base of slope.
4. Field workshop on Middle Triassic boundaries, Veszprum, Hungary, September, 2002.
5. *Extinction events, faunal turnovers, and natural boundaries within and around the Late Triassic.* Vancouver, Canada. May 25<sup>th</sup> -28<sup>th</sup>, 2003. Conodont workshop on the Carnian-Norian boundary.

6. *Triassic geochronology and cyclostratigraphy* a field symposium, September 11<sup>th</sup> -15<sup>th</sup> 2003. Focus on Secada core research and Middle Triassic time scales. Conodont workshop on the Olenekian-Anisian boundary.
7. Field workshop in Spiti, India, 26<sup>th</sup> June-6<sup>th</sup> July 2004. Conodont workshop on the Ladinian-Carnian boundary.
8. International Geological Congress, Florence, Italy, August 20-28, 2004. G22-06: Triassic in Tethys Realm; DWO-09: Upper Triassic boundaries.
9. Meeting on *Triassic Chronostratigraphy and Biotic Recovery*. Chaohu, China, May 23-25, 2005. Focus on I-O boundary
10. Symposium on *Circum-Panthalassa Triassic Faunas and Sequences*, at INTERRAD conference. Te Papa Tongarewa, Museum of New Zealand, in Wellington, Wellington, New Zealand. March 19-24, 2006.
11. Symposium on *Triassic Conodonts: Taxonomy and Time Scales*, at the First International Conodont Symposium (ICOS1), in Leicester, England, July 17-21, 2006.
12. Conference, *The Boreal Triassic*. Longyearbyen, Svalbard, Arctic Norway, August 16-20, 2006.
13. International meeting on *The Global Triassic*. Albuquerque, New Mexico, USA. May (19-)23-25, 2007.
14. Field workshop on the *Carnian-Norian boundary*, Williston Lake, NE BC, Canada. May 27-31, 2007.

### **Publications**

14 issues of *Albertiana* (#24-36) were published in 2000 thru 2007. Each of these issues was made available for download from the web.

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

### ***Task groups***

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

The **Induan-Olenekian boundary** Task Group, formed in 1997, reviewed the options for a GSSP in the Russian Far East but found them lacking because of strong remagnetization of Triassic rocks and poor recovery of I/O conodont assemblages. A section in Chaohu, Anhui Province, China subsequently became the focus of intensive study. Ammonoid and conodont biostratigraphy, magnetostratigraphy, and chemostratigraphy were undertaken. The FAD of the conodont *Neospathodus waageni* was identified as a potential GSSP datum: it lies 26 cm below the FAD of the flemingitid ammonoids, and is located slightly prior to the top of the second Triassic normal magnetozone, and prior to the peak of the first Triassic positive excursion of  $\delta^{13}\text{C}$ . A preliminary conodont biostratigraphy for Chaohu was summarized in *Albertiana* #29 (2004), and the ammonoids described in *Albertiana* #31. This boundary and proposed GSSP was the focus of a meeting held in China during June 2005, at which time many members of the task group were able to examine the section. Several publications on Chaohu appeared in 2006, including an account of the conodont succession, and papers on the bivalves, ammonoids and palynomorphs.

After 2004 field work carried out in Muth, Spiti, an evaluation of the Mikin Fm. for establishing an Induan-Olenekian boundary GSSP candidate began. The rocks include top *Gyronites*, complete *Flemingites*, and basal *Euflemingites* ammonoid intervals. Three boundary options based in ammonoids were suggested

and provisionally tied to the FAD of *Neospathodus waageni* subsp. Initial conodont studies identified useful taxa common to Chaohu. The ammonoid record appears superior to that at Chaohu but the section lacks a magnetostratigraphy. Both the proposal and studies on the conodonts and C-isotopes from Spiti appeared in *Albertiana*, as did an account of the considerable discussion on this boundary that took place during and after the Svalbard meeting.

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

At Desli Caira, the FAD of the conodont *Chiosella timorensis* corresponds to a significant change in the ammonoid fauna, and a little below a peak of a positive C isotope excursion; it falls within a short reversed polarity interval situated between two short normal intervals that follow the longer reversed interval in the upper Spathian. The Guandao section lacks rich ammonoid faunas but it is relatively expanded and has an excellent conodont succession and numerous dated ash beds that place the O-A boundary at 247.2 Ma. At the Svalbard meeting, E. Grădinaru presented data on the ammonoids and nautiloids of Desli Caira: the boundary is placed between beds with *Deslicairites simionescui* n. g. n. sp., *Procarnites kokeni* and other upper Spathian ammonoids below and the *Paracrochordiceras-Japonites* Beds of basal Anisian age above. Especially important for correlation with the Boreal Realm is the outstanding occurrence of olenekitids (*Deslicairites*, *?Svalbardiceras*) in the topmost Olenekian of the Tethys and of *?Karangatites* at the very base of the Anisian at Desli Caira. *Karangatites* is the zonal marker for the base of the Anisian in Arctic Siberia.

The use of the FAD of the conodont *Chiosella timorensis* as a datum for the O-A boundary was challenged due to variation in its taxonomic treatment and evolution in our understanding of the group leading to historical records of the species occurring within Olenekian strata. A study of *Chiosella* based on the collections from both Desli Caira and Guandao was undertaken in order to clarify its taxonomy and demonstrate its utility as a global index. A paper on this topic was published in *Albertiana* #34.

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

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

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

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

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

M. Gaetani, the task group chair, distributed a questionnaire in June 2006 concerning the status of the boundary deliberations and the pros and cons of various fossil criteria. An outcome of this was that, in spite of a lack of an ancestor for *Daxatina*, ammonoids were favored for definition of the boundary. Marco Balini, the principal worker on the ammonoid faunas of this boundary interval visited the Smithsonian Museum for comparative studies and then completed his collections in South Canyon, Nevada. He reports a much more detailed view of the lithologic as well as of the faunal succession, with bed-by-bed data from 5 sites: A, B, D, E, F, three of which have yielded conodont fauna.

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

Discussions during ICOS1 centered on the suitability of key CNB conodont taxa for intercontinental correlation. It was agreed amongst those present that the FAD of *Epigondolella quadrata*, a higher level than those previously considered, might be a suitable index but this was not widely supported. New work in both Canada and Sicily was planned.

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

In Austria, a section in the Hallstatt and Zlambach Formation produced good ammonoids, pelagic bivalves, conodonts, rare radiolarians, and palynomorphs, as well as a magnetostratigraphy. A distinctive

dinoflagellate change occurs midway through the Zlambach section with the FO of *Rhaetogonyaulax rhaetica*, a datum that may have potential in correlation with shallow marine and/or high latitude basins.

At Steinbergkogel, Austria, a potential GSSP candidate, the FAD of the conodont *Misikella posthernsteini* was proven to be isochronous with the FO of the ammonoid *Cochloceras*. This well-constrained bioevent is closely above the FO of the conodont *Misikella hernsteini* and a magnetic polarity change from a long normal to a well developed reversed interval. The distinctive dinoflagellate change, which occurs with the FO of *Rhaetogonyaulax rhaetica* in the Zlambach section, is stratigraphically higher than the other two options and corresponds to another ammonoid change with the FO of the widely distributed genera *Cycloceltites* and *Vandaites*.

## 11. OBJECTIVES AND WORK PLAN BEYOND 2008.

After completion of the GSSPs, work plans will be shaped by the next executive.

\*\*\*\*\*

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

#### *2004-2008 Subcommittee officers (with addresses)*

**Chairman:** M. J. Orchard, Geological Survey of Canada, 625 Robson Street, Vancouver, B.C. V6B 5J3, Canada, e-mail: [morchard@nrcan.gc.ca](mailto:morchard@nrcan.gc.ca)

**Vice Chairman:** Yin Hongfu, China University of Geosciences, Yujiashan, Wuhan, Hubei, 430074, Peoples Republic of China. [hfyin@cug.edu.cn](mailto:hfyin@cug.edu.cn)

**Vice Chairman:** Marco Balini, Dipartimento di Scienze della Terra, via Mangiagalli 34, I-20133 Milano, Italy. [Marco.Balini@unimi.it](mailto:Marco.Balini@unimi.it)

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

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

#### *2008-2012 Subcommittee officers (with addresses)*

A slate of nominated candidates were agreed by the present executive and ballots were sent by e-mail and/or FAX to all 25 voting members of the STS. Twenty-three completed ballots were returned by the specified time and resulted in the following:

**Chairman:** Marco Balini, Dipartimento di Scienze della Terra, via Mangiagalli 34, I-20133 Milano, Italy. [Marco.Balini@unimi.it](mailto:Marco.Balini@unimi.it)

**Vice Chairman:** **Mark Hounslow, Centre for Environmental Magnetism and Palaeomagnetism, Geography Dept, Farrer Avenue, Lancaster University, Lancaster, UK., LA1 4YQ.**  
[m.hounslow@lancaster.ac.uk](mailto:m.hounslow@lancaster.ac.uk)

**Vice Chairman:** Jinnan Tong, GPMR and BGEG laboratories at China University of Geosciences, Wuhan 430074, China. [jntong@cug.edu.cn](mailto:jntong@cug.edu.cn)

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

**Albertiana Editor/ Webmaster:** Wolfram M. Kuerschner, Laboratory of Palaeobotany and

Palynology, Utrecht University, Budapestlaan 4, 3584 CD Utrecht, The Netherlands.  
[W..M.Kurschner@bio.uu.nl](mailto:W..M.Kurschner@bio.uu.nl)

***Task Groups and their officers***

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

***Base Olenekian:*** Y. Zakharov, Russia. [fegi@online.marine.su](mailto:fegi@online.marine.su)

***Base Anisian:*** E. Gradinaru, Romania. [egradin@geo.edu.ro](mailto:egradin@geo.edu.ro)

***Base Ladinian:*** A. Baud, Switzerland. [Aymon.Baud@sst.unil.ch](mailto:Aymon.Baud@sst.unil.ch)

***Base Carnian:*** M. Gaetani, Italy. [maurizio.gaetani@unimi.it](mailto:maurizio.gaetani@unimi.it)

***Base Norian:*** M. Orchard, Canada. [morchard@nrcan.gc.ca](mailto:morchard@nrcan.gc.ca)

***Base Rhaetian:*** L. Krystyn, Austria. [leopold.krystyn@univie.ac.at](mailto:leopold.krystyn@univie.ac.at)

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

***List of Voting Members (2004-2008)***

<b>Yoshiaki Aita</b> , Utsunomiya, JAPAN	<a href="mailto:aida@cc.utsunomiya-u.ac.jp">aida@cc.utsunomiya-u.ac.jp</a>
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<b>Om N. Bhargava</b> , INDIA	<a href="mailto:onbhargava@yahoo.co">onbhargava@yahoo.co</a>
<b>Hugo Bucher</b> , Zurich, SWITZERLAND	<a href="mailto:Hugo.Bucher@pim.unizh.ch">Hugo.Bucher@pim.unizh.ch</a>
<b>Hamish Campbell</b> , Dunedin, NEW ZEALAND	<a href="mailto:H.Campbell@gns.cri.nz">H.Campbell@gns.cri.nz</a>
<b>Mark Hounslow</b> , Lancaster, ENGLAND	<a href="mailto:m.hounslow@lancaster.ac.uk">m.hounslow@lancaster.ac.uk</a>
<b>Dennis Kent</b> , Palisades, USA.	<a href="mailto:dvk@rci.rutgers.edu">dvk@rci.rutgers.edu</a>
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<b>Wolfram M. Kurschner</b> , Utrecht, NETHERLANDS	<a href="mailto:w.m.kurschner@bio.uu.nl">w.m.kurschner@bio.uu.nl</a>
<b>Max Langer</b> , BRAZIL	<a href="mailto:mclanger@ffclrp.usp.br">mclanger@ffclrp.usp.br</a>
<b>Spencer Lucas</b> , Albuquerque, USA.	<a href="mailto:SLucas@nmmnh.state.nm.us">SLucas@nmmnh.state.nm.us</a>
<b>Christopher R. McRoberts</b> , Cortland, USA	<a href="mailto:microberts@cortland.edu">microberts@cortland.edu</a>
<b>Manfred Menning</b> , Potsdam, GERMANY	<a href="mailto:menne@gfz-potsdam.de">menne@gfz-potsdam.de</a>
<b>Paolo Mietto</b> , Padova, ITALY	<a href="mailto:mietto@epidote.dmp.unipd.it">mietto@epidote.dmp.unipd.it</a>
<b>Alda Nicora</b> , Milano, ITALY	<a href="mailto:Alda.nicora@unimi.it">Alda.nicora@unimi.it</a>
<b>Michael J. Orchard</b> , Vancouver, CANADA	<a href="mailto:morchard@nrcan.gc.ca">morchard@nrcan.gc.ca</a>
<b>Bruce Rubidge</b> , Wits, SOUTH AFRICA	<a href="mailto:106gar@cosmos.wits.ac.za">106gar@cosmos.wits.ac.za</a>
<b>Kazem Seyed-Emami</b> , Tehran, IRAN	<a href="mailto:k.seyedemami@kavosh.net">k.seyedemami@kavosh.net</a>
<b>Michael A. Shishkin</b> , Moscow, RUSSIA	<a href="mailto:schsz@orc.ru">schsz@orc.ru</a>
<b>Jinnan Tong</b> , Hubei, CHINA	<a href="mailto:jntong@cug.edu.cn">jntong@cug.edu.cn</a>
<b>Attila Voros</b> , Budapest, HUNGARY	<a href="mailto:voros@zoo.zoo.nhmus.hu">voros@zoo.zoo.nhmus.hu</a>
<b>Wolfgang Weitschat</b> , Hamburg, GERMANY	<a href="mailto:weitschat@geowiss.uni-hamburg.de">weitschat@geowiss.uni-hamburg.de</a>
<b>Hongfu Yin</b> , Hubei, CHINA	<a href="mailto:hfyin@cug.edu.cn">hfyin@cug.edu.cn</a>
<b>Yuri D. Zakharov</b> , Vladivostok, RUSSIA	<a href="mailto:zakharov@fegi.ru">zakharov@fegi.ru</a>



## SUBCOMMISSION ON PERMIAN STRATIGRAPHY

ANNUAL REPORT 2007

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

International Subcommission on Permian Stratigraphy (SPS)

#### *SUBMITTED BY:*

Charles M. Henderson, Chairman SPS

Department of Geoscience, University of Calgary, Calgary, AB Canada T2N 1N4

Phone: 403-220-6170; Fax: 403-284-0074; Email: [charles.henderson@ucalgary.ca](mailto:charles.henderson@ucalgary.ca);

Website: [www.geo.ucalgary.ca/asrg](http://www.geo.ucalgary.ca/asrg)

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

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

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

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

### 3. ORGANIZATION

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

The objectives of the Subcommission are pursued by both stratigraphic and thematic Working Groups that are disbanded upon completion of their directed task. For example, the Working Groups on the Carboniferous-Permian Boundary, on the Guadalupian stages (Middle Permian), on the base-Lopingian boundary (base-Wuchiapingian Stage), and on base-Changhsingian have been disbanded upon the successful establishment of their defining GSSPs and ratification by IUGS. The current working groups include the following: 1. Cisuralian stages, 2. Continental Permian, 3. Transitional biotas as gateways for global correlation, 4. Neotethys, Palaeotethys, and S. China Correlations, and 5. International Lopingian Working Group.

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

Chair: Professor Charles M. Henderson, University of Calgary

Vice-Chair: Dr. Vladimir Davydov, Boise State University  
 Secretary: Dr. Shuzhong Shen, Nanjing Institute of Geology and Palaeontology

**3b. Officers for 2008-2012:** There were no objections from the voting membership, nor from the membership at-large, and therefore the above officers will continue in their respective capacities for a second term.

Chair: Professor Charles M. Henderson, University of Calgary  
 Vice-Chair: Dr. Vladimir Davydov, Boise State University  
 Secretary: Dr. Shuzhong Shen, Nanjing Institute of Geology and Palaeontology

SPS website is located at <http://www.nigpas.ac.cn/permian/web/index.asp>. This site includes all back issues of *Permophiles* in downloadable PDF format (#1 in 1978 to #49 June, 2007). A link to *Permophiles*/Permian research has also been established at <http://www.geo.ucalgary.ca/asrg>.

#### 4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

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

#### 5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2007

**GSSPs:** Progress was made on the three remaining Lower Permian (Cisuralian) stage GSSPs including base-Sakmarian, base-Artinskian, and base-Kungurian. An international field excursion was conducted in early July 2007 (reported in *Permophiles* #49; p. 4-6) and samples for carbon isotopes, geochronology and biostratigraphy were collected. The geochemical samples will provide further correlation potential for the proposed GSSPs; these materials are being analyzed at Boise State University and the Nanjing Institute of Geology and Palaeontology. The biostratigraphy samples are intended to determine reproducibility of GSSP definitions. In addition the timely shipment of samples and establishment of procedures for shipping through Russian customs was a goal of this excursion in order to demonstrate accessibility. Once complete the proposals will go forward for a vote. We hope to complete this task no later than 2009, but one or two of the three remaining proposals should be ready for a vote in 2008.

**Publications:** The June 2007 issue of *Permophiles* (#49) was produced at Nanjing China during June 2007 and distributed as a pdf document to a mailing list of 280. The December 2007 issue will be produced in January 2008 during a field excursion to Australia. We now have a complete series of *Permophiles* on our website (1978 to 2006).

**Meetings:** The SPS conducted one business meeting at the XVI International Congress on the Carboniferous and Permian in Nanjing, China in June 2007 and is reported in *Permophiles* #49.



**Membership:** There were no changes to the membership in 2007, but as noted in the 4 year summary we have made several changes over the past four years. We currently have 16 voting members representing Australia (2), Canada (1), China (3), France (1), Germany (1), Italy (1), Japan (1), Russia (3), and United States (3). We also have five honorary Members.

## 6. CHIEF PROBLEMS ENCOUNTERED IN 2007

There were no major problems in 2007. The delayed Cisuralian excursion, which was finally conducted in July 2007 meant that we could not complete the base-Sakmarian GSSP proposal in 2007 as planned.

## 7. SUMMARY OF EXPENDITURES IN 2007:

### INCOME

Donations:	\$ 300.00
University of Calgary (1):	\$2,400.00
NIGPAS (2):	\$1,600.00
ICS:	\$ 700.00
Cisuralian Excursion(3) estimated:	<u>\$25,000.00</u>

**TOTAL: \$30,000.00** (quoted in US\$ using 1.04 as the conversion from Canadian\$)

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

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

(3) Costs for international participants for travel, internal costs, and shipping. These costs were borne by each participant individually.

### EXPENDITURES

Printing and Mailing of <i>Permophiles</i> :	\$1,000.00
Travel support for <i>Permophiles</i> Production:	\$4,000.00
Cisuralian Excursion:	<u>\$25,000.00</u>

**TOTAL: \$30,000.00** (quoted in US\$ using 1.04 as the conversion from Canadian\$)

**BALANCE: \$0.00**

## 8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2008):

1. Report of results of sampling from Cisuralian field excursion in early 2008.
2. Production of *Permophiles* #50 in Australia in January 2008.
3. Production of *Permophiles* #51 in Calgary during July 2008.
4. Completion of base-Sakmarian GSSP proposal by July 2008.
5. Business meeting to be held during 33<sup>rd</sup> IGC in August 2008 in Oslo, Norway.
6. Completion of base-Artinskian GSSP proposal by December 2008.

**9. BUDGET AND ICS COMPONENT FOR 2007****EXPENDITURES**

Travel to Australia and Calgary for Permophiles(1)	\$8,000.00
Annual Business Meeting, Oslo IGC (2)	\$9,000.00
<i>Permophiles and GSSP proposals</i> printing and postage	\$1,250.00

(1) Travel of Shen to Australia and Calgary and Henderson to Australia.

(2) Cost of travel to IGC for Executive (Henderson, Davydov, Shen)

**TOTAL 2007 BUDGET** **\$18,250.00**

**Income**

Support from University of Calgary (Henderson; NSERC)	\$6,000.00
Support from NIGPAS (Shen; NSF-C)	\$8,000.00
Support from Boise State for Davydov travel (NSF)	\$3,000.00
Anticipated donations for <i>Permophiles</i>	\$ 250.00
Requested ICS contribution	<u>\$1,000.00</u>
	0.00

**TOTAL BUDGET REQUEST (ICS)** **\$1,000.00**

**10. REVIEW CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2003-2007)**

The SPS has approved the general divisions of the Permian and has now had 6 GSSPs ratified by ICS and IUGS (Asselian, Roadian, Wordian, Capitanian, Wuchiapingian, Changhsingian). Proposals for the latter two stages were published in Episodes in 2006. Support for documentation (fieldwork and publications) of the various chronostratigraphic methods for the establishment of the GSSPs has been the most outstanding and differentiating character of this Subcommittee. *Permophiles* has become an internationally respected newsletter and bears an ISSN designation (1684-5927) and is deposited in the National Library of Canada; nine issues were published during the five year period. See Accomplishments in 2007 (above) for additional details.

**11. OBJECTIVES AND WORK PLAN FOR NEXT 4 YEARS (2007-2010)**

The primary objective was to complete the GSSP process by 2008 although delays in the field excursion to Urals have delayed this process. We currently anticipate that the last three GSSPs (Sakmarian, Artinskian, and Kungurian) should be ratified by 2009. We anticipate the following schedule:

1. A vote by SPS on the base-Sakmarian proposal will be conducted prior to IGC in 2008.
2. Business meeting at IGC in Oslo in August 2008.
3. A vote by SPS on the base-Artinskian is anticipated during late 2008 or early 2009.
4. A vote by SPS on the Kungurian is anticipated during 2009.
5. Business meeting at International Conodont Symposium during July 2009 in Calgary.

Once this process is completed SPS will shift focus toward three directions in 2009/2010: 1. correlations into continental deposits, 2. correlations across provincial boundaries and within the Tethys region, 3. detailed documentation of the geologic evolution of the Earth during the Permian with respect to the established chronostratigraphic framework.

**12. WEBSITE STATUS AND ACTIVITIES:**

SPS website is located at <http://www.nigpas.ac.cn/permian/web/index.asp>. This site is updated regularly and includes all back issues of *Permophiles* in downloadable PDF format (#1 in 1978 to #49 June, 2007) as well as other information about SPS activities including annual reports, membership. Shuzhong Shen at Nanjing China maintains the site and Henderson and Shen both have administrator rights.

### **13. IGC ACTIVITIES:**

At this time, the only planned SPS activity is to conduct a business meeting at the 33<sup>rd</sup> IGC 5-14 August 2008. I am sure that several members will be presenting at the meeting, however.

### **14. FOUR YEAR SUMMARY OF ACTIVITIES:**

**GSSPs:** The proposal for the base-Lopingian (base-Wuchiapingian) was ratified by ICS and IUGS in 2004. The proposal for the base-Changhsingian was voted and ratified by SPS in 2004. The proposal for the base-Changhsingian was voted and ratified by ICS/IUGS in 2005. The base-Wuchiapingian and base-Changhsingian (Upper Permian or Lopingian Series) GSSPs were published in Episodes (volume 29, No. 3&4) in 2006. Progress was made on the three remaining Lower Permian (Cisuralian) stage GSSPs including base-Sakmarian, base-Artinskian, and base-Kungurian. An international field excursion was conducted in early July 2007 (reported in *Permophiles* #49; p. 4-6) and samples for carbon isotopes, geochronology and biostratigraphy were collected. The geochemical samples will provide further correlation potential for the proposed GSSPs; these materials are being analyzed at Boise State University and the Nanjing Institute of Geology and Palaeontology. The biostratigraphy samples are intended to determine reproducibility of GSSP definitions. In addition the timely shipment of samples and establishment of procedures for shipping through Russian customs was a goal of this excursion in order to demonstrate accessibility. Once complete the proposals will go forward for a vote. We hope to complete this task no later than 2009, but one or two of the three remaining proposals should be ready for a vote in 2008.

**Publications:** The December 2003 issue of *Permophiles* (#43) was produced at Reston, Virginia in February 2004 and distributed to a mailing list of 280 from the University of Calgary later in the year. The June/December 2004 issue of *Permophiles* (#44) was produced at Pend Oreille, Idaho during October 2004 and was distributed in December 2004 from the University of Calgary. The June 2005 issue of *Permophiles* (#45) was produced at Nanjing China during June 2005 and distributed to a mailing list of 280. The December 2005 issue of *Permophiles* (#46) was produced at the University of Calgary during November 2005 and distributed as a pdf on our website. In addition the remaining back issues of *Permophiles* were scanned and added to our website providing a complete series of communications by *Permophiles* since 1978. The June 2006 issue of *Permophiles* (#47) was produced at Nanjing China during June 2006 and distributed as a pdf document to a mailing list of 280. The December 2006 issue of *Permophiles* (#48) was produced at the University of Calgary during November 2006 and distributed as a pdf on our website. We now have a complete series of *Permophiles* on our website (1978 to 2006). The June 2007 issue of *Permophiles* (#49) was produced at Nanjing China during June 2007 and distributed as a pdf document to a mailing list of 280. The December 2007 issue will be produced in January 2008 during a field excursion to Australia. We now have a complete series of *Permophiles* on our website (1978 to 2007).

**Meetings:** The SPS conducted its annual business meeting at the IGC meeting in Florence, Italy on August 23, 2004 with 23 people in attendance. This business meeting was preceded by a session on “The Lower Permian Cisuralian Stages” co-chaired by Boris Chuvashov and Charles Henderson. This was a successful session with six oral presentations and several posters that demonstrated clear progress in the definitions for the Cisuralian stages. Abstracts for these papers appear in *Permophiles* issue #44. The SPS conducted two business meetings in 2005 including at the Triassic Chronostratigraphy and Biotic Recovery meeting in Chaohu, China on May 23, 2005 with 27 in attendance and at the Non-marine Permian Conference at Albuquerque New Mexico on Oct. 23, 2005 with 28 in attendance. This latter conference was organized by Spencer Lucas and was very successful with 68 people in attendance from 12 countries. The SPS conducted one business meeting at the 2<sup>nd</sup> International Palaeontology Congress in Beijing, China in June 2006. The SPS conducted one business meeting at the XVI International Congress on the Carboniferous and Permian in Nanjing, China in June 2007 and is reported in *Permophiles* #49.

**Membership:** During 2004 the voting membership of SPS saw considerable renewal. We have a completely new executive and six new voting members. In order to allow this renewal, a few members were asked to retire their voting status. The SPS executive has decided to name a new membership category, Honourary Members, to reflect the significant past and continuing contributions of these retiring voting members. The first Honourary Members are Professors Brian Glenister, Heinz Kozur, and Claude Spinosa. Honourary Members will receive GSSP proposals and be invited to comment on the merits of the proposal, but they will not vote on the proposal. The comments of Honourary Members will be included in subsequent versions of the proposal. Only one change in voting membership occurred in 2005. Professor Giuseppe Cassinis of Italy retired as a voting member and Dr. Marc Durand of Universite de Nancy, France was voted by the executive as a replacement. Two changes were made to voting membership in 2006. Dr. John Utting retired as a voting member and was named by the SPS Executive as a Honourary Member given his long service to SPS (past Secretary) and distinguished research record in Late Paleozoic palynology. Dr. Lucia Angiolini was nominated by the executive to fill this vacancy. This increased the membership from Europe bringing it more in line with other major regions. Secondly, we sadly lost our distinguished colleague and friend Professor Jin Yugan who died in June 2006 (see *Permophiles* 48 for a tribute). His was a very distinguished career in Late Paleozoic paleontology and service including as a past-Secretary and past-Chairman of SPS. He has been replaced as a voting member by Professor Yue Wang. There were no changes to the membership in 2007, but as noted in the 4 year summary we have made several changes over the past four years. In addition, the current executive will continue for a second term. We currently have 16 voting members representing Australia (2), Canada (1), China (3), France (1), Germany (1), Italy (1), Japan (1), Russia (3), and United States (3). We also have five honourary Members.

**Summary (2004-2007):** In 2004 a new SPS executive was named including Charles Henderson as Chair, Vladimir Davydov as Vice-Chair, and Shuzhong Shen as Secretary. In terms of the voting membership, nine of sixteen members are new during the reporting period (56% renewal). SPS also instituted a new membership category, Honourary Member, and five individuals have been so-named. SPS conducted five business meetings during the four-year period at major international meetings. Two GSSP proposals for the base-Wuchiapingian (also base-Lopingian Series) and base-Changhsingian were prepared, voted, ratified and published in Episodes during the past four years. Significant progress has been made on the last three Cisuralian GSSP proposals for the base-Sakmarian, base-Artinskian, and base-Kungurian stages. An international workshop was conducted

in July 2007 to determine reproducibility and accessibility as well as collect new geochemical data. During the reporting period, Permophiles #43 to #49 have been produced with #50 to come later this year. In addition, a website was constructed and hosted by the Nanjing Institute of Geology and Palaeontology during the reporting period. Among other items, this website has pdf versions of all issues of Permophiles dating back to #1 in 1978.

\*\*\*\*\*

## **APPENDIX**

### **Officers and Voting Members as of November 2007**

**Dr. Lucia Angiolini**

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

**Dr. Boris I. Chuvashov**

Institute of Geology and Geochemistry  
Urals Branch of

Russian Academy of Science

Pochtovy per 7

Ekaterinburg 620154 Russia

**Dr. Vladimir Davydov, SPS Vice-Chairman**

Department of Geosciences

Boise State University

1910 University Drive

Boise ID 83725 USA

**Dr. Marc Durand**

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France

**Dr. Yoichi Ezaki**

Department of Geosciences

Osaka City University

Sugimoto 3-3-138

Sumiyoshi-Ku, Osaka, 558-8585, Japan

**Dr. Clinton B. Foster**

Australian Geological Survey Organization

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**Prof. Charles M. Henderson, SPS Chairman**

Dept. of Geoscience

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Calgary, Alberta

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**Dr. Galina Kotlyar**

All-Russian Geological Research Institute

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St. Petersburg 199026 Russia

**Prof. Ernst Ya. Leven**

Geological Institute

Russian Academy of Sciences

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Moscow 109017 Russia

**Dr. Tamra A. Schiappa**

Department of Geography, Geology and the Environment

Slippery Rock University

Slippery Rock, PA 16057 USA

**Prof. Joerg W. Schneider**

Freiberg University of Mining and Technology

Institute of Geology, Dept. of Palaeontology,

Bernhard-von-Cotta-Str.2

Freiberg, D-09596, Germany

**Dr. Shuzhong Shen, SPS Secretary**

Nanjing Institute of Geology and

Paleontology, 39 East Beijing Rd.

Nanjing, Jiangsu, China 210008

**Dr. Guang Shi**

Deakin University, Resden Campus

School of Aquatic Science and Natural Res. Management

662 Blackburn Rd.

Clayton, Victoria, Australia 3168

**Dr. Xiangdong Wang**

Nanjing Institute of Geology and

Paleontology, 39 East Beijing Rd.

**Prof. Yue Wang**

Nanjing Institute of Geology and

Paleontology, 39 East Beijing Rd.

Nanjing, Jiangsu, China 210008

**Dr. Bruce R. Wardlaw**

U.S. Geological Survey

926A National Center

Reston, VA 20192-0001 USA

**Honourary Members**

**Prof. Giuseppe Cassinis**

Earth Sciences Dept.

University of Pavia, 1 Via Ferrata,

27100 Pavia, Italy

**Prof. Brian F. Glenister**

Department of Geology

University of Iowa  
Iowa City, IA 52242 USA  
**Dr. Heinz Kozur**  
Rezsú u 83  
Budapest H-1029 Hungary  
**Prof. Claude Spinosa**  
Department of Geosciences  
Boise State University

1910 University Drive  
Boise ID 83725 USA  
**Dr. John Utting**  
Geological Survey of Canada  
3303 - 33rd Street N.W.  
Calgary Alberta T2L2A7 Canada

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

1. Cisuralian stages; Chairman is **Boris Chuvashov**
2. Continental Permian Correlations; Chairman is **Joerg Schneider**
3. Transitional biotas as gateways for global correlation; Chairman is **Guang Shi**
4. Neotethys, Palaeotethys, and S. China Correlations; Co-Chairs are **Lucia Angiolini and Yue Wang.**
5. International Lopingian Working Group; Chairman is **Shuzhong Shen.**



# SUBCOMMISSION ON CARBONIFEROUS STRATIGRAPHY

## ANNUAL REPORT 2007

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

*SUBMITTED BY (with contact information)*

Philip H. Heckel, Chair of SCCS

Department of Geoscience

University of Iowa

Iowa City, IA 52242

Phone: 319-335-1804

Fax: 319-335-1821

Philip-heckel@uiowa.edu

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

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

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

### 3. ORGANIZATION

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

Chair: Philip H. Heckel (USA)

Vice-Chair: Geoffrey Clayton (Ireland)

Secretary: David M. Work (USA)

**New officers for 2008-2012:**

**Chair:** Dr. Barry C. Richards  
 Geological Survey of Canada  
 3303-33<sup>rd</sup> St. N.W.  
 Calgary, AB, T2L 2A7, Canada  
[brichard@NRCan.gc.ca](mailto:brichard@NRCan.gc.ca)

**Secretary:** The secretary will be appointed by the Chair-elect in due time.

**Vice-Chair:** Dr. Wang Xiangdong  
 Nanjing Institute of Geology and Paleontology  
 Chinese Academy of Sciences  
 39 East Beijing Road  
 Nanjing 210008, China  
[xdwang@nigpas.ac.cn](mailto:xdwang@nigpas.ac.cn)

**Procedure for selecting new officers:**

During the summer prior to the IGC, the Chair has the Secretary distribute the following message:

**“Election of officers of the Subcommittee are subject to the following ICS Statutes:**

**9.4. Election of the managing committee of Subcommittee**

A chair and one or two optional vice chairs of a Subcommittee of ICS are proposed to ICS after appropriate ballot within each Subcommittee with the names submitted to the ICS General Secretary not later than twelve (12) months prior to the next IGC. These officers-elect are subsequently ratified by the ICS Executive Committee no less than nine (9) months prior to the next IGC. The elected Chair of a Subcommittee will select a Secretary who will be a voting member of the Subcommittee's Executive Committee for that term of office.

**9.7. Voting Procedures in ICS**

The members of the Voting Commission, Subcommittees and Task Groups make their decisions by vote. For approval, all decisions, including elections, require a sixty percent (60%) majority of delivered votes, provided that a quorum of 60% has been attained. In cases where no quorum is attained the first time around, a second round of voting is organized. Elections with more than one candidate will require the winner of a relative majority of less than 60% to pass a second ballot listing only him/herself, where he/she has to receive a 60% confirmation.

Voting shall be conducted electronically (by email), giving a deadline of thirty (30) calendar days for the receipt of votes [[recent update]]. Voting members may vote "yes", "no" or officially "abstain".

The ICS Statutes do not address the issue of nomination procedure, so a procedure similar to that undertaken in 2003 will be followed:

1.(a) Nominees for Chair and Vice-Chair must be proposed by two or more Voting members of the Subcommittee, and (b) the member so nominated must also indicate a willingness to stand for the position. The appended chart lists the voting members of SCCS and their current terms of office. No voting member may serve more than 12 years on the subcommittee.

2. A secret ballot of SCCS voting members will take place immediately after the closing date. Results will be circulated to members and forwarded to the ICS Executive Committee for ratification.”



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*Include WEB address for Subcommittee site; and indication of contents*  
 {The SCCS has no website}

SCCS has a total of 21 voting members (see list at end of report), and approximately 350-400 corresponding members. Meetings of the SCCS are held every two years, both at the quadrennial meetings of the International Carboniferous-Permian Congress, and at a Field Meeting convened by the SCCS alone midway between the Congresses.

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

**Task Group to establish the Tournaisian-Visean Boundary** [which is also the base of the Middle Mississippian Series], chaired by George Sevastopulo (Ireland), who summarized the recent work of the group through May 2007 in this year's Carboniferous Newsletter [v. 25, p. 5].

**Task Group to establish the Visean-Serpukhovian Boundary** [which is also the base of the Upper Mississippian Series], chaired by Barry Richards (Canada), who summarized the recent work of the group through May 2007 in this year's Carboniferous Newsletter [v. 25, p. 5-6].

**Task Group to establish the Bashkirian-Moscovian Boundary** [which is also the base of the Middle Pennsylvanian Series], chaired by John Groves (USA), who summarized the recent work of the group through May 2007 in this year's Carboniferous Newsletter [v. 25, p. 6-7].

**Task Group to establish the Moscovian-Kasimovian Boundary** [which is also the base of the Upper Pennsylvanian Series], and the **Kasimovian-Gzhelian Boundary**, chaired by Elisa Villa (Spain), who summarized the recent work of the group through May 2007 in this year's Carboniferous Newsletter [v. 25, p. 7-8].

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

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

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

The SCCS has worked with the Subcommissions and Working Groups on Devonian and Permian Stratigraphy to establish the common boundaries with the Carboniferous, and will soon be working again with the Devonian Subcommittee on the problem with the lower boundary [see Appendix 3]. The SCCS expects to cooperate with the NSF-sponsored Chronos initiative, which has a website at [www.chronos.org](http://www.chronos.org), and also with the NSF-sponsored PaleoStrat community digital information system for sedimentary, paleontologic, stratigraphic, geochemical, geochronologic, and related data, hosted at Boise State University, and with a website at [www.paleostrat.org](http://www.paleostrat.org). It also has established a working relationship with the Permian Research Group at Boise State, which has initiated a program of obtaining precise ID-TIMS U-Pb radiometric dates from biostratigraphically constrained Carboniferous-Permian successions in the Ural Mountains.

## 5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2007 (SEE ALSO BRIEF SUMMARY AT END)

**The Sixteenth International Congress on the Carboniferous and Permian** [XVI-ICCP] met June 21-24 in Nanjing, China. There, all task groups had meetings, followed by the SCCS meeting where the Chair summarized progress in Carboniferous classification and nomenclature, stage boundary definition, and GSSP selection since the Fifteenth Congress in Utrecht in 2003. Task group reports for 2007 are summarized below.

**One of the highlights of this meeting was Post-Congress Field Excursion C-3 to southern Guizhou Province, where a day was spent at the roadcut exposure at Nashui west of Luodian.** This excellent exposure provides a nearly complete section of Carboniferous strata, for which Wang and Qi (2003 *Rivista Italiana di Paleontologia e Stratigrafia*, v. 109, p. 379-397) show what appears to be a complete conodont succession that ranges from mid-Visean through the Serpukhovian, Bashkirian, Moscovian, Kasimovian, and Gzhelian stages into the Lower Permian. These strata span about 200 meters from the approximately located Visean-Serpukhovian boundary to the approximately located Kasimovian-Gzhelian boundary. They have a nearly constant dip, in which we could see no obvious structural complications. The strata consist of relatively uniform dark carbonate facies that apparently were deposited in a lower slope to basinal setting at the foot of a complex of thick carbonate banks. These banks display subaerial exposure surfaces in the lighter, shallow-water carbonate bank facies where they were visited at the Zhongdi section, 40 km to the north. **The Nashui section contains no obvious structural or sedimentary breaks, and thus has the potential to provide GSSPs for the remaining four Carboniferous stage boundaries that have not yet been selected [V-S, B-M, M-K, and K-G]. Therefore, Chinese colleagues have begun a systematic program of detailed collection of samples at a centimeter to decimeter scale across the approximately located stage boundaries, and they are planning to involve international experts on all the stage boundary intervals in the analysis of the conodont and other faunas that are obtained from these samples. This section may thus help to resolve the major problem of widespread glacial-eustatic disconformities separating the major marine units in shelf and shallow basinal regions, which have prevented the establishment of GSSPs in the well-known classic successions of North America and eastern Europe.**

**Newsletter on Carboniferous Stratigraphy, Volume 25**, published in July 2007. Its 26 pages include commentary by the Chair on various current issues, reports of the task groups for 2006-7 [typically containing much current detail], and 3 articles on various topics of interest, including: Afanasievo section – neostatotype of Kasimovian Stage (Upper Pennsylvanian Series), Moscow Basin, central Russia; Carboniferous Conference Cologne 2006 – From Platform to Basin: A research and field conference sponsored by SEPM-CES; and The Carboniferous of Germany. **As usual, it provides a significant outlet for timely presentation and discussion of useful information relating to boundary selection, often from areas that are not typically covered in other journal venues.**

### **Summary of Task Group Reports**

[Full text of all reports updated from the 2007 Newsletter is provided in Appendix B at the end]

The **Task Group to establish the Tournaisian-Visean boundary** is preparing to submit the GSSP proposal for the T-V boundary at the Pengchong section in south China to the SCCS for ballot in late November 2007, after unexpected delays engendered by slight repositioning of the boundary at Pengchong.

The **Task Group to establish the Visean-Serpukhovian boundary** continues to find that the first evolutionary appearance of the conodont *Lochriea ziegleri* in the lineage *Lochriea nodosa*—*Lochriea ziegleri* presents the best potential for boundary definition. Recently this lineage has been documented in northern Spain and in the Nashui section in southern China, where Qi and Wang (2005, *Rivista Italiana di Paleontologica e Stratigrafia*, v. 3, p. 3-10) use it to define the V-S boundary. Although the relatively deep-water carbonate section near Verkhnyaya Kardailovka on the eastern slope of the southern Urals (Nikolaeva et al., 2005, *Newsletter on Carboniferous Stratigraphy*, v. 23, p. 27-30), which also contains this lineage and has a complete succession of ammonoid, conodont, ostracode, and foramifer zones, is still an excellent candidate for the GSSP, the Nashui section has become another possibility. Recent work in the classic ammonoid-rich sections on the west side of the southern Urals, published in the *Carboniferous Newsletter* [v. 24, p. 9-11] is correlating the conodont succession into the classic ammonoid zonation. This will allow ammonoid workers to better bracket the position of the first appearance of *Lochriea ziegleri* in ammonoid-bearing sections where the *Lochriea* lineage is unknown, such as western North America, where current work is focused on the Chainman Shale of Nevada and Utah. Also, current detailed work on foraminifers and corals in the carbonate successions of western Canada and of western Europe (where the *Lochriea* lineage is known) is similarly directed toward bracketing the position of *Lochriea ziegleri* in western Canada, where it is as yet unknown. New work is also being undertaken on the palynostratigraphy and magnetostratigraphy of the late Visean and Serpukhovian of the Canadian Maritime region.

The **Task Group to establish the Bashkirian-Moscovian boundary** added another conodont appearance (#3, below) to the two conodont lineages already being considered as the event marker: 1) derivation of *Idiognathoides postsulcatus* from *Id. sulcatus*; 2) derivation of *Declinognathodus donetzianus* from *D. marginodosus*. 3) **appearance of *Diplognathodus ellesmerensis*, which was named from the Canadian Arctic, and is present at the Nashui section in south China, as well as in Japan, the Moscow and Donets basins, Spain, northern Europe, the North American craton, and northern South America. Spanish workers are refining the fusulinid and conodont biostratigraphy of the Las Llacerias section, and Russian workers are refining the fusulinid biostratigraphy in the southern Urals. Discovery of the *Declinognathodus* lineage in evolutionary sequence at the Basu River section, along with a rich fusuline fauna, including the *P. prisca* group, make this section a possible candidate for a GSSP. The appropriate interval in the Nashui section in south China, which contains *Diplognathodus ellesmerensis*, also will soon undergo thorough study as a potential GSSP.**

The **Task Group to establish the Moscovian-Kasimovian and Kasimovian-Gzhelian boundaries** met at the XVI-ICCP in Nanjing, China, with 8 members in attendance, and 6 members attended the field trip to Nashui. The chart and text showing biostratigraphic and positional correlation of the glacial-eustatic cyclothems across both boundaries in Midcontinent U.S, Moscow Basin and Donets Basin were published by Heckel et al. in the 2007 July issue of *Geology* [v. 35, p. 607-610], updating the initial report by Heckel et al. in the 2005 *Newsletter on Carboniferous Stratigraphy* [v. 23, p. 36-44]. This will provide a strong

## **framework for evaluating the utility of fossil lineages as event markers across both boundaries.**

For characterizing **the M-K boundary**, several levels are critical in the cyclothem correlation: The Farlington—Lower Suvorovo—N<sub>3</sub> cyclothem is correlated by first appearance of *Swadelina neoshoensis* in the Farlington and Limestone N<sub>3</sub>, and by first appearance of *Streptognathodus subexcelsus* in the Lower Suvorovo and Limestone N<sub>3</sub>. Although this level is at the traditional base of the Kasimovian Stage in eastern Europe, it is marked by a disconformity in all three places with abrupt appearance of the genus *Swadelina* just above it in two of them, and most task group members want to select a higher event marker for the boundary. The Lost Branch—Voskresensk—N<sub>3</sub><sup>3</sup> cyclothem is correlated mainly on *Swadelina nodocarinata*, but this species may appear earlier in the Donets Basin in Limestone N<sub>3</sub>. The Exline—Basal Neverovo—N<sub>5</sub> cyclothem is correlated by the first appearance of *Idiognathodus eccentricus* in North America and Russia. **Recent work by S. Rosscoe and J.E. Barrick [ms. in review] describes new *Idiognathodus* species across this boundary interval in the Midcontinent, and their relationship to *I. sagittalis*, which now has a possible precursor in Russia. All these species will be examined at a task group meeting in Oviedo, Spain, in June 2008. The appropriate interval in the Nashui section in south China will now undergo thorough study to determine if any of these morphotypes occur there.**

**The task group voted 22 to 0 with 1 abstention that the K-G boundary will be based on the first appearance of the conodont *Idiognathodus simulator* (Ellison 1941) [sensu stricto]. This taxon defines correlation of the Oread—Upper Rusavkino—O<sub>6</sub> cyclothem, and is known from the Midcontinent, Illinois, Appalachian basin, and north Texas in North America, from the Moscow and Donets basins in Europe, several sections in the southern Urals, and from the Nashui section in south-central China. The current ongoing vote within the entire SCCS is 16 in favor and none opposed, which exceeds the statutory 60% quorum required, with final results due on November 22, 2007. The taxonomy of *I. simulator* and its ancestor *I. aff. simulator* in North America has been updated by J.E. Barrick, P.H. Heckel, and D.R. Boardman, in a manuscript now in review. The first appearance of *I. simulator* in the Moscow area is accompanied by the first appearance of the recently chosen lectotype of the fusulinid *Rauserites rossicus*, which has been reported from several parts of Eurasia, northern Spain, and northern Greenland, and will aid in recognizing this boundary in areas where conodonts are scarce. Preliminary description of a potential GSSP at Usolka in the southern Urals was published by Chernykh et al. in the 2006 Carboniferous Newsletter [v. 24, p. 23-29] and in a 2006 issue of *Geologija* [v. 49, p. 205-217]. The appropriate interval in the Nashui section in south China is also planned for thorough study as a potential GSSP.**

### **BRIEF SUMMARY OF PROGRESS ON STAGE BOUNDARY SELECTION:**

**Tournaisian-Viséan: GSSP at Pengchong, south China will soon be in SCCS ballot procedure.**

**Viséan-Serpukhovian: One conodont lineage [*Lochriea nodosa*—*Lochriea zieglerei*] is being studied extensively, and 2 potential GSSPs [Verkhnyaya Kardailovka in southern Urals, and Nashui in south China] are undergoing intensive examination.**

**Bashkirian-Moscovian: Two conodont lineages [*Idiognathoides sulcatus*—*Id. postsulcatus*; *Declinognathodus marginonodosus*—*D. donetzianus*] and one conodont marker event [*Diplognathodus ellesmerensis*] are being studied extensively, and 2 potential GSSPs [Basu River in southern Urals, and Nashui in south China] are undergoing intensive examination.**

**Moscovian-Kasimovian:** Several conodont lineages in the genera *Idiognathodus* and *Swadelina* are being studied extensively, and a potential GSSP at Nashui in south China is undergoing intensive examination.

**Kasimovian-Gzhelian:** Selection of conodont *Idiognathodus simulator [sensu stricto]* as marker event has been approved in SCCS ballot procedure, and 2 potential GSSPs [Usolka in southern Urals, and Nashui in south China] are undergoing further intensive examination.

## 6. CHIEF PROBLEMS ENCOUNTERED IN 2007

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

b) Within the Carboniferous, the endemism of conodont and foram lineages between Eurasia and North America that has slowed down submission of the T-V boundary proposal and is hampering the choice of the boundary levels for the V-S and B-M boundaries, is being overcome by work on correlating other fossil groups to bracket the boundary levels in major regions where the boundary-event taxon is unknown. In the case of the higher two boundary levels [M-K, K-G], there are enough conodont species in common between the regions to achieve what appear to be fairly good 'digital' correlations based on utilizing the positions and scales of glacial-eustatic cyclothem in conjunction with biostratigraphy, which was published in the 2005 Newsletter, and an update published in the July 2007 issue of *Geology*. **However, the strong glacial-eustatic control over sedimentation and consequent widespread disconformities across entire shelves that aids in this 'digital' correlation, still seriously hampers the selection of acceptable GSSPs for these younger boundaries, which will require successions of relatively continuous sedimentation.** We are now focusing close attention on deeper-water slope and basinal sections in the southern Urals and south China, which can be correlated with the shelf cyclothem succession, for potential GSSPs.

## 7. SUMMARY OF EXPENDITURES IN 2007 (ANTICIPATED THROUGH MARCH 2008):

### STATEMENT OF OPERATING ACCOUNTS FOR 2006/2007

Prepared by David Work, Secretary

(Definitive accounts maintained in US currency)

#### INCOME (Oct. 31, 2006 – Oct. 31, 2007)

IUGS-ICS Grant 2007	\$500.00
Donations from Members*	945.00
Interest	9.46
<b>TOTAL INCOME</b>	<b>\$1454.46</b>

#### EXPENDITURE

Newsletter 25 (printing)**	\$460.12
----------------------------	----------

Postage for bulk mailings**	432.19
Mailing/Office Supplies**	<u>20.00</u>
<b>TOTAL EXPENDITURE</b>	<b>\$912.31</b>

#### **BALANCE SHEET (2006 – 2007)**

Funds carried forward from 2005 – 2006	\$2669.10
PLUS Income 2006 – 2007	1454.46
LESS Expenditure 2006 – 2007	<u>- 912.31</u>
<b>CREDIT balance carried forward to 2008</b>	<b>\$3211.25</b>

\*Half of that in 2006, but twice that in 2005, and thus not predictable

\*\*Much less than expected, because 2007 Newsletter is much shorter than usual

#### **8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2008):**

**The focus of all task groups will be to present updates of their work on boundary events and possible candidates for GSSPs at the 33rd International Geological Congress to be held August 6-14 in Oslo, Norway.** The following activities are planned in the task groups, as distilled from the task group reports in # 5 above, for which the full texts appear in Appendix B:

**Tournaisian-Visean boundary.** This task group voted approval of the GSSP at Pengchong in south China in 2004, and plans to submit the proposal for voting in late November 2007 to the SCCS, which then will forward it to the ICS for ratification in early 2008. Following U-Pb zircon dating of the base of the mid-Visean Livian Substage in Belgium, attempts are being made to date ash beds bracketing the T-V boundary in Ireland.

**Visean-Serpukhovian boundary.** Since recognition that the first appearance of the conodont *Lochriea ziegleri* in the lineage *Lochriea nodosa*—*Lochriea ziegleri* appears to be the best event to define this boundary, work is focused on correlating successions where it occurs in Eurasia with those in North America (where it is not yet been found) by means of other fossil groups, in order to bracket its appearance level in North America. This includes work on the classic ammonoid localities of the southern Urals and in the Chainman Shale of Nevada and Utah, and foram and coral work on the carbonate successions in western Europe and western Canada. **Although the richly fossiliferous section near Verkhnyaya Kardailovka in the southern Urals with its conodont, ammonoid, ostracode, and foram zones is still a strong candidate for a GSSP, the Nashui section in south China, which was visited on a field trip associated with the July 2007 Nanjing Congress, is also being considered.** Chinese colleagues have initiated intensive sedimentologic and biostratigraphic work in the boundary interval, and American and Chinese conodont experts plan to meet in Nanjing in April 2008 to study the conodonts obtained.

**Bashkirian-Moscovian boundary.** After problems surfaced with the initially favored *Idiognathoides sulcatus*—*Id. postsulcatus* lineage, and attention turned to evaluating the less widespread *Declinognathodus marginonodosus*—*D. donetzianus* lineage for defining an event level, one member is still attempting to expedite reassessment of the identity of *Idiognathoides postsulcatus* reported from Bashkirian strata in Japan. All members are evaluating occurrences of the new conodont under consideration, *Diplognathodus ellesmerensis*, in places

outside of China, and several are searching for more appearances of the distinctive *Profusulinella prisca* fusulinid group near this boundary level in areas beyond Spain, Turkey and the southern Urals. Russian workers are continuing work on the *Declinognathodus* lineage and the distinctive fusulinid group at the Basu River section in the southern Urals, to evaluate this section a possible candidate for a GSSP. Chinese colleagues are undertaking extensive collections to provide more detailed information on the conodont succession across the B-K boundary interval at the Nashui section in south China as another potential GSSP.

**Moscovian-Kasimovian boundary.** With publication of the cyclothem correlation across the boundary interval in the July 2007 issue of *Geology* providing a strong framework for evaluating the utility of fossil lineages as event markers across this boundary, **attention will now be focused on evaluating several new species of *Idiognathodus* described across this boundary interval in midcontinent North America [Rosscoe and Barrick, ms. in review] as well as refining the taxonomy of the *Idiognathodus sagittalis* group of morphotypes in Russia, in order to identify a possible boundary event level, but others [including *Swadelina*] are also being considered.** To provide more information, Russian members are processing samples from across the boundary in an apparently more complete section in the Oka-Tsna swell region of central Russia, and American colleagues are processing samples from localities in southern New Mexico. **Chinese colleagues are planning to undertake extensive collections to provide more detailed information on the conodont succession at the Nashui section in south China. A task group meeting planned for June 2008 in Oviedo, Spain, will allow the conodont experts to evaluate the lineages of species of *Idiognathodus* across the M-K boundary interval in Russia and North America.**

**Kasimovian-Gzhelian boundary.** After the task group voted overwhelmingly in favor of the first appearance of *I. simulator* [*sensu stricto*] as the boundary-defining event, this selection has been supported unanimously and has now exceeded the 60% quorum required in the ongoing voting procedure within the SCCS. A manuscript on the taxonomic detail of this conodont lineage by Barrick, Heckel, and Boardman is in review. This event level is also consistent with both the working ammonoid definition of this boundary and with the first appearance of a cotype of the fusulinid *Rauserites rossicus* in the Moscow region. **The recent selection of the lectotype of the fusulinid *R. rossicus* at the first appearance of *I. simulator* in Russia will expedite the recognition of this boundary in Eurasia. For establishment of the GSSP, Russian colleagues are undertaking detailed redescription and recollection of the Usolka section in the southern Urals, and Chinese colleagues now are undertaking more detailed sampling of the Nashui section in south China. A task group meeting planned for June 2008 in Oviedo, Spain, will allow an update on the more detailed sedimentologic and biostratigraphic work on the potential GSSP sections at Usolka and Nashui.**

Much of the work that is ongoing in all task and project groups will be published in Volume 26 of the Newsletter on Carboniferous Stratigraphy in July 2008.

## 9. BUDGET AND ICS COMPONENT FOR 2008

### PROJECTED EXPENSES

Newsletter printing (est. 400 copies @ 70 pages at commercial rates [-0.05])\*      \$1400\*

Postage for bulk and individual mailings of Newsletters*	\$800**
Mailing and office supplies	\$300**
Bank charges for international account	\$200**
<b>TOTAL PROJECTED EXPENSES</b>	<b>\$2700</b>
<b>INCOME</b>	
Carryover (from CREDIT balance in section # 7 above)	\$3210
Estimated donations [2007 was relatively larger than usual]	\$400
<b>TOTAL PROJECTED INCOME</b>	<b>\$3610</b>
<b>BALANCE</b>	
Estimated (deficit) / credit from above	\$910
<b>BUDGET REQUEST FROM ICS for 2008</b>	<b>\$800</b>

\*This estimate is higher than actual expense last year because the Newsletter was quite a bit shorter than usual, and the Secretary was again able to get a special rate in Portland, some distance from his home in Augusta. Neither situation may be repeatable.

\*\*These estimates are higher than the actual expenses last year because although the system of bulk mailing to certain members overseas [who then distribute the Newsletters to members in their areas] has stabilized somewhat [thus limiting the number of copies mailed individually], the costs of some bulk mailings were absorbed by the Secretary's institution on a one-time basis. Also, the bank charges for this year were greatly reduced from previously because of the much larger balance carried on account of the somewhat larger donations this year.

*Include potential funding sources outside IUGS*

No direct funding sources for SCCS exist beyond voluntary donations from some SCCS members, which fluctuate from year to year and cannot accurately be predicted.

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

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

**General.** An initial 1997 ballot on the naming of the two subdivisions of the Carboniferous System resulted in a close vote that rejected the names Lower and Upper, and approved the names Mississippian and Pennsylvanian, but just short of the required 60% majority to be declared final. After a long period of wrangling over procedure as well as the nomenclatural issues, the final ballot was ultimately taken at the mandate of former ICS Chair Jurgen Remane in late 1999. As reported in the 2000 Carboniferous Newsletter [v. 18, p. 3], this ballot resulted in approval of the names Mississippian and Pennsylvanian by a 76% majority, along with a reconfirmation of the previous decisions of the SCCS to regard their rank as subsystems, by the same 76% majority. In 2003 the SCCS voted to classify the two subsystems into Lower, Middle, and Upper Mississippian Series and Lower, Middle, and Upper Pennsylvanian Series, by a 74% majority of those 90% of the total membership who voted. **This vote with its implicit acceptance of the stage names used in Russia as the global stage names for the Carboniferous now provides the Carboniferous with all its official global series and stage names, and all effort is now being focused on selecting events and GSSPs for stage boundaries. Information on usage of the new official scheme of Carboniferous subdivision was recently published in the following articles:**



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

Heckel, P.H., and Clayton, G., 2006, The Carboniferous System. Use of the new official names for the subsystems, series, and stages: *Geologica Acta*, v. 4, p. 403-407.

Work on the **Tournaisian-Visean boundary** through 2001 progressed to the point that its biostratigraphic definition was approved in 2002 by a vote of 19 to 0, with 2 non-responses [as reported in the Secretary-Editor's Report in the 2002 Carboniferous Newsletter, p. 2-4]. Field work progressed to the point that a proposal for the GSSP in south China was published in the June 2003 issue of *Episodes*. Supplementary information requested by the SCCS chair on correlating this boundary into regions where the defining taxa do not occur was published in the 2004 *Carboniferous Newsletter* [v. 22, p. 8-11], and further updated and summarized in the full text of this task group report in Appendix B in the 2004 report. The task group voted unanimously to approve the Pengchong GSSP in southern China in 2004, further refined correlation with the type Mississippian in 2005, readjusted the boundary slightly in the GSSP section in 2007, **and it plans to present the formal proposal to the SCCS in late 2007.**

The Task Group on the **Visean-Serpukhovian Boundary** was established under the leadership of Barry Richards in 2002. Membership was selected and work was started for presentation and discussion at the Utrecht Congress in 2003. This Task Group initially considered several conodont and foram lineages for potential boundary-defining events, but in 2004, it focused most attention on one conodont lineage, *Lochriea nodosa*—*Lochriea ziegleri*, for further work, particularly in regions where the succession is poorly known. In 2005, identification of this conodont lineage along with recognition of the conodont, ammonoid, ostracode, and foram zones in the **richly fossiliferous section near Verkhnyaya Kardailovka in the southern Urals initiated an upgrading of correlations across this boundary elsewhere, and established this section as a strong candidate for a GSSP. In 2006, this lineage was reported from northern Spain and southern China, and work was initiated on ammonoid-rich successions in the southern Urals and western U.S., and on foram- and coral-rich successions in western Europe and western Canada in order to bracket the level of the first appearance of *Lochriea ziegleri* in North America, where the lineage is not yet known. In 2007, the section at Nashui in south China was visited, and the interval across the V-S boundary has now undergone further detailed collection.**

The Task Group on the **Bashkirian-Moscovian Boundary** was established in 2002 under the leadership of John Groves. Membership was selected and work was started for presentation and discussion at the Utrecht Congress in 2003. This Task Group initially considered several conodont and foram lineages, but after the Chair asked for formal boundary-defining events by April 2004, proposals for only three conodont lineages were received. More recent consensus suggested that only two conodont lineages are viable, and work became concentrated on them. Three new Spanish members who received funding for work on this boundary in the Cantabrian Mountains were added to this task group in 2005. After further investigation of the *Idiognathoides sulcatus*—*Id. postsulcatus* lineage [the most favored of the two remaining proposals for boundary-defining events] resulted in discovery that the event taxon was misidentified in cratonic North America, and also may occur in strata well below the boundary in Japan, some attention turned to reassessing the identity of the older specimens in Japan. Most attention turned to evaluating the less widespread *Declinognathodus marginonodosus*—*D. donetzianus* lineage for defining the event level, and the task group focused on correlating the Bashkirian-Moscovian boundary into the areas it is absent, using other groups and other conodont taxa. Members then reported the appearance of the distinctive *Profusulinella prisca* group near this boundary level in Spain, Turkey, southern Urals, and possibly North and South America. **In 2006, Russian workers discovered an evolutionary lineage of *Declinognathodus marginonodosus*—*D. donetzianus* (the other lineage being considered) in a new accessible section in the southern Urals that also contains rich foram faunas, and might be a candidate for a GSSP. Chinese workers reported the appearance, with *D. donetzianus*, of another conodont, *Diplognathodus ellesmerensis*, which has a broader more global distribution, hence will help to identify the level of *D. donetzianus* in places where**

it is absent. In 2007, several task group members proposed that first appearance of *D. ellesmerensis* also be considered as the marker event for this boundary, and Chinese colleagues have designated the interval across the B-M boundary at Nashui in south China for further detailed collection.

Work on the Moscovian-Kasimovian boundary has been extensively reported in prior issues of the Carboniferous Newsletter. Delineation of the Kasimovian-Gzhelian boundary was added to this task group's work load in 1998. Much new work has been stimulated on both 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, the Southern Urals region of Russia in 2002, Spain again in 2004, St. Petersburg, Russia in 2005, Ljubljana, Slovenia in 2006, and Nanjing in 2007. **Correlation charts based on the scale of glacio-eustatic cyclothems as well as biostratigraphic events for the successions across both boundaries in the U.S. and eastern Europe were published in the 2005 Carboniferous Newsletter and in the July 2007 issue of *Geology*, and provide a framework for evaluating lineages being considered for boundary markers. All this work has engendered more new work in Russia, southwestern U.S., and south-central China.**

Fusulinid workers have recognized that problems of provincialism across the Moscovian-Kasimovian boundary interval precludes the use of this group to define the M-K boundary. Nevertheless, two fusulinid events appear to coincide with events in conodont appearances near the M-K boundary. The higher one, involving *Montiparus*, is readily identified, but the lower one, among protriticitids, is more dependent on preservation. Despite the recognition of more provincialism than was once thought to exist between Eurasian and North American conodont lineages during the late Moscovian, Kasimovian and early Gzhelian [late Desmoinesian, Missourian and early Virgilian], more widespread conodont appearances are now being clarified, and one soon may be able to be chosen to define the Moscovian-Kasimovian boundary. **Conodont workers are in the process of clearing up the serious taxonomic problems that have stymied progress within that group, and Russian workers have suggested a lineage involving *Idiognathodus sagittalis*. American workers have recently completed a taxonomic revision of species of *Idiognathodus* across the M-K boundary interval in the southern Midcontinent. In 2007, the section at Nashui in south China was visited, and the interval across the M-K boundary there was designated for further detailed collection by Chinese colleagues.**

The conodont lineage *Idiognathodus* aff. *simulator*—*I. simulator* [*sensu stricto*] to define the Kasimovian-Gzhelian boundary at the first appearance of *I. simulator* [*sensu stricto*] has long been favored by members of the task group. This event marker was unanimously voted by the task group in April 2007, and is being unanimously approved by the SCCS in a vote that has just passed the 60% required quorum. In 2007, the section at Nashui in south China was visited, and the interval across the K-G boundary was designated for further detailed collection by Chinese colleagues.

Radiometric dating throughout the Carboniferous, most of it published in detail elsewhere, was summarized in the Newsletter several times by Manfred Menning and his colleagues [see especially 2001]. They have shown that use of different methods in different places, many on samples from sections without good marine biostratigraphic constraints, has resulted in inconsistencies [for example, of up to 7.5 million years at the Mid-Carboniferous boundary]. A new laboratory dating paleocaliches and fresh-water limestones at SUNY Stony Brook produced some new dates on upper Pennsylvanian units in the Appalachian Basin where there is good marine biostratigraphic control, but these are inconsistent with previous dates of supposedly the same interval in areas where accurate marine biostratigraphy is lacking. **More precise radiometric U-Pb zircon dating now being undertaken by the Permian Research Group at Boise State University on ash beds from conodont-bearing intervals in the Pennsylvanian-Permian succession in the south Urals has recently provided new dates on the Carboniferous-Permian boundary and the late Moscovian with error bars of  $\pm 0.2$  Ma, which I used to more accurately calibrate the late Pennsylvanian time scale by means of cyclothems in the 2006 Carboniferous Newsletter [v. 24, p. 35-39] and in a chapter in the article on cyclostratigraphy published by Strasser, Hilgen, and Heckel in 2007 Newsletters in *Stratigraphy* [v. 42, p. 75-114]. The volunteered Project Group on Carboniferous Magnetostratigraphy, formed in 2004 to research the potential for identifying correlatable**

magnetostratigraphic events in the Carboniferous, reported on some aspects of this approach in both 2004 and 2005 issues of the Carboniferous Newsletter.

*See Accomplishments in 2007 (above) for additional details.*

## 11. OBJECTIVES AND WORK PLAN FOR NEXT 4 YEARS (2008-2011)

I am strongly encouraging all members to maintain progress on researching and selecting defining events and GSSPs for as many stage boundaries as possible in the next few years, **keeping in mind the emphasis on selecting readily correlatable boundaries expressed by Remane et al. (1996).**

The **Tournaisian-Visean Boundary GSSP** should be voted upon in late 2007 and submitted to the ICS by early 2008, as the initial proposal for the GSSP published in the June 2003 issue of *Episodes* has been recently supplemented by more information on correlating the boundary into areas where the defining taxa are not present. More U-Pb dating of ash bands bracketing this boundary is underway in western Europe, and may remain as the focus of this Task Group once the boundary is ratified. **I expect that future work in this task group may address the possible subdivision of the inordinately long Visean Stage.**

The **Visean-Serpukhovian Boundary Task Group** will continue to focus study onto the most promising conodont lineage *Lochriea nodosa*—*Lochriea zieglerei*. **Identification of this conodont lineage and recognition of the conodont, ammonoid, ostracode, and foram zones in the richly fossiliferous section near Verkhnyaya Kardailovka in the southern Urals establishes this section as a strong candidate for a GSSP. Intensive work has now been initiated on this boundary interval in the Nashui section in southern China.** Current work is also being carried out on conodonts, ammonoids, forams, and corals, in western North America and in the southern Urals and western Europe across this boundary interval, in order to identify correlatable faunal zones that can closely bracket the boundary interval in North America, where the defining lineage has not yet been found. **Work has recently been started on palynostratigraphy and magnetostratigraphy across this boundary in the Canadian Maritime region. All this suggests that the boundary event may be selected in 2008, and with work well underway on better characterizing the potential GSSPs, a selection of the GSSP is possible in 2009.**

The **Bashkirian-Moscovian Boundary Task Group** is now focusing attention on a third conodont appearance, that of *Diplognathodus ellesmerensis*, which is known from Japan, Europe, North and South America, as well as China, where it is now used to identify the boundary, and further intensive work is underway at the Nashui section for evaluation as a potential GSSP. The second conodont lineage, *Declinognathodus marginonodosus*—*D. donetzianus*, is still a candidate for the event level, and further work on it and a distinctive fusulinid group that accompanies it is being carried out in the section in the southern Urals that is also a potential GSSP candidate. Nevertheless, the *Idiognathoides sulcatus*—*Id. postsulcatus* lineage also is still under consideration, pending reassessment of the identity of the Bashkirian specimens reported from Japan. **Therefore, 2009 is the earliest likelihood for GSSP selection.**

The **Moscovian-Kasimovian Boundary and Kasimovian-Gzhelian Boundary Task Group** is moving ahead as the previously muddled conodont taxonomic problems are slowly being clarified and resolved in manuscripts in review. **Publication of the cyclothem correlation chart (Heckel et al., 2007) across both these boundaries in North America [Midcontinent] and eastern Europe where the disconformity-bounded cyclothem are identified [Moscow region, Donets Basin], has increased the potential for selecting the events that can be identified in the more complete successions of this age where cyclothem are not yet identified [e.g., southern Urals and south China]. While the event for the M-K boundary still needs to achieve**

consensus, recent clarification of the taxonomy of species of the abundant conodont *Idiognathodus* will hasten this process. The K-G boundary event has been selected in 2007, and taxonomic work on the conodont lineage leading up to *I. simulator*, the event marker, is in review for publication, hopefully in 2008. Further taxonomic work is in progress on the morphotypes of the fusulinid *Rauserites*, which accompanies *I. simulator* in Eurasia. The existence of the widespread glacio-eustatic disconformities across nearly all of the well-known regions and the resulting lack of continuously deposited sections present the greatest problems for selection of GSSPs, but further work on the possibly more complete slope sections in the southern Urals, and the basinal to lower slope succession at Nashui in south China, are providing more appropriate sections for potential GSSPs. Therefore, 2009 is probably the earliest likelihood for GSSP selections.

I am hopeful that ongoing work in chemostratigraphy and magnetostratigraphy will identify events that can be used to supplement the boundaries that will be defined by means of faunal events, and eventually will provide the basis for correlating these boundaries into the northern-hemisphere Angara region and the southern-hemisphere Gondwana region, where the pan-tropical biotas are replaced by provincial cold-climate communities.

I am also hopeful that new, more coordinated precise radiometric dating on biostratigraphically well-constrained marine successions, such as are being reported from the Pennsylvanian of the southern Urals by the Boise State group, and also from the Mississippian of Belgium by a Belgian group, will both narrow the age disparities that currently exist within much of the Carboniferous and also provide better correlation with more precise modern radiometric dates that will hopefully be obtained from the Angara and Gondwana regions.

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

I expect that meetings of all task groups will take place at the 2008 International Geological Congress in Oslo, Norway in August 2008. Prior to this, the Task Group on the Moscovian-Kasimovian and Kasimovian-Gzhelian boundaries will meet in Oviedo, Spain in June 2008, where the various conodont lineages across the Moscovian-Kasimovian boundary interval in North America and Russia will be compared and evaluated, and any information derived from the Nashui section in China will be presented. From all this, I expect that a better understanding will be gained of the possibilities of the Nashui section to provide potential GSSPs, along with better characterization of the potential GSSPs being studied in the sections in the southern Urals.

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

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

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***Base Serpukhovian (base Upper Mississippian):*** Barry Richards, Canada. [brichard@nrcan.gc.ca](mailto:brichard@nrcan.gc.ca)

***Base Moscovian (base Middle Pennsylvanian):*** John Groves, USA. [john.groves@uni.edu](mailto:john.groves@uni.edu)

***Base Kasimovian (base Upper Pennsylvanian) and base Gzhelian:*** Elisa Villa, Spain.  
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***List of Voting Members [2004-2008]***

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## APPENDIX B. [Full text of Task Group Reports]

The **Task Group to establish the Tournaisian-Viséan boundary**, chaired by George Sevastopulo, plans to submit the formal proposal for the GSSP for the base of the Viséan Stage to be located in the Pengchong section, south China, to the SCCS in late November for approval and eventual transmission to the International Commission on Stratigraphy for ratification.

### The Viséan-Serpukhovian boundary: Summary of progress made by the boundary Task Group in 2006-2007 and plans for 2008

Barry C. Richards and Task Group

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During the past year, continued progress has been made toward the selection of a GSSP for the Viséan/Serpukhovian stage boundary. In spite of a rigorous search for alternatives, the first evolutionary appearance of the conodont *Lochriea ziegleri* in the lineage *Lochriea nodosa* - *Lochriea ziegleri* still presents the best potential for definition of the boundary. Richards (2007) presented a talk about the boundary at the XVI International Congress on the Carboniferous and Permian, held in Nanjing China on June 21-24 (Richards, 2007). Participants at the session agreed with Richards that the *Lochriea* lineage currently presents the best potential for definition of the boundary. *L. ziegleri* appears near the middle of the Brigantian Substage, which is slightly below the current base of the Serpukhovian as defined by its type section near the town of Zaborie in the Moscow Basin. The lineage, best documented from relatively deep-water sections, has been identified in several European sections (Nemirovskaya et al., 1994; Skompski et al., 1995), Russia and China. Most recently, the lineage was located in the Cantabrian Mountains of Spain (Nemyrovskaya, 2005). Unfortunately, the lineage has not been observed in North American strata although several relatively long ranging species of *Lochriea* including *L. commutata*, *L. mononodosus* and *L. nodosus* have been reported. Despite that major shortcoming, the first appearance of *L. ziegleri* is an excellent potential marker for the boundary and the task group will vote on either accepting or rejecting it for GSSP definition.

Task-group member Yuping Qi and his associates recently recognized the lineage *L. nodosa* – *L. ziegleri* and other lineages within the *Lochriea* group of species in the Nashui section near the town of Luodian in Guizhou province, southern People's Republic of China (Wang and Qi, 2003; Qi and Wang 2005). Qi and Wang have decided to use the first appearance of *L. ziegleri* to define the Viséan/Serpukhovian boundary in southern China. In the near future, Qi plans to study additional sections containing the lineage in South China.

During the XVI International Congress on the Carboniferous and Permian, three members of the Viséan/Serpukhovian working group and several other voting members of the SCCS visited the Nashui section on field excursion C3 (Qi et al., 2007). Examination of the section revealed it was highly suitable for the GSSP because it recorded essentially continuous sedimentation across the proposed boundary level in a relatively deep water, well-exposed limestone-dominant succession devoid of structural complications and significant erosion surfaces. At the Nanjing meeting, the team's conodont experts studied the conodont faunas collected across the proposed boundary interval in the Nashui section. They concluded that the conodonts are well preserved and abundant. In addition, elements transitional between *L. nodosa* and *L. ziegleri* were seen. In late September 2007, Qi and associates resampled the Viséan/Serpukhovian boundary interval in the Nashui section on a bed-by-bed basis and processed the samples. During the spring of 2008, conodont experts Richard Lane, Yuping Qi and Zhihao Wang plan to meet in Nanjing and study the recently processed conodont faunas in detail. Several members of the working group plan to visit the Nashui section

in April, 2008 to complete a detailed sedimentologic analysis of that section and two nearby sections spanning the Viséan/Serpukhovian boundary.

Nikolaeva et al. (2005) recognized the *L. nodosa* – *L. zieglerei* lineage in a condensed, relatively deep-water, carbonate section along the Ural River opposite the village of Verkhnyaya Kardailovka on the eastern slope of the southern Urals, southern Russia. Tamara Nemyrovska plans to complete a detailed study of the conodonts within the *Lochriea* lineage from the locality and from other Uralian sections that Nikolaeva et al. (2005) have been working on. Richards and several other members of the working group plan to visit the Verkhnyaya Kardailovka section during the summers of either 2008 or 2009 to determine how the section compares with the Nashui section in terms of the adequacy of its exposure and depositional continuity.

During 2006 and 2007, Svetlana Nikolaeva and her colleagues continued work on the Verkhnyaya Kardailovka section and expanded their study of carbonate-dominant, Viséan/Serpukhovian successions to the Dombar Limestone in the nearby Dombar and Kyzyl-Shin region of northern Kazakhstan. In the Dombar Limestone, the *Lochriea* lineage occurs with a taxonomically diverse association of extremely abundant ammonoids (Kulagina et al. 2006; Nikolaeva et al., 2007). The exact position of the ammonoid zones with respect to those based on other groups, particularly conodonts, has not been precisely established but work is currently underway to develop such a correlation. The study of ammonoids in the Dombar sections combined with related ongoing work by task-group members Alan Titus and Dieter Korn on Viséan ammonoids in the Chainman Shale of western Utah and eastern Nevada may lead to a precise correlation with North America at the proposed level of the Viséan/Serpukhovian stage boundary.

Several task group members, in addition to associate member Sergio Rodriguez from Spain and Wayne Bamber from the Geological Survey of Canada-Calgary, are studying various carbonate-dominant, well-exposed sections across the boundary interval in the upper Viséan to Serpukhovian Etherington Formation in the southern Canadian Rocky Mountains. Rodriguez and Bamber are preparing a monograph on the taxonomically diverse, abundant and well preserved rugose coral faunas that span the Viséan/Serpukhovian boundary within the Etherington. In conjunction with that work, task group member Bernard Mamet is studying the associated Etherington foraminifers in order to obtain a precise correlation with Eurasian sections containing the *Lochriea* lineage. Several of the Etherington sections have been sampled for conodonts.

A multidisciplinary study resembling that of the Etherington project is proceeding in Western Europe. In collaboration with D. Vachard and L. Pille (University of Lille), task group member Markus Aretz is working on upper Asbian to Serpukhovian calcareous microfaunas and rugose corals in France, Belgium, Germany, and England. It is hoped that through co-ordination, the western Canadian and European coral/microfaunal projects will lead to the discovery of biostratigraphic markers that are either more globally distributed than the *Lochriea* lineage or can be used to correlate the *L. nodosa* – *L. zieglerei* transition between Europe and North America.

Gibshman (2001) and Nikolaeva et al. (2002) list a number of the important foraminiferal taxa appearing at the base of the Serpukhovian in Russia. The foraminifers include *Neoarchaediscus postrugosus*, *Janishewskina delicata*, and *Eolasiodiscus donbassicus*. If the *Lochriea* lineage is eventually used to define the Viséan/Serpukhovian boundary, either *Eolasiodiscus donbassicus* or possibly one of the other forams appearing at the base of the Serpukhovian in Russia may be useful for locating the base of the Serpukhovian in North America. Task group member Paul Brenckle recently discovered that *E. donbassicus* occurs in the Chesterian Fraileys Shale of central Kentucky. According to Brenckle, it was identified as *Monotaxinoides* sp. by Browne and Pohl (1973, pl. 26, figs. 4, 5). Unfortunately, *E. donbassicus* may be rather rare in North America.

John Utting (Geological Survey of Canada - Calgary) and Peter Giles (Geological Survey of Canada - Atlantic) have been studying the palynostratigraphy and lithostratigraphy of the partially marine late Viséan

to terrestrial early Serpukhovian rocks of southwest Newfoundland, Atlantic Canada (Utting and Giles, 2004). The miospore assemblages recorded enable correlations to be made with spore zones of western Europe, where there is some biostratigraphic control from marine faunas.

Armed with new palynological zonations for the Mississippian of the Maritimes Basin in eastern Canada, Peter Giles and John Utting recently applied these data to the revision of published magnetic stratigraphy, and are working with Neil Opdyke (University of Florida) and Vic DiVenere, (Long Island University) to expand and refine the polarity stratigraphy of the Late Mississippian. Normal polarity dominates most of the Serpukhovian but several reversals show strong potential for long-range correlation. The Late Viséan record in eastern Canada is dominated by reversed polarity, but as many as seven normal magnetozones can be recognized in the latest Viséan substage alone.

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### **Report of the Task Group to establish a GSSP close to the existing Bashkirian-Moscovian boundary**

John Groves and Task Group

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Our Task Group is continuing to evaluate two potential events for marking the base of the Moscovian Stage: 1) the appearance of *Idiognathoides postsulcatus* from *I. sulcatus*; and 2) the appearance of *Declinognathodus donetzianus* from *D. marginodosus*. A third proposal was submitted in October, 2007, by Qi Yuping, Wang Zhihao, Wang Yue, Katsumi Ueno, and Wang Xiangdong, who identified the appearance of *Diplognathodus ellesmerensis* as a potential marker event (Qi Yuping et al., 2007). *Diplognathodus ellesmerensis* was first described from the Canadian Arctic. It is known elsewhere in the Donets Basin, Moscow Syncline, Spain, northern Europe, Japan, the North American craton, northern South America, and South China. Authors of the new proposal documented occurrences of *D. ellesmerensis* and associated forms at the Nashui section, a well exposed and positionally continuous sequence of slope carbonates in Guizhou Province. Other members of the Task Group have been asked to examine the new proposal and submit comments before the end of the year.

Significant progress in the past year has been made by teams working in the Cantabrian Mountains (northern Spain) and the South Urals. The Las Llacerias section in the Cantabrian Mountains contains diverse assemblages of foraminifers and conodonts in the Bashkirian-Moscovian boundary interval. Preliminary studies by E. Villa, C. Méndez, O. Merino-Tomé, L. C. Sánchez de Posada and M. L. Martínez-Chacón show that upper Bashkirian strata contain *Profusulinella tashliensis*, *Verella* sp., *Profusulinella* ex gr. *primitiva*, and the highest observed occurrences of Archaediscidae. Beds regarded as lower Moscovian contain *Idiognathoides sulcatus*, *I.* aff. *aljutovensis*, *Neognathodus atokaensis*, *Profusulinella sitteri*, *Verella?* sp. (transitional form), *Profusulinella prisca*, and *Tenebrosella asturica*. The suspected position of the boundary falls within a covered interval immediately below the latter assemblage. The Spanish research team plans to continue with more detailed work on this section.

Fusulinid-bearing successions across the Bashkirian-Moscovian boundary are present in the South Urals. According to E. Kulagina, the following evolutionary changes can be used to recognize the base of the Moscovian: 1) the development of an almost spherical shell shape in *Staffellaeformes* – *Depratina* lineage; and 2) the appearance of primitively fluted septa in the *Profusulinella* (*Tikhonovichiella*) *tikhonovichi* – *Aljutovella subaljutovica* – *Skelnevatella skelnevatica* and *Profusulinella pararhomboides* – *Profusulinella* (*T.*) *pseudoaljutovica* – *Aljutovella aljutovica* lineages.

At the Askyn River section, hypostratotype of the Bashkirian Stage, the base of the Moscovian has been placed traditionally at the base of bed 31 in the Solontsovsky Horizon (Sinitina and Sinitin, 1987). The fusulinids *Depratina* (= *Profusulinella*) *prisca*, *Profusulinella* (*T.*) *pseudoljutovica*, *Aljutovella* cf. *subaljutovica*, *Skelnevatella* sp., and *Schubertella gracilis* appear approximately 4 m above the base of this horizon. However, *Aljutovella aljutovica*, a marker for the base of the Moscovian Stage in its type area, occurs about 28 m higher in bed 35. At the Uklykaya and Seryat sections, similar patterns of occurrences have been observed. *Declinognathodus donetzianus* has been recovered only at the Basu River section (not far from the Askyn River section) with a foraminiferal assemblage similar to that from the lower Solontsovsky Horizon (Pazukhin et al., 2006).

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## REPORT FOR THE IUGS INTERNATIONAL COMMISSION ON STRATIGRAPHY, NOVEMBER 2007

### Elisa Villa and Task Group to establish Moscovian-Kasimovian and Kasimovian-Gzhelian boundaries

(List of members of the Task Group: A. S. Alekseev, J. E. Barrick, D. R. Boardman, V. Chernykh, V. Davydov, A. Dzhenchuraeva, B. Fohrer, H. Forke, N. V. Goreva, P. H. Heckel, T. N. Isakova, O. Kossovaya, L. L. Lambert, M. L. Martínez-Chacón, C. A. Méndez, T. I. Nemyrovskaya, S. Remizova, E. Samankassou, L. C. Sánchez de Posada, K. Ueno, E. Villa, G. Wahlman, and D. M. Work)

### Task Group activities in 2007

The Task Group met on June 23, 2007, at the XVI International Congress on the Carboniferous and Permian in Nanjing, China. Group members who attended were A. Alekseev, V. Davydov, N. Goreva, P. Heckel, O. Kossovaya, L. Lambert, T. Nemyrovskaya, and K. Ueno. P. Heckel presented the report on task group progress that was prepared by group leader E. Villa, who was unable to attend the Congress. After the Congress, task group members Alekseev, Goreva, Heckel, Lambert, Nemyrovskaya, and Ueno participated in a field excursion to the Nashui section near Luodian in Guizhou Province, south-central China, where potential candidates for both the Moscovian-Kasimovian and Kasimovian-Gzhelian stage boundaries are well exposed in a continuous succession of slope to basinal limestone facies, based on preliminary collections made about ten years ago. Chinese colleagues returned to this section in late summer to collect more closely-spaced samples across these boundary intervals.

Substantial progress was made during 2007 on correlation of cyclothem units across both the Moscovian-Kasimovian and Kasimovian-Gzhelian boundaries, and on definition of the K-G boundary. The task group has generally agreed upon a rather detailed correlation of the glacial-eustatic sequence-stratigraphic units called cyclothem in the regions where they can be recognized in strata across these two boundaries, specifically, in the Midcontinent U.S., Moscow Basin and Donets Basin. Cyclothem correlation is supported by biostratigraphy of the conodont and fusuline faunas, and, at certain levels, by ammonoids. These cyclothem correlations, first published by Heckel et al. (2005), were updated by Heckel et al. (2007). Further relevant biostratigraphic data on the K-G boundary are summarized in Heckel et al. (paper submitted to *Episodes*), and in Villa et al. (paper to be submitted to the Nanjing Proceedings).

The task group has reached agreement on the characterization of the **Kasimovian-Gzhelian boundary**. After a ballot among the 23 task group voting members, the first appearance of the conodont *Idiognathodus simulator* (Ellison 1941) [*sensu stricto*] was approved to serve as the fossil marker for the global lower Gzhelian boundary, by a vote of 22 in favor and 1 abstention. This boundary is now placed at a level slightly higher than the traditional lower Gzhelian boundary in parts of Eastern Europe and corresponds to the base of the upper Rusavkino Formation in the Moscow Basin, to the base of the O<sub>6</sub> Limestone in the Donets Basin, and to the base of the Oread cyclothem in the Midcontinent (therefore, slightly higher than the base of the regional Virgilian stage of North America).

*I. simulator* [*s.s.*] has been so far identified in Midcontinent North America, the Moscow Basin, the Donets Basin, northern Timan, and the southern Urals of eastern Europe, as well as in south-central China. Correlation at this level based on this species can be reinforced in some areas by ammonoid data (first appearance of the oldest species of the genus *Shumardites*, *S. cuyleri*, and of *Vidrioceras uddeni*), and by fusuline data (first appearance of *Rauserites rossicus*).

With respect to the **Moscovian-Kasimovian boundary**, one of the more promising taxa being considered as a fossil marker is the conodont *Idiognathodus sagittalis*, although its potential value must still be confirmed using data gathered from ongoing studies. Jim Barrick and his student Steve Rosscoe have prepared a manuscript on *Idiognathodus* morphotypes across the regional Desmoinesian-Missourian boundary in North America, which is currently in review. These morphotypes span the interval from the Lost Branch through the Swope cyclothem, which likely will include the level of the global Moscovian-Kasimovian boundary once it is selected.

Other fossils bearing on correlation within the Moscovian-Kasimovian transition beds are *I. subexcelsus* (which links Donets Basin Limestone N3 with the Lower Suvorovo Formation of the Moscow Basin), and *Swadelina nodocarinata* (which links Donets Limestone N3/3, the Voskresensk Formation of the Moscow Basin, and the Lost Branch cyclothem of the Midcontinent). In this scheme, the traditional Lower Kasimovian boundary of Eastern Europe is at a level just below the upper Desmoinesian Farlington cyclothem, but that level is marked by a disconformity with abrupt appearance of the genus *Swadelina* just above it.

### Coming steps

Voting is currently underway in the SCCS on accepting the selection of *I. simulator* [*s.s.*] as the event marker for the base of the global Gzhelian Stage. A detailed report dealing with this selection will be submitted for publication in the reports of the 2007 XVI-ICCP in Nanjing, China.

Following acceptance of *I. simulator* as the fossil marker for the base of the global Gzhelian Stage, the next goal for the present task group will be the selection of a GSSP for this level. Two potential candidates are currently undergoing further study: The Usolka roadcut near Krasnousolsk in the southern Urals of Russia (see Chernykh et al., 2006a, b); and the Nashui roadcut near Luodian, Guizhou Province, south-central China (see Wang and Qi, 2003, 2004).

In late spring 2008, prior to the ICS meeting at the International Geological Congress in Oslo (August 2008), the *Task Group to establish the Moscovian-Kasimovian and Kasimovian-Gzhelian boundaries* plans to have a Task Group Meeting and Workshop at the University of Oviedo (Spain). This meeting will focus on potential conodont event markers for the Moscovian-Kasimovian boundary, among other issues, and should serve to shape the schedule for the coming years.

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**APPENDIX C. [Letter from Thomas Becker, Chair of Devonian Subcommittee on problem with established GSSP for base of Carboniferous, at La Serre, France.]**

Date: Wed, 26 Jul 2006 14:59:17 +0200

Dear Phil,

When we last met at the Leuven ICS meeting I raised the issue that there are obviously some severe problems with the D/C boundary GSSP at La Serre. In the meantime, my former Ph.D. student, Sandra Kaiser, currently based at the museum in Stuttgart, has re-sampled the GSSP once more and obtained even more conodonts that pose a serious problem. Initially I stimulated her to re-sample La Serre in order to get conodonts that are suitable for oxygen isotopic analysis of conodont phosphate, a major aspect of her Ph.D. on the D/C boundary.

But she came up with *Siphonodella* specimens that confirm an old suspicion that the current GSSP level, at the base of Bed 89, is NOT the base of the the *Siph. sulcata* Zone, following the initial proposal on morphometric change from *praesulcata* to *sulcata* in the original contribution by Flajs & Feist (1988) that formed the base for the GSSP decision at Courtmacsherry (where I was present). All beds from Bed 85 to 88 produced specimens that have to be identified as *Siph. sulcata*. Intermediate forms very close to *Siph. sulcata* (specimens 85/2 85/4 in Flajs & Feist 1988) were already published and regarded as belonging to *sulcata* by

some conodont workers (discussion at Courtmacsherry meeting, Ziegler & Sandberg 1996, with agreement of Wang, Chen-yuan and Ji, Qiang of China). Ziegler & Sandberg (1996) also mention *Protognathodus kuehnei* as a rare species in the next sample above lateral equivalents of Bed 85; this species is not known from levels older than *Si. sulcata* in the few sections with a continuous Siphonodella record. In many other sections *Si. sulcata* enters above beds with only *Protognathodus* faunas and the entry of *Proto. kuehnei* (defining the Upper Protognathodus fauna) within these is currently thought to show the position of the D/C boundary (and not the facies controlled higher entry of *Si. sulcata*). To make the situation even worse, there are also specimens which might belong to *Si. duplicata*, the index of the next higher Carboniferous conodont zone, as low as Bed 85. These specimens are not well preserved. But the situation seems to be as follows:

1. The GSSP level at the base of Bed 89 seems to fall in the upper part of the Siph. *sulcata* Zone or even already in the Siph. *duplicata* Zone.
2. The precise zonal assignment at La Serre is hampered by the fact that the beds do not provide high numbers of well preserved siphonodellids (but a lot of reworked conodonts).
3. The GSSP level cannot be correlated with precision into any of the other numerous D/C boundary sections.
4. Point 1 gives a clear correlation of the GSSP level with a level well within (and not below) the Gattendorfia subinvoluta ammonoid zone. As a consequence, Gattendorfia would become partly a Devonian genus, which is completely unacceptable to ammonoid workers and with respect to the long tradition (Oberrödinghausen stratotype of 1937) of the definition of the Carboniferous.
5. There is no record of the phylogenetic transition from *Siph. praesulcata* to *sulcata* at La Serre, the main reason why the GSSP was fixed there. Both *praesulcata* and *sulcata* (and intermediates) co-occur jointly in the basal Tournaisian and above a facies break (as in all other known D/C boundary sections). Bed 84 is currently assigned to the Upper *praesulcata* Zone (defined by *Proto. kockeli*) but does not have a siphonodellid record, as the same level in many other sections.

There are various ways out of the dilemma:

- 1) The "small solution", originally favoured by me: Lower the GSSP level down to the base of Bed 85 at La Serre.
- 2) Select a new GSSP section (favoured by quite a number of people present at our business meeting last week in Leicester/ICOS symposium).
3. Select a completely new GSSP level, for example the base of the Upper *praesulcata* Zone, where many typical Carboniferous taxa start.

As mentioned we discussed the problem at our Leicester Annual Business Meeting but, of course, SDS has no right to decide on the base of the Carboniferous. Any revision will have to be done by both SDS and SCS, via a formal Working Group. As a first step, Sandra Kaiser and I will publish the new La Serre results, pointing out the mentioned implications - probably in Episodes. But you will have to bring up the issue during your SCS meetings as well. Once the data are available for everyone (an abstract is included in the Leicester symposium booklet), a Working Group may have to be established.

To be honest, I was not too keen to open this kind of "box of Pandora", having worked with the D/C Boundary Working Group for so long. But it seems inevitable. I know that Raimund Feist is aware that La Serre is not an ideal stratotype and he should be involved from the beginning (therefore, a copy of this message to him). George Sevastopoulo, who was present at Leicester, commented jokingly that it would have been the best to have a GSSP that was so remote that re-sampling was not done.

with best wishes  
Thomas

Prof. Dr. R. Thomas Becker

Chairman of the International Subcommission on Stratigraphy  
Geologisch-Paläontologisches Institut  
Corrensstr. 24  
D-48149 Münster



# International Commission on Stratigraphy Subcommission on Devonian Stratigraphy

## Annual Report 2007

### 1. TITLE OF CONSTITUENT BODY

Subcommission on Devonian Stratigraphy

*Submitted by:*

R. Thomas BECKER, *Chair of SDS*

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

SDS was the first Subcommission that has finalized the initial goal to define all series and stages internationally by the selection of formally approved and published GSSPs. Since the decided formal chronostratigraphic units have widely different durations in terms of absolute ages, since stage subdivisions have become common use in many publications, but without any common sense, and since major global events and mass extinctions occurred within some stages, SDS started a program for formal stage subdivision/substage definition in the Emsian and younger half of the Devonian (Givetian to Famennian), where highest stratigraphical precision is available and widely used globally. With progress and increased knowledge it became also evident that some of the GSSP decision were unfortunate since levels were chosen that differ significantly from the original intention when GSSP votes took place. Eventually this will have to lead, after 10 years of moratorium, to GSSP revisions. It underlines - an important insight for all Subcommissions - that GSSP decisions are important major achievement but subsequent monitoring and testing are equally important. SDS objectives of 2007 can be summarized as follows:

- Improvement of the internationally agreed time framework by formal voting on Givetian and Frasnian substages.
- Improvement of correlation in the very long Famennian substage by the continuing search for Famennian substage levels.
- Invite/stimulate new research on Emsian and Devonian/Carboniferous Boundary GSSPs as preparation for future GSSP revision.

- Advances in interdisciplinary stratigraphical correlation, involving biostratigraphy, chemostratigraphy, isotope stratigraphy, magnetostratigraphy (magnetic susceptibility studies), gamma ray spectroscopy, event, sequence and cyclostratigraphy.
- Improvements of cross-facies correlation between terrestrial, neritic and pelagic realms.
- Improvements of the global eustatic sea-level curve for the Devonian.
- Stimulate high-level Devonian stratigraphic research by intensive co-operation with other research bodies, such as IGCP 499 on “Devonian land-sea interactions – evolution of ecosystems and climate”.
- Communicate Devonian stratigraphy and SDS activities via the new SDS Homepage, international Devonian symposia, and the new SDS Newsletter (no. 22).
- Increase involvement of young Devonian stratigraphers and of specialists from regions/countries with a past poor international co-operation.

All listed objectives fit the directions of IUGS and ICS:

- development of an internationally approved chronostratigraphical timescale for the Devonian with maximum time resolution;
- promotion of new and modern stratigraphical techniques and their integration into Devonian multidisciplinary schemes;
- application of GSSP decisions internationally and as a base for a better understanding of patterns and processes in Earth History, including Devonian major global environmental changes.

It should not be underevaluated that significant recent advances in Devonian stratigraphy forms an important base for hydrocarbon exploration. It came to the attention of SDS that consulting companies have started to scan recent SDS publications, especially for relevant sequence stratigraphic data.

### 3. ORGANIZATION

#### **Officers for 2004-2008**

Chair: Prof. Dr. R. Thomas BECKER, WWU Münster, Germany

Vice-Chair: Prof. Dr. Ahmed EL HASSANI, Institute Scientifique, Rabat, Morocco

Secretary: Dr. John E. MARSHALL, University of Southampton, U. K.

The Subcommittee has currently further 19 Voting Members that cover many major Devonian outcrop areas and many stratigraphical disciplines (see Appendix).

The Corresponding Membership covers several additional countries (South Africa, Austria, Latvia, Estonia, Lithuania, Belarus, Vietnam, Tadjikistan, Uzbekistan, Iran, New Zealand) but, unfortunately, SDS has been unable to recruit active Devonian stratigraphers from South America, although Devonian rocks form important source and reservoir rocks there.

SDS has generated Working Groups for the substage subdivision of the Emsian (chaired by R. MAWSON), Givetian (chaired by P. BULTYNCK), Frasnian (chaired by J. OVER), and Famennian (chaired by R. T. BECKER). They will cease with formal substage decision/ratification and publication. A new Working Group on the Devonian-Carboniferous boundary has been planned to



be installed jointly with SCS; SDS nominations took place in September 2007 – a chairman has to be selected when the Working Group is formally founded.

At national level several Devonian Subcommissions exist in various countries, partly under different organisational names (e.g., Germany, Russia, “Friend of the Devonian” at GSA meetings).

**Website:** A new website, run by Corresponding Members C. CORRADINI and S. Gouwy at the University of Cagliari (Sardinia), has been established in spring 2007: <http://www.unica.it/sds/> The old SDS website at the University of Texas at Arlington is not served any more and should be deleted from links and bookmarks. The new website includes the last two and future issues of the SDS Newsletter (No. 21 and 22), Minutes of SDS Business Meetings since 2002, a list of SDS publications, its membership with full addresses, links to ICS and IUGS, and information on SDS meetings. GSSP information and photos will soon be added.

#### 4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

SDS is traditionally strongly tied with IGCP projects that have a Devonian focus. This is currently IGCP 499, which emphasized the correlation of terrestrial, shallow and deeper marine successions. It is lead by P. KÖNIGSHOF and colleagues from the Senckenberg Institute, Frankfurt a. M., Germany. There is a strong overlap of SDS and IGCP 499 members and several joint field meetings have been organized: Dra Valley, Morocco (2004), southern Siberia, Salair, Rudny and Gorny Altai (2005), Nevada-Utah (2007). For 2008 a joint meeting is planned in the Kitab Reserve, including the Emsian GSSP, Uzbekistan, and SDS members are invited to take part in a Devonian fieldtrip to Libya (April 2008) and to the final IGCP Symposium at the Senckenberg Institute in autumn 2008. A Devonian symposium was also organized at the 2<sup>nd</sup> International Palaeontological Congress in Beijing (2006) and SDS members took the opportunity of an IGCP 499 excursion in spring 2007 to see Devonian successions of Argentine. IGCP 499 meetings are all advertized on the official SDS Homepage.

#### 5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2007

**Chronostratigraphic definitions:** Via email ballot the SDS Voting Members have decided formally on the boundary levels (all entries of conodont species) for the base of the Middle Givetian (entry of *Polygnathus rhenanus* or *varcus*), base of the Upper Givetian (entry of *Schmidtognathus hermanni*), base of the Middle Frasnian (entry of *Palmatolepis punctata*), and base of the Upper Frasnian (entry of *Palmatolepis semichatovae*). All defining species had global (pantropical) distribution and allow a worldwide recognition of substage levels. There is good correlation with sequence and event stratigraphy but correlation into neritic facies partly needs more data from benthic fossil groups, such as brachiopods, trilobites and corals. The past rules excluded the selection of GSSPs for substages and demanded only the selection of regional reference sections. This may change in future and, therefore, SDS will point out potential GSSP sections. Following communication with the ICS Chairman it was decided to adopt the style of stage definitions. Consequently, the substage working groups are currently preparing comprehensive proposals to ICS for the ratification of substage decisions.

The discussion of Emsian and Famennian substages is continuing. A formal vote on the Famennian has been decided for summer 2008. An Emsian vote is delayed until after the forthcoming Uzbekistan field meeting (Sept. 2008), which will have a Lower Devonian focus.

A detailed re-sampling at the **D/C boundary** GSSP at La Serre, Montagne Noire confirmed the old suspicion that the supposedly defining conodont *Siphonodella sulcata* enters in the oolitic succession with mostly reworked conodonts several beds earlier than published in the original GSSP proposal. This places the GSSP level well above the intended boundary level, above the traditional *Gattendorfia* boundary level, and in a position that cannot be correlated with precision into any other section. The supposed *praesulcata-sulcata* transition is an artifact at the GSSP position and the rarity of siphonodellids, their poor preservation and the dominating reworking processes prevent the recognition of the decided GSSP level by other means. A GSSP revision seems unavoidable.

Additional reviews of conodont and brachiopod data and their correlation with the Zinzilban Emsian GSSP provide new and convincing evidence that it was placed much lower than originally intended, at a level that correlates with a position in the middle of the type Pragian and much below the Emsian of the German type area. A GSSP revision without change of the GSSP section seems unavoidable.

**Publications:** The proceedings of the SDS 2004 Rabat/Dra Valley meeting and other invited papers on multidisciplinary event stratigraphy and cross-facies correlation were published as a volume on “*Devonian Events and Correlations*”, vol. 278 of the “Geological Society of London, Special Publication” series. It is the first volume that was nicely published under the auspice of the formal IUGS-Geol. Soc. co-operation. The volume contains 12 articles that cover all of the Devonian and a very wide array of classical and modern stratigraphical techniques [of course, a MUST for all libraries]. It honors the life-time achievement of our long-term SDS member and former chairman M. R. HOUSE.

The edition of the SDS Newsletter was shifted from Arlington, Texas, to Münster, Germany. Newsletter 22, edited by the SDS Chairman, was published in February 2007 and is rather voluminous (109 pp.). It includes all SDS news from 2005 and 2006, including meetings minutes and documents presented at 2005 and 2006 SDS meetings in Novosibirsk and Leicester, U.K. Newsletter 23 is due in February 2008.

Papers presented at the 2005 Novosibirsk meeting are currently being revised and assembled for a Devonian volume of the Bulletin of Czech Geological Survey, edited by P. KÖNIGSHOF and others. Devonian conodont contributions presented at the ICOS/SDS meeting at Leicester, 2006, are about to be published (end of 2007) in Geological Quarterly (BULTYNCK & NARKIEWICS, Eds.). Manuscripts for two other Devonian volumes (Geol. Soc. Spec. Publ., Palaeogeogr., Paleocl., Palaeoec.) have been submitted but these will not be published before 2008.

**Meetings:** Aspects of the Devonian-Carboniferous boundary that require a GSSP revision were presented at the International Congress on the Carboniferous and Permian in Najing, June 2007. The SDS Chairman took part in the SCS Business Meeting in order to form a future joint new working group on the D/C boundary.

The SDS Annual Business Meeting took place in Eureka, Nevada, in September 2007, in conjunction with a joint SDS/IGCP 499 field meeting to the Great Basin of Nevada and western Utah and with an international symposium on “Devonian Global Change”. The very successful event was perfectly organized by TM J. Over and CM J. Morrow. A proceedings volume will be

published in *Palaeontographica America* as yet another Devonian book in 2008 (manuscript deadline = 1<sup>st</sup> Dezember 2007).

**Membership:** TM T. UYENO has offered to step down but in the absence of any other representative for Canada he was asked to continue until the end of the voting period. CM J. DAY, who has conducted intensive work on the Canadian Devonian in the last years, was nominated to replace him subsequently. Further changes of Titular Membership with the next voiting period (with the Oslo IGC) are currently being discussed.

Our former SDS Newsletter editor and TM R. CRICK has left his academic position and resigned from SDS.

Co-operation and increased communication enabled the recruitment of new CMs that will represent in future Myanmar, Vietnam, Turkey, and Bulgaria/Romania. The juvenation of SDS was continued by electing young scientist with permanent position from Germany, the U.S., and Belgium as CMs.

## 6. CHIEF PROBLEMS ENCOUNTERED IN 2007

Palaeozoic stratigraphy is in steady decline in several countries, which used to be a stronghold (Canada, Australia). Funding for remaining SDS members in these countries has become so difficult that they hardly can attend SDS meetings any more. IUGS and ICS strongly have to consider how to improve the funding situation and how to better support and highlight the importance of non-industrial/non-profit stratigraphical research. Despite the incredible economic progress, funding has remained very difficult for Russian and Chinese SDS members. The very restricted funding for ICS/SDS meant that no member could be supported to attend the annual meeting and SDS field symposium.

The ICS demand for formal substage proposals delayed their ratification but manuscript are being prepared.

## 7. SUMMARY OF EXPENDITURES IN 2007

### INCOME

carried over from 2006	256 \$
IUGS subvention 2007	350 \$
donations from members	100 \$

Sum	706 \$
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### EXPENSES

SDS Newsletter 23, 02/2008 printing/mailling	400 \$
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balance early 2008	306 \$
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## 8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR

- Submit proposals for the formal definition of Givetian and Frasnian substages to ICS for ratification
- Publication of brief note on Givetian and Frasnian substage definition in Episodes
- Publication of more extensive substage definition and reference sections in Geological Quarterly
- Formal founding of joint SDS/SCS Working Group on D/C boundary; first WG discussion (new results from 2007 Chinese section re-sampling by S. I. KAISER & R. T. BECKER) at IGC in Oslo
- Publication of volume on Middle Devonian stratigraphy and correlation in Palaeogeography, Palaeoclimatology, Palaeoecology (TM C. E. BRETT, Ed.)
- Publication of SDS Newsletter 23 in February 2008
- Publication of proceedings volume of 2007 Field Meeting in Palaeontographica Americana (J. OVER & J. MORROW, Eds.)
- Update of Devonian Timescale for next GTS volume (GRADSTEIN et al.)
- Annual Meeting and Devonian symposium at IGC, Oslo, August 2008, some emphasis on formal voting on Famennian substages
- Joint field meeting with IGCP 499 on “Global alignments of Lower Devonian Carbonate and Clastic Sequences; revision and re-sampling of Zinzilban Emsian GSSP, September 2008
- SDS support/attendance to International Congress on “Palaeozoic Climates”, August 2008, Lille, France
- Nomination of Honorary SDS Members that have contributed significantly to Devonian Stratigraphy and who have served long periods as voting members or SDS officers.

## 9. BUDGET AND ICS COMPONENT FOR 2007

### INCOME

balance from 2007	306 \$
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### EXPENSES

SDS Newsletter 24	400 \$
support for SDS member to attend Oslo IGC	1000 \$
support for SDS member to attend Uzbekistan Field Symposium	500 \$
SUM	1900 \$

**request for support/subvention from IUGS/ICS 400 \$**

**request for additional travel funding 1300 \$**

## 10. SUMMARY OF CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2003-2007)

## 11. OBJECTIVES AND WORK PLAN FOR NEXT 4 YEARS (2008-2011)

## APPENDIX A

### *Subcomission officers*

#### CHAIRMAN + SDS NEWSLETTER EDITOR

R. Thomas BECKER, *Chair of SDS*

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D-48149 Münster, Tel. +49-251-83 339 51, fax +49-251-83 339 68; [rbecker@uni-muenster.de](mailto:rbecker@uni-muenster.de)

#### VICE-CHAIRMAN

Ahmed EL HASSANI, Département de Géologie, Institut Scientifique, B.P. 703-Rabat-Agdal,  
Marokko ; [elhassani@israbat.ac.ma](mailto:elhassani@israbat.ac.ma)

#### SECRETARY

John E. MARSHALL, School of Ocean and Earth Science, University Southampton,  
Southampton Oceanography Centre, European Way, Southampton SO14 3 ZH, U. K.,  
[jeam@soc.soton.ac.uk](mailto:jeam@soc.soton.ac.uk)

#### WEBMASTERS

Carlo Corradini, Sofie Gouwy,

#### List of voting members, country, special fields, email:

1. A. BLIECK: France, micro- and macro-vertebrates; [alain.blieck@univ-lille1.fr](mailto:alain.blieck@univ-lille1.fr)
2. C. E. BRETT: Eastern U.S., sequence and cyclostratigraphy; [carlton.brett@uc.edu](mailto:carlton.brett@uc.edu)
3. J.-G. CASIER: Belgium, ostracods; [casier@naturalsciences.be](mailto:casier@naturalsciences.be)
4. Chen Xiuqi: Nanjing, brachiopods; [chenxq@public1.ptt.js.cn](mailto:chenxq@public1.ptt.js.cn)
5. J. HLADIL: Czechia, stromatoporoids, tabulate corals, various modern stratigraphic methods; [hladil@gli.cas.cz](mailto:hladil@gli.cas.cz)
6. N. IZOKH: Siberia, Asian Russia, conodonts;
7. MA Xueping: Beijing, brachiopods; [maxp@pku.edu.cn](mailto:maxp@pku.edu.cn)
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9. OVER: U.S., conodonts; [over@uno.cc.geneseo.edu](mailto:over@uno.cc.geneseo.edu)
10. M. C. PERRI: Italy, conodonts; [perri@geomin.unibo.it](mailto:perri@geomin.unibo.it)
11. G. RACKI: Poland, brachiopods, event and sequence stratigraphy; [racki@us.edu.pl](mailto:racki@us.edu.pl)
12. C. A. SANDBERG: Western U. S., conodonts, sequence stratigraphy; [casandberg@attbi.com](mailto:casandberg@attbi.com) [outgoing 2008]
13. E. SCHINDLER: Germany, tentaculites, event stratigraphy; [eberhard.schindler@senckenberg.de](mailto:eberhard.schindler@senckenberg.de)
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17. K. WEDDIGE: Germany, conodonts; [karsten.weddige@senckenberg.de](mailto:karsten.weddige@senckenberg.de)
18. G. YOUNG: Australia, micro- and macrovertebrates, general stratigraphy; [gyoung@geology.anu.edu.au](mailto:gyoung@geology.anu.edu.au)
19. ZHU Min: Beijing, vertebrates; [zhumin@ivpp.ac.cn](mailto:zhumin@ivpp.ac.cn)



# International Commission on Stratigraphy Subcommission on Silurian Stratigraphy

ANNUAL REPORT 2007

## 1. TITLE OF CONSTITUENT BODY

**International Subcommission on Silurian Stratigraphy ISSS**

*Submitted by:*

**Rong Jiayu, Chairman, ISSS**

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

### **Mission statement**

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

- (4) The development of an internationally agreed scale of chronostratigraphic units, fully defined by GSSPs at Series and Stage levels and related to a hierarchy of units (Substages, Standard Zones, Subzones etc.) to maximize relative time resolution within the Silurian Period;
- (5) Establishment of frameworks and mechanisms to encourage international collaboration in understanding the evolution of the Earth during the Silurian Period;
- (6) Working towards an international policy concerning conservation of geologically and palaeontologically important sites such as GSSPs

### **Goals**

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

## 3. ORGANIZATION

The ISSS is a Subcommission of the Commission on Stratigraphy. The Subcommission is organized by an Executive consisting of Chairman, Vice-Chairman and Secretary, who are all Voting Members of the Subcommission. In the new Subcommission elected for 2004-2008 there are twelve other Voting Members. The network of Corresponding Members have first of all a responsibility for

communication in both directions between the Subcommittee and researchers on Silurian topics in their region. Secondly they represent a broad spectrum of specialized stratigraphical disciplines from those countries or regions where Silurian rocks are extensively studied in relation to fundamental and/or applied geological research.

**Officers for 2004-2008:**

Chair:	Rong Jiayu, Nanjing, China.
Vice-Chair:	T. N. Koren', St. Petersburg, Russia.
Secretary:	J. Verniers, Ghent, Belgium (2005-2008)

Current research activities and future plans are communicated through publication of an annual ISSS newsletter *Silurian Times* in both email attachment and as a web release.

**Websites:** <http://www.silurian.cn/home.asp> contains newsletters, meeting announcements, discussion posting-boards, bibliography of Silurian articles, links to related sites, and other information.

The former web site for the Silurian Subcommittee:

<http://iago.stfx.ca/people/mmelchin/SILURIAN.HTML> has access to pre-2005 issues of *Silurian Times* in PDF format.

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

Jointly with the **International Subcommittee on Ordovician Stratigraphy** the joint meeting of the ISSS in Nanjing in 2007 was organized.

Collaboration on an IGCP Project N° 503 entitled “*Ordovician Palaeogeography and Palaeoclimate*”.

#### **5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2007**

The year 2007 has been the culmination of more than 2 years of work of the ISSS with the organization of the 3rd International Symposium on the Silurian System and the IGCP 503 4th Annual meeting both in Nanjing, China, 27 – 30 June, 2007. They were held together with the 10th International Symposium on the Ordovician System and the conference was called the “Yangtze Conference on Ordovician and Silurian”. About 140 scientists from 23 countries attended the combined conference convened by Chen Xu (Nanjing, China), Rong Jiayu (Nanjing, China) and Thomas Servais (Lille, France). It was sponsored by the Chinese Academy of Science, the National Natural Science Foundation of China and the Jiangsu Association for Science and Technology, and hosted by the Nanjing Institute of Geology and Palaeontology and State Key Laboratory of Palaeobiology and Stratigraphy, NIGPAS. On the Silurian there were 21 talks and 20 posters focusing on palaeontology, stratigraphy, palaeo-biogeography and palaeogeography, geo- and bioevents, palaeo-oceanography, community palaeoecology, geochemistry, sedimentology, climatology, and tectonic settings. In informal and formal workshops research was discussing on graptolites, trilobites, acritarchs and chitinozoans. The last day an open business meeting of the ISSS was held (see below). A pre-conference field trip to Zhejiang and Jiangxi Provinces in southeast China with Ordovician to Early Silurian sections of slope facies was organized by Zhang Yuan-dong, Wang Haifeng and others. A half-day mid-conference field excursion to Ordovician and Silurian outcrops in the Nanjing Hills, east of the host city, was led by Yuan Wenwei and Fan Junxuan. More than 70 participants joined for the post-conference field trip, led by Zhan Renbin

and Jin Jisuo, to Ordovician-Early Silurian rocks of the Yangtze Platform around the Tongzi County Town (Guizhou Province) and Yichang area (Hubei Province). A special issue of *Acta Palaeontologica Sinica*, Vol. 46 (566 p.), edited by Li, Fan & Percival, contains 88 short papers presented at the conference with 21 on the Silurian. Two well illustrated field guidebooks were produced for the pre- and post-conference excursions.

The ISSS open business meeting in Nanjing on 30 June 2007 was attended by the ICS secretary James Ogg, by 10 titular members (from a total of 15) and about 20 corresponding and interested members of the ISSS. It was acknowledged that the vote of the ICS members on our proposal on a revision of the GSSP for the base of the Silurian will probably be accepted. The proposal was to keep the GSSP at Dob's Linn but to take *Akidograptus ascensus* as the graptolite index fossil for the FAD, defining the boundary. The problem was mainly due to a miss-identification at the time of the definition of the GSSP. It was understood that the restudy of the base of the Wenlock, however, was not running as easily. Intensive studies, provided good correlations around the Llandovery-Wenlock boundary of the graptolite, conodont, acritarch, chitinozoan and early vertebrate biozonations, but no suitable section was yet been found. The working group was asked to continue to work, but without hope to reach the deadline of the IGC in Oslo 2008. It is now generally perceived that the Silurian is not a stable green house world, with cosmopolitan fauna as was thought before. It was proposed by the titular members that future work in the ISSS should focus on chemostratigraphy of the Silurian, integrated with biostratigraphy with graptolites, conodonts, chitinozoans and acritarchs and the study on the environment, climate and sea level changes. The next ISSS field meeting in Sardinia in June 2009, organised by Carlo Corradini, will have a special session on that topic. A new working group is starting the restudy of the base of the Ludlow.

Election will be held in the fall of 2007 for a new chairman and vice-chair (2009-2012); it was prepared by a nominating committee led by R. Cocks and the replacement is prepared of 2 or 3 titular members. Five new corresponding members of the ISSS were nominated. A letter in that sense should be written to Carlo Corradini on behalf of the ISSS.

A provisional proposal for the next ISSS Symposium in St.-Petersburg in June or July 2011 was accepted with a field trip to the Kajim River Section in the northern Urals

Silurian Times No 14 was edited by the secretary in June 2007, and circulated as an email attachment to all titular, corresponding and interested members of the subcommission. It contained the result of the votes on the base of the Silurian, the final report on the restudy of the base of the Wenlock, the second circular for the 3rd International Symposium on the Silurian System and the IGCP 503 4th Annual meeting both in Nanjing, China, 27 – 30 June, 2007 and the latest news and recent publications on Silurian research.

The new web site for the ISSS at <http://www.silurian.cn/home.asp>, created in 2005 by Fan Juanxuan and Zhao Hui at the Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, under the direction of Rong Jiayu, ISSS Chair, has been updated with the Silurian Times No.14 (2005), the Second Circular of the Yangtze Conference on Ordovician and Silurian (27-30 June, 2007), and news about the oncoming meeting.

## 6. CHIEF PROBLEMS ENCOUNTERED IN 2007

No major problems except for the old problem related to difficulties in obtaining grants for research on stratigraphical topics and travel to meetings of Subcommission. Applications are often given low priority by National grant-awarding agencies. It would be helpful if IUGS emphasized to



its member countries the importance it attaches to the GSSP programme and encouraged the relevant research funding bodies to give priority to funding relevant basic research.

## 7. SUMMARY OF EXPENDITURES IN 2007

### Income

Carried forward from 2006	00.00
ICS Allocation	US\$350

<b>Total</b>	<b>US\$350</b>
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### Expenditure

Part of travel costs Vice-Chair	US\$350
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<u>Balance</u>	<u>US\$000</u>
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## 8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR:

### 2008

- a. Continued work on the **Llandovery/Wenlock boundary**
- b. Studies on integrated chemostratigraphy and biostratigraphy in different palaeocontinents and facies
- b. Continued work on the base of the Ludlow.
- d. *Silurian Times* 16 (edited by the secretary)

## 9. BUDGET AND ICS COMPONENT FOR 2008

Transportation, accommodation & registration of the Chairman to participate in the IGC in Oslo	
2008	\$1000.00
<b>Total:</b>	<b>\$1000.00</b>

### Potential funding sources outside IUGS

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

## 10. CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2003-2007)

Over the period of 2003-2007 the Subcommittee on Silurian Stratigraphy was active in several respects.

1) New York State Museum Bulletin 493 (Title: "*Silurian Lands and Seas---Paleogeography Outside of Laurentia*") was released in May 2003. The Bulletin consists of eleven contributed papers that cover Silurian palaeogeography, plate tectonic assembly, stratigraphy, and biogeography in North Africa, southern and central Europe, China, Kazakhstan, the Baltic region (including Scandinavia), Avalon, the Russian "Far East," northern Siberia, Australia and New Guinea, and the Himalayan countries and southeast Asia.

2) The field meeting of the ISSS was held in San Juan, Argentina in August, 2003, in connection with an International Symposium on the Ordovician System and an International Graptolite Conference. Field trips and the conference sessions were well organized and well

attended. Accompanying this conference was the publication of the volume entitled “*Proceedings of the 7th International Graptolite Conference & Field Meeting of the International Subcommittee on Silurian Stratigraphy. INSUGEO, Serie Correlación Geológica. 18 Comunicarte Editorial, Córdoba, Argentina*” edited by G. Ortega and G.F. Aceñolaza.

3) The Silurian Field Meeting of the SSS was held in Gotland, Sweden between August 15 and 22, 2005. A three day symposium followed by five days excursion was organized by Eriksson, M.E., Calner, M. and L. Jeppsson (Lund University and support of the Swedish Geological Survey). The field guide and the abstract book were published in the volume “*The Dynamic Silurian Earth*”. In: Eriksson, M.E., Calner, M. (Eds.), *Field Meeting of the Subcommittee on Silurian Stratigraphy 2005, Gotland, Rapport och meddelanden-Sveriges Geologiska Undersökning vol. 121, pp.1-99*.

4) The restudy of the base of the Silurian System. A restudy of the GSSP for the **Base of Silurian** was prepared in 2002 (?) by a working group under the leadership of Mike Melchin. Through 3 year work, the working group has unanimously agreed that the current GSSP, at 1.6 m above the base of the Birkhill Shale, at Dob’s Linn, Scotland, should be maintained as the GSSP, but the biostratigraphical definition of the boundary needs to be revised. The GSSP should be regarded as coinciding with the first appearance of *Akidograptus ascensus*, defining the base of the *A. ascensus* Biozone at that GSSP section. By the middle of March 2006 all titular members have voted in favour of the proposal of Mike Melchin for the base of the Silurian at Dob's Linn.

5) Regarding the restudy of the base of the Wenlock Series. The working group to restudy the **Base of the Wenlock Series** (base of Sheinwoodian Stage) was led by David Loydell, looked at potential GSSP sections in the Czech Republic and Wales, as possible alternatives to the current GSSP in England. The primary marker for the base-Wenlock was a graptolite, but the GSSP in England is notably poor in allowing exact determination of their ranges. Recent evidence has shown that the current GSSP does not coincide with the base of the *Cyrtograptus centrifugus* Biozone, as was supposed when the GSSP was defined. It has been suggested to retain the GSSP location in England but revise the level of the GSSP slightly to coincide with a conodont event -- the Ireviken conodont datum 2, which coincides approximately with the base of the lower *murchisoni* graptolite biozone (instead of the current *centrifugus* graptolite zone). Alternatively, another GSSP locality with a precise base of the *Cyrtograptus centrifugus* Biozone could be chosen (e.g., potential sections in Great Britain and the Czech Republic), but this process would be quite lengthy. The report of this work at the Silurian Field Meeting in Gotland, in August, 2005, was discussed over the winter and spring, 2006. Most voting members appreciated very much the amount of work by the working group and especially the leader of the group. But most felt that for the moment that no good alternative for the previous GSSP can be proposed. It was decided not to propose a new GSSP and stick for the time being to the old GSSP, although it had many shortcomings, until new studies can propose a better alternative. This time consuming study could however not be effectuated before the deadline of the ISC, ending at the International Geological Congress in Oslo summer 2008.

6) An International Conference on the Silurian System was held in Nanjing, China, in June-July 2007, hosted by the Nanjing Institute of Geology and Palaeontology. 22 talks and posters were presented on the Silurian and three excursions to the extensive Silurian outcrop areas of South China with more than 70 participants impressed the participants by the good exposures and the extensive work that was done in these sections.

**OBJECTIVES AND WORK PLAN FOR NEXT 4 YEARS (2008-2010)**

For those of us who are interested in the geology of the Silurian, the four-yearly International Symposium is a priority and these will be "officially" supported and sponsored as resources allow.

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

1. Substage Working Groups to propose GSSPs for Substages as appropriate,
2. Involvement in the aims and objectives of IGCP Project 503 in 2007 and 2008: developing and expanding the Thematic Working Groups: for example, searching for and interpreting data from all sources relevant to reconstructing the palaeobiogeography or the climate of one or more specific time-intervals. In part this will be given further impetus by involvement in IGCP Project 503.
3. Investigate the establishment of data-bases which would bring together and make available information from all sources associated with the Silurian researchers.

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

***Subcommission officers***

**Chairman:** Rong Jiayu, **Key Laboratory of Palaeobiology and Stratigraphy**, Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, 39# East Beijing Road, Nanjing, 210008, P R China, e-mail: [jyrong@nigpas.ac.cn](mailto:jyrong@nigpas.ac.cn)

**Vice Chairman:** Tatiana Koren', All-Russia Geological Research Institute (VSEGEI), Sredny Pr. 74, 199026, St. Petersburg, Russia, e-mail: [koren@vsegei.sp.ru](mailto:koren@vsegei.sp.ru)

**Secretary:** Jacques Verniers, Research Unit Palaeontology, Department of Geology and Pedology, Ghent University, Krijgslaan 281 building S8, B-9000, Gent, Belgium, e-mail: [Jacques.Verniers@ugent.be](mailto:Jacques.Verniers@ugent.be).

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

**Base of Wenlock:** David Loydell, England: [david.loydell@port.ac.uk](mailto:david.loydell@port.ac.uk)

**Base of the Ludlow:** Tatiana Koren', Russia: [koren@vsegei.sp.ru](mailto:koren@vsegei.sp.ru)

***List of Voting Members***

C.E. Brett, Cincinnati, USA, [brettce@email.uc.edu](mailto:brettce@email.uc.edu)

L.R.M. Cocks, London, UK, [R.Cocks@nhm.ac.uk](mailto:R.Cocks@nhm.ac.uk)

D. Holloway, Melbourne, Australia, [dhollow@museum.vic.gov.au](mailto:dhollow@museum.vic.gov.au)

Jin Jisuo, London, Canada, [jjin@uwo.ca](mailto:jjin@uwo.ca)

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A. Le Hérisse, Brest, France, [alain.le.herisse@univ-brest.fr](mailto:alain.le.herisse@univ-brest.fr)

D.K. Loydell, Portsmouth, UK, [david.loydell@port.ac.uk](mailto:david.loydell@port.ac.uk)

P. Mannik, Tallinn, Estonia, [mannik@gi.ee](mailto:mannik@gi.ee)

M.J. Melchin, Antigonish, Canada, [mmelchin@stfx.ca](mailto:mmelchin@stfx.ca)

S. Peralta, San Juan, Argentina, [speralta@unsj.edu.ar](mailto:speralta@unsj.edu.ar)

Rong Jiayu, Nanjing, China, [jyrong@nigpas.ac.cn](mailto:jyrong@nigpas.ac.cn)

P. Štorch, Prague, Czech Republic, [storch@gli.cas.cz](mailto:storch@gli.cas.cz)

J. Verniers, Ghent, Belgium, [Jacques.Verniers@ugent.be](mailto:Jacques.Verniers@ugent.be)

***Corresponding members***

Aldridge (UK)		Dufka (Czech Rep.)	1995
Antoskhina (Russia)		Einasto (Estonia)	1996
Baarli (USA)	2002	Eriksson, M.	2005
Barnes (Canada)		Fan Junxuan (China)	2005
Bassett (UK)		Ferretti (Italy)	1996
Berry (USA)		Fu (China)	
Bjerreskov (Denmark)		Geng (China)	
Blieck (France)		Gutierrez-Marco (Spain)	1995
Bogolepova (Russia)	2002	Hansch (Germany)	
Boucot (USA)		Hints O. (Estonia)	2007
Calner M. (Sweden)	2005	Holland (Ireland)	
Caputo M.V. (Brazil)		Jell J.S. (Australia)	
Chen (China)		Jeppsson (Sweden)	1995
Corradini C. (Italy)	2007	Kaljo D. (Estonia)	

Kozłowska-Dawidzuik (Poland)		Schonlaub (Austria)	
Larsson (Sweden)		Sennikov (Russia)	1999
Laufeld (Sweden)		Serpagli (Italy)	
Lawson (UK)		Simpson (Australia)	2002
Lenz A. (Canada)		Strusz (Australia)	
Legrand P. (France)		Su (China)	
Lesperance (Canada)		Suyarkova A. (Russia)	2007
Maletz (USA)	2002	Tang Peng (China)	2005
Marss (Estonia)		Teller (Poland)	
Musteikis (Lithuania)		Tesakov (Russia)	
Nestor (Estonia)		Walliser (Germany)	
Norford (Canada)	1995/1996	Wang Nian Zhong (China)	1999
Paris (France)		Wang Yi (China)	2005
Piçarra (Portugal)		Yolkin (Russia)	
Predtechensky (Russia)		Zhan Renbin (China)	2005
Radziadicius, S. (Lithuania)	2007	Zhang Yuan Dong (China)	1999
Rickards (UK)		Zigaite Z. (Lithuania)	2007
Robardet (France)			



## International Commission on Stratigraphy Subcommission on Ordovician Stratigraphy

### ANNUAL REPORT 2007

#### 1. Name of constituent body:

Subcommission on Ordovician Stratigraphy (SOS)

Submitted by: Chen Xu; Chairman, SOS

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Chinese Academia of Sciences, Nanjing 210008, P.R. China

Tel. & Fax: +86 25 83375157

Email: [xu1936@yahoo.com](mailto:xu1936@yahoo.com), [xuchen@nigpas.ac.cn](mailto:xuchen@nigpas.ac.cn),

J. C. Gutiérrez-Marco; *Vice-Chairman, SOS*

Instituto de Geología Económica (CSIC-UCM), Facultad de Ciencias Geológicas  
28040 Madrid, Spain

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E-mail: [jcgrapto@geo.ucm.es](mailto:jcgrapto@geo.ucm.es), URL: <http://www.ucm.es/info/paleo/personal/gutierrez.htm>

G. L. Albanesi; *Secretary, SOS*

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E-mail: 1) [galbanesi@arnet.com.ar](mailto:galbanesi@arnet.com.ar); 2) [galbanes@com.uncor.edu](mailto:galbanes@com.uncor.edu)

Oct. 3, 2005

#### 2. Overall objectives, and Fit within IUGS science policy:

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

- a. To delimit and subdivide the Ordovician System (and Period) as a part of the overall ICS mission to elaborate the standard global stratigraphic scale. This work aims to establish the boundaries (GSSPs), the correlation of the subdivisions (Stages and Series), and the nomenclature of the subdivisions.
- b. To promote regular international meetings on aspects of Ordovician geology, especially those devoted to clarifying stratigraphic procedures, nomenclature and methods for use in establishing a unified global time scale, and to prepare correlation charts with explanatory notes (this latter task is now completed).
- c. To encourage, promote, and support research on all aspects of Ordovician geology worldwide and to provide outlets, *Ordovician News*, international meetings, and a web page, for promoting discussions and reporting results of this research.
- d. To encourage, promote, and support interdisciplinary research on the Ordovician global Earth system, addressing topics that require high-resolution, global correlation.

- e. The ultimate goal of the Subcommittee 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 Subcommittee involves much of the global geological community.

### 3. Summary table of Ordovician subdivisions

SYSTEM	GLOBAL SERIES	GLOBAL STAGES	KEY GRAPTOLITE/ CONODONT(C) BIOHORIZONS
ORDOVICIAN	UPPER	HIRNANTIAN	← <i>P. acuminatus</i> (GSSP-Dob's Linn)
		KATIAN	← <i>N. extraordinarius</i> (GSSP-Wangjiawan North)
		SANDBIAN	← <i>D. caudatus</i> (GSSP-Black Knob Ridge)
	MIDDLE	DARRIWILIAN	← <i>N. gracilis</i> (GSSP-Fågelång)
		DAPINGIAN	← <i>U. austrodentatus</i> (GSSP-Huangnitang)
	LOWER	FLOIAN	← <i>B. triangularis</i> (C), (GSSP-Huanghuachang)
		TREMADOCIAN	← <i>T. approximatus</i> (GSSP-Diabasbrottet)
			← <i>I. fluctivagus</i> (C) (GSSP-Green Point)

### 4. Organization

#### a. Subcommittee Executive

Chairman, Chen Xu (P.R.China)

Vice Chairman Juan Carlos Gutiérrez-Marco (Spain)

Secretary, Guillermo L. Albanesi (Argentina)

16 other Voting Members

Over 100 Corresponding Members

Subcommittee website: [www.ordovician.cn](http://www.ordovician.cn)

<http://seis.natsci.csulb.edu/ISOS> (remains active for facilitating discussion of GSSP proposals).

The Subcommittee officers and voting members will be re-organized for the next term from 2008-2011. The Subcommittee had a business meeting during the Nanjing conference and then a replacement of the new Subcommittee officers completed at first, followed by the replacement of the new voting members.

(a) The of votes to define the new officers for the International Subcommittee on Ordovician Stratigraphy.

a: Chair, D.A. Harper, received 100% (17 of 17) of votes.

b: Vice-Chair, J.M. Gutiérrez-Marco, received 100% (18 of 18) of votes.

c: Secretary, I. Percival, received 100% (18 of 18) of votes.

Abstentions and non responses (blank vote) are not counted in calculating the majority, following ICS guidelines.

Aceñolaza: a: yes, b: yes, c: yes

Albanesi: a: yes, b: yes, c: yes

Chen Xu: a: yes, b: yes, c: yes

Dronov: a: yes, b: yes, c: yes

Fatka: a: yes, b: yes, c: yes

Finney: a: yes, b: yes, c: yes

Fortey: a: blank, b: blank, c: blank

Gutiérrez-Marco: a: yes, b: yes, c: yes

Harper: a: abstention, b: yes, c: yes

Huff: a: yes, b: yes, c: yes

Li Jun: a: yes, b: yes, c: yes

Mitchell: a: yes, b: yes, c: yes

Nicoll: a: yes, b: yes, c: yes

Nowlan: a: yes, b: yes, c: yes

Owen: a: yes, b: yes, c: yes

Paris: a: yes, b: yes, c: yes

Percival: a: yes, b: yes, c: yes

Popov: a: yes, b: yes, c: yes

Saltzman: a: yes, b: yes, c: yes

(b) Titular members to be replaced:

-Chairman: Chen Xu (China)

-Secretary: Guillermo Albanesi (Argentina)

-Richard Fortey (UK)

-Florentin Paris (France)

-Stanley Finney (USA)

-Warren Huff (USA)

-Robert Nicoll (Australia)

Juan Carlos Gutiérrez-Marco (Spain) will remain as Vice-Chair, and Guillermo Albanesi (Argentina) will remain as titular member, both for the new period 2008-2011. Thus, the Subcommittee needs six new voting members to replace the six retired senior voting members. The vote is carried out very recently and a very good result comes out. There are six candidates that obtain more than half positive votes from the Subcommittee voting members. They are:

O. Hints (Estonia),

S. Leslie (USA),

A. T. Nielsen (Denmark),

T. Servais (France),

T. Vandenbroucke (Belgium),

Zhang Yuandong (China).

They will replace Chen Xu (China), Richard Fortey (UK), Florentin Paris (France), Stanley Finney (USA), Warren Huff (USA) and Robert Nicoll (Australia) from 2008 after the Oslo IGC.

## 5. Interfaces with other international projects

**IGCP Project 503:** Arguably the most sustained rise in marine biodiversity took place during the Ordovician, and the second largest mass extinction event took place close to the end of that Period, coincident with an episode of major climate fluctuation. The results of the very successful IGCP project n° 410 "The Great Ordovician Biodiversification Event" not only included the development of an improved globally-integrated biozonation for graptolites, conodonts and chitinozoans, but also generated biodiversity curves that have been constructed for all Ordovician fossil groups.

Following the work of the numerous regional teams and of the clade teams, that were established for each fossil group in IGCP project n° 410, a new successor project was proposed in order to develop a better understanding of the environmental changes that influenced the biodiversity trends in the Ordovician and Early Silurian. In this project, the major objective is thus to attempt to find



the possible physical and/or chemical causes (e.g., related to changes in climate, sea level, volcanism, plate movements, extraterrestrial influences, etc.) of the Ordovician biodiversification, the end-Ordovician extinction, and the Silurian radiation.

## 6. Chief accomplishments and products in 2007

### a. The Yangtze Conference in Nanjing, China, 27-30 June, 2007

About 140 scientists (of whom nearly 100 came from 23 countries to visit China) recently held an international conference in Nanjing to discuss the latest progress in research into Ordovician and Silurian Systems. “The Global Ordovician and Silurian”, combined the 10<sup>th</sup> International Symposium on the Ordovician System, the 3<sup>rd</sup> International Symposium on the Silurian System and the 4<sup>th</sup> Annual Meeting of the IGCP 503 project on “Ordovician Palaeogeography and Palaeoclimate”. These combined meetings, convened by CHEN Xu (Nanjing, China), RONG Jiayu (Nanjing, China) and Thomas SERVAIS (Lille, France), were sponsored by the Chinese Academy of Science, the National Natural Science Foundation of China and the Jiangsu Association for Science and Technology, and were hosted by Nanjing Institute of Geology and Palaeontology and State Key Laboratory of Palaeobiology and Stratigraphy, NIGPAS. During the three days of the indoor meeting, 66 talks and about 20 posters were presented, focusing on various fields such as palaeontology, stratigraphy, palaeo-biogeography and palaeo-geography, geo- and bio-events, palaeo-oceanography, community palaeoecology, geochemistry, sedimentology, climatology, and tectonic settings. With so many specialists gathered, the conference also provided an ideal opportunity to hold workshops discussing research on graptolites, trilobites, acritarchs and chitinozoans; business and information meetings were also convened of the International Subcommittee on the Ordovician System, International Subcommittee on the Silurian System, and IGCP Project 503.

Field excursions to examine relevant exposures in the host country are an integral part of international Ordovician and Silurian symposia, and this meeting was no exception. A pre-conference field trip from June 22-26, organized to Zhejiang and Jiangxi Provinces in southeast China by ZHANG Yuandong, WANG Haifeng and others, was attended by about 30 registrants. This field trip concentrated on Ordovician to Early Silurian sections of slope facies. One of the significant localities visited was the GSSP of the Darriwilian Stage (upper Middle Ordovician) at Huangnitan in the Changshan National Geopark

A half-day mid-conference field excursion to Ordovician and Silurian outcrops in the Nanjing Hills, east of the host city, was led by YUAN Wenwei and FAN Junxuan (Fig. 3: Mid-conference excursion in Tangshan, Nanjing, photo by Ian Percival); the afternoon was devoted to a taste of the history of Nanjing, with visits to the city Museum and the Zhonghuamen Castle on the ancient city wall.

Seventy registrants participated in the post-conference field trip, led by ZHAN Renbin and JIN Jisuo to the Ordovician-Early Silurian rocks of the Yangtze Platform, exploring outcrops near Tongzi County Town in Guizhou Province, a tranverse through the Yangtze River Gorges between Wanxian and Yichang, and finally examination of some stratigraphically significant sections in the vicinity of Yichang (Hubei Province). One highlight was the unveiling of a monument to the newly defined GSSP for the base of the Middle Ordovician at Huanghuachang village. This ceremony was attended by the Ministry of Land and Resources representatives, Yichang city government officials, and members of the International Commission on Stratigraphy including Secretary Prof. Jim OGG and Vice-chairman Prof. Stan FINNEY. Yichang city is richly endowed with geological stratotypes – the area also contains the GSSP for the base of the latest Ordovician Hirnantian Stage near Wanjiawan village (see *Episodes* vol. 29, no. 3, pp. 183-196).

Three publications provide a permanent record of the symposia and their associated field excursions. A special issue of *Acta Palaeontologica Sinica* Volume 46 (“The Global Ordovician and Silurian” of 566 pages; edited by LI, FAN & PERCIVAL) contains 88 short papers that were presented at the conference. Two excellent and copiously illustrated field guidebooks were produced for the pre-and post-conference excursions. These and the conference Proceedings volume are available from the Nanjing Institute of Geology and Palaeontology.

The next International Symposium on the Ordovician System will take place in Spain in May, 2011. IGCP 503 concludes its 5-year program with an International Congress on Palaeozoic Climates in Lille, France during August, 2008.

**b. The Subcommssion completed the GSSP research and all 7 Stage GSSPs have been established and approved by the IUGS** before the Ordovician Yangtze Conference. Bergstrom, Chen Xu, Gutierrez-Marco, and Dronov will edit a new chronostratigraphic classification of the Ordovician System and its relations to major regional series and stages. The English version will be published in *Lethaia* and the Chinese version will be published in the *Journal of Stratigraphy in China* next year before the Oslo IGC. A colour reprint of the Global Ordovician Chronostratigraphy chart will be distributed to colleagues in different countries.

c. *Ordovician News No. 24* was produced and posted on the Subcommittee web.

## 7. Chief problems encountered in 2007

The Subcommittee is planning to publish an Ordovician time table because all of the GSSPs are approved and ratified. It was discussed at the Yangtze conference during June in Nanjing. The Subcommittee may face a financial support problem to publish this table although we got some support from Chen Xu's research project.

As always, the lack of travel support limits the participation of Voting Members to attend the IGC next year in Oslo.

## 8. Summary of expenditures in 2007

TOTAL: \$ 1000

Support to the production of newsletter (Albanesi) 500USD

(in the past years, the Subcommittee supported 500USD every year to Albanesi as the secretary of the Subcommittee).

Support the members to participate in the Yangtze conference in Nanjing. 900 USD  
(from 500USD of this year and 400 USD deposited from last year).

Postage 50USD

TOTAL 1450 USD

## 9. Work plan, critical milestones, anticipated results and communications to be achieved next year

- Will publish the Ordovician Chronostratigraphy chart in *Lethaia* and the Chinese version in *Journal of Stratigraphy in China* before the Oslo IGC.
- Production and internet distribution of *Ordovician News No. 25* in 2008.
- Management of Subcommittee website should be move to another Webmaster appointed by the new Chairman of the Subcommittee.

## **10. Budget and ICS component for 2008 (agree with the new Chairman)**

*Ordovician News* No. 25 production: 500USD

Travel subsidies for executive members to attend the 10<sup>th</sup> Ordovician conference in China and the GSSP dedication ceremonies: 1000USD

Support to the preparing work of the organization committee for the 2007 Ordovician conference: 300USD

Management of Subcommittee website: 300USD

Preparation of an Ordovician Time Table: 300USD

TOTAL 2007 BUDGET REQUEST: 2400USD

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

The IGCP Project 503, “Ordovician Palaeogeography and Palaeoclimate”, co-funded the four meetings (with related field trips) in 2007 in China with the 10<sup>th</sup> Ordovician conference. This project will provide travel support to a significant number of Ordovician specialists, including voting members of the Subcommittee, allowing for regular meetings at the annual workshops scheduled for the project.

The State Key Laboratory of Stratigraphy and Palaeobiology, Nanjing Institute of Geology and Palaeontology, Chinese of Academia of Sciences, provides a server for the Subcommittee website.

The Subcommittee officers are also supported by their research projects for parts of their activities.

## **11. Review chief accomplishments over last five years (2000-2006)**

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

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

c. Approval, ratification, and dedication of the Black Knob Ridge section, Oklahoma, USA and the Wangjiawan North, Yichang, China GSSPs for the bases of the Katian and Hirnantian stages, respectively.

d. Approval, ratification, and dedication of the Huanghuachang section, Yoichang, China for the base of the Dapingian Stage, which coincides with the base of the Middle Ordovician.

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

f. The 9<sup>th</sup> International Symposium on the Ordovician System held in San Juan, Argentina, in August 2003, in conjunction with the 7<sup>th</sup> International Graptolite Conference and a Field Meeting of the Subcommittee on Silurian Stratigraphy and publication of 556 page proceedings, 130 participants represented 18 countries, 124 papers were presented in technical sessions.

g. Publication of *Ordovician News* nos. 17-23 and their posting on the Subcommittee’s web site.

h. Development of the web site “Ordovician Stratigraphy Discussion Group” to facilitate discussions on selection of the GSSPs. This site has evolved into the Subcommittee’s web site and also includes postings of *Ordovician News*.

i. Sponsorship of a technical session and field excursion on the GSSP for the base of the Middle Ordovician Series at the Annual Meeting of the Geological Society of America in November 2000.

j. Sponsorship at the 31st International Geological Congress, Rio de Janeiro, Brazil, 2000, of the symposium “Paleontological, stratigraphical, and paleogeographical relations among South America, Laurentia, Avalonia, and Baltica during the Ordovician.”

k. Sponsorship at the 32<sup>nd</sup> International Geological congress, Florence, Italy, 2004, of the symposium “The global Ordovician Earth system”.

l. Launched GOES (Global Ordovician Earth System) Program to stimulate integrated multi-disciplinary studies of global events (mass extinction, sea-level changes, greenhouse conditions, tectonics) during the Ordovician Period.

m. Sponsorship of a special symposium on the Ordovician System at the Geological Society of America Annual Meeting in 2000, of WOGOGOB 2001 in Copenhagen, and the meeting and field excursion “The Gondwanan Platform in Ordovician times: Climatic, eustatic and geodynamic evolution”, in Morocco in February 2001.

o. Selection of names for 2<sup>nd</sup>, 3<sup>rd</sup>, 5<sup>th</sup>, 6<sup>th</sup> and 7<sup>th</sup> stages of the Ordovician System.

p. Sponsorship of the 2006 IGCP 503 Glasgow meeting on “Changing palaeogeographical and palaeobiogeographical patterns in the Ordovician and Silurian”.

q. Sponsorship of the 2007 Yangtze Conference (the 10<sup>th</sup> Ordovician Conference) which is combined with the 3<sup>rd</sup> Silurian Conference and the IGCP503 annual meeting in Nanjing.

## 12. Objectives and work plan for the next 4 years (2008-20012)

a. Publication of an Ordovician time table.

b. Publication of the special volume of “The global Ordovician Earth system”.

c. Refocusing of Subcommittee to address the global Ordovician Earth system.

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

### Subcommission Officers

#### **Chairman:** Chen Xu

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Chinese Academia of Sciences, Nanjing 210008, P.R. CHINA  
Tel. & Fax: +86 25 83375157; Email. [xu1936@yahoo.com](mailto:xu1936@yahoo.com)

#### **Vice Chairman:** Juan Carlos Gutierrez-Marco

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#### **Secretary:** Guillermo L. Albanesi

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### List of Voting Members (through early 2008)

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**Olda Fatka**, Prague, CZECH REPUBLIC [fatka@prfdec.natur.cuni.cz](mailto:fatka@prfdec.natur.cuni.cz)

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**Richard A. Fortey**, London, UNITED KINGDOM [raf@nhm.ac.uk](mailto:raf@nhm.ac.uk)  
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**Warren D. Huff**, Cincinnati, USA [warren.huff@uc.edu](mailto:warren.huff@uc.edu)  
**Li Jun**, Nanjing, CHINA [junli@nigpas.ac.cn](mailto:junli@nigpas.ac.cn)  
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**Godfrey S. Nowlan**, Calgary, CANADA [GNowlan@NRCan.gc.ca](mailto:GNowlan@NRCan.gc.ca)  
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**Leonid E. Popov**, Cardiff, UNITED KINGDOM [Leonid.Popov@nmgw.ac.uk](mailto:Leonid.Popov@nmgw.ac.uk)  
**Matthew R. Saltzman**, Columbus, USA [saltzman.11@osu.edu](mailto:saltzman.11@osu.edu)



## **International Commission on Stratigraphy Subcommission on Cambrian Stratigraphy**

**ANNUAL REPORT 2007**

### **1. TITLE OF CONSTITUENT BODY**

#### **International Subcommission on Cambrian Stratigraphy**

*Submitted by:*

Prof. Loren E. BABCOCK, Secretary  
 School of Earth Sciences  
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 The Ohio State University  
 Columbus, OH 43210  
 USA  
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### **2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY**

#### **Mission Statement**

The Subcommission is the primary body for facilitation of international communication and scientific cooperation in Cambrian stratigraphy.

#### **Goals**

The goals of the Subcommission fall into two main areas:

- (1) To develop a global stage-level and series-level chronostratigraphic classification of the Cambrian System.
- (2) To complete and publish regional and global correlation charts for the Cambrian System.

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

The objectives of the Subcommission fall within three main areas of IUGS policy:

- (1) The development of an internationally agreed scale of chronostratigraphic units, fully defined by GSSPs where appropriate (stages and series), and related to a hierarchy of units (zones) to maximize relative time resolution within the Cambrian Period.
- (2) Establishment of frameworks and systems to encourage international collaboration in understanding the evolution of the Earth during the Cambrian Period.

(3) Working towards an international policy concerning conservation of geologically and paleontologically important sites such as GSSPs.

### **3. ORGANIZATION**

The Subcommittee is organized by an Executive consisting of Chairman, two Vice-Chairs, and Secretary, who are all Voting Members of the Subcommittee. There are currently 14 other Voting Members. The Voting Members are elected for their expertise and experience, but also represent a diversity of countries and regions.

The objectives of the Subcommittee are pursued by Working Groups, both stratigraphic and thematic. Each Working Group is organized by a Chair who is a Voting or Corresponding Member.

The Subcommittee sponsors an International Symposium on the Cambrian System at irregular intervals, and sponsors Field Conferences of the Cambrian Stage Subdivision Working Group at one- or two-year intervals. The Chair of the Organizing Committee of each of the meetings is normally a Voting Member, Honorary Member, or Corresponding Member of the Subcommittee.

#### **Officers for 2004-2008:**

Chairman:	Prof. Shanchi Peng, China
First Vice-Chair:	Prof. Malgorzata Moczydlowska-Vidal, Sweden
Second Vice-Chair:	Prof. Gerd Geyer, Germany
Secretary:	Prof. Loren E. Babcock, USA

**Website:** [www.uni-wuerzburg.de/palaeontologie/ISCS/index.htm](http://www.uni-wuerzburg.de/palaeontologie/ISCS/index.htm)

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

Members of the Cambrian Subcommittee are involved in a number of international projects, normally in an individual capacity but sometimes facilitated by contacts through activities related to the Subcommittee. In 2008, some VMs of the Cambrian Subcommittee will participate in an international trilobite meeting in Spain and the International Geological Congress in Norway, in addition to a variety of other international or regional meetings.

### **5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2007.**

#### **5a. XIIth International Field Conference on Cambrian Stage Subdivision, East Laurentia, September 2007..**

The XIIth International Field Conference on Cambrian Stage Subdivision was held in September, 2007 in New York and Vermont. The meeting was organized principally by ISCS Voting Members Ed Landing and Steve Westrop. A field guide was published in association with the meeting as a New York State Museum Bulletin, and a proceedings volume for the meeting is in the works.

#### **5b. Publication stemming from IV International Conference on the Cambrian System.**

In 2005, the IV International Conference on the Cambrian System was held in Nanjing, China, organized principally by ISCS Moting Member Maoyan Zhu. Full, peer-reviewed papers resulting from the meeting were published as a thematic issue of *Palaeoworld* (vol. 15, issues 3-4, edited by Maoyan Zhu and Loren Babcock) in late 2006.

### **5c. Publication stemming from the Sino-German Symposium on Environmental and Biological Processes of the Cambrian Explosion.**

In 2004, a meeting of Chinese and German Cambrian specialists (principally) met in Nanjing, China, to discuss progress on studies of the Cambrian of China. Results stemming from the meeting were published as full papers in a thematic issue of *Palaeogeography, Palaeoclimatology, Palaeoecology* in 2007 (vol. 254, issues 1-2, edited by Maoyan Zhu, Harald Strauss, and Graham Shields).

### **5d. Publication stemming from the XIth International Field Conference on Cambrian Stage Subdivision, South, Australia 2006.**

In 2006, the XI International Field Conference on Cambrian Stage Subdivision was held in August, 2006 in Adelaide, Australia, organized principally by ISCS Voting Member James B. Jago. Peer-reviewed papers resulting from the meeting are to be published late in 2007 as a thematic issue of the Association of Australasian Palaeontologists Memoir 33, edited by J.R. Laurie, J. R. Paterson, and J. B. Jago.

### **5e. Progress with selection of GSSPs for Cambrian Stages.**

Voting Members (VMs) of the Cambrian Subcommittee voted overwhelmingly to apply the name **Guzhangian** Stage to what was provisionally called Cambrian Stage 7. The Guzhangian Stage, with a GSSP in the Wuling Mountains, Hunan, China, was later approved by ICS and ratified by IUGS.

A majority of VMs of the Cambrian Subcommittee voted to approve the name "**Terreneuvian** Series" and "**Fortunian** Stage" for the lowermost series and stage of the Cambrian System. The conterminant GSSP is the same as that ratified in 1992 for the base of the Cambrian System. The series and stage names were later approved by ICS and ratified by IUGS.

Proposals for a GSSP of provisional Cambrian **Stage 9** were submitted respectively by T. Pegel et al. and S. C. Peng et al to Duck K. Choi, Chair of the Working Group on the *Agnostotes orientalis* level, in November, 2007. After review by Working Group members, the best options will be put forward to the VMs of the Cambrian Subcommittee for a vote. The vote is expected to take place in early 2008.

A proposal for a GSSP of provisional Cambrian **Stage 5** (and Series 3) was submitted by Eladio Linan, an ISCS Voting Member, and his colleagues to Linda McCollum, Chair of the Working Group on the base of Stage 5 (and Series 3), in November, 2007. After more proposals have been received, and after review of all the proposals by Working Group members, the best options will be put forward to the VMs of the Cambrian Subcommittee for a vote. The vote is expected to take place in fall 2008 (after Subcommittee meeting in Russia).

The Subcommittee is working toward establishing GSSPs of the remaining undefined series and stages. Significant progress is being made towards the definition of **Stage 10**, as well as divisions in the lower half of the system.



## **6. ELECTION OF ISCS EXECUTIVE OFFICERS FOR 2008-2012**

The current officers of ISCS were elected for a second term of office for 2008-2012 because significant progress was made in their first tenure. In a questionnaire organized by ISCS Voting Member Jim Jago, 10 of 14 non-executive Voting Members indicated definite support for the continuation of the present Cambrian Subcommittee office-bearers. Two voting members indicated strong support but raised a question as to the legality of the extended term of one individual on the present executive committee. Two voting members failed to answer. Thus the complete slate of current executive officers received unqualified support from 80% of the non-executive Voting Members and will serve the subcommittee for a second tenure.

## **7. CHIEF PROBLEMS ENCOUNTERED IN 2007**

The principal difficulties encountered in 2007 were: 1, obtaining funding to support basic research on key stratigraphic intervals (potential GSSP horizons and sections); and 2, obtaining funding to support travel. A modest increase in funding for the coming year would be of great benefit to members of some of the Working Groups on key horizons who have limited access to funding through nationally competitive research grants.

## **8. SUMMARY OF EXPENDITURES IN 2007:**

### INCOME

Carried forward from 2006	\$ 433.57
ICS Allocation	\$ 2000.00
SUBTOTAL 2007 income	\$ 2433.57

### EXPENDITURE FROM 2007 BUDGET

Contribution to officer's travel expenses	\$ 980.45
Support for East Laurentia meeting	\$ 1000.00
SUBTOTAL 2007 expenditures	\$ 1980.45

To be carried forward to 2008	\$ 453.12
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## **9. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR**

### **9a. GSSP proposals and names for lowermost series and stage.**

In 2008, the Subcommittee expects to vote on at least two proposals for stage-level GSSPs (**stages 5 and 9**).

Planning is underway for meetings of the Cambrian Stage Subdivision Working Group in 2008 (Siberia) and 2009 (Kazakhstan).

### **9b. Newsletter**

An annual newsletter, highlighting activities of the Subcommittee, is expected to be issued by email in 2008.

## 10. BUDGET AND ICS COMPONENT FOR 2007.

In order to accelerate the pace of work in establishing GSSPs within the Cambrian, we request a modest increase in funds as compared to previous years. The proposed increased funding is targeted at field research on key sections by Working Group members and travel by Voting Members to international meetings where much of the decision-making takes place. We request support particularly for the meeting in Siberia (2008), for which the registration and other expenses are extremely high.

### INCOME

Carry-over from 2007	\$ 453.12
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### PLANNED EXPENDITURES FOR 2007

Preparation for the XIII Cambrian Stage Subdivision Working Group Conference (Siberia, 2008)	\$ 3000.00
Executive and VMs travel costs, Siberian meeting	\$ 4000.00
General office expenses	\$ 100.00
<b>TOTAL 2008 PLANNED EXPENSES</b>	<b>\$ 7100.00</b>

### ICS 2007 BUDGET REQUEST

<b>Total ICS 2008 budget request</b>	<b>\$ 7100.00</b>
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Most of the costs of field conferences and other activities will be met by local support from host institutions. Some members are supported by research grants, normally awarded competitively within individual nations. It is hoped that the field excursion to Siberia will receive financial support from local authorities and even from the Russian government, but the extent of support cannot be predicted at this stage.

## 11. CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2003-2007)

In 1998, the Cambrian Subcommittee began work to define chronostratigraphic subdivisions (stages and series) within the system. Previously, the base and top of the Cambrian were defined by Working Groups on the Precambrian-Cambrian boundary (voted on and ratified in 1992) and Cambrian-Ordovician boundary (voted on in 1999 and ratified in 2000). Most of the Subcommittee members share the opinion that the process of defining and ratifying globally appropriate divisions must begin with an evaluation of potential correlation horizons. Following this work, evaluation of candidate sections can begin. The Cambrian Stage Subdivision Working Group has made reconnaissance visits to sections in association with international field conferences. Areas visited include Morocco (1995), Spain (1996), eastern Canada (1997), Sweden (1998), the Great Basin, USA (1999), Argentina (2000), South China (2001), France (2002), South Korea (2004), North and South China (2005), South Australia (2006), and East Laurentia (2007).

In a seminal paper, John Shergold and Gerd Geyer (Episodes, 2000) reviewed widely recognizable biohorizons having intercontinental correlation value (ones that could potentially serve as stage-level or series-level boundaries for chronostratigraphic units). This work led to a focusing of subsequent effort on the issue of better characterizing potential chronostratigraphic boundary horizons using available stratigraphic tools. A protocol for identifying GSSPs within the Cambrian has been established: 1, selection of a horizon suitable for intercontinental correlation (followed by

balloting by the Voting Members); then 2, search for the best sections from which to select a GSSP (followed by balloting by the Voting Members).

A plan has been devised for subdivision of the Cambrian System into four series, each representing roughly equal time intervals. The lowermost two series, which approximately correspond to the traditional lower Cambrian, are each expected to be divided into two nearly equal stages. The uppermost two stages are each expected to be divided into three nearly equal stages. The plan received overwhelming support from ISCS Voting Members.

With the objectives now better focused, and a procedure in place for selecting the best horizons and locations for GSSPs, work has proceeded toward the establishment of stage-level or series-level GSSPs. Successful GSSP proposals arising from the Cambrian Subcommittee were for the bases of the Paibian Stage and Furongian Series (2004), the Drumian Stage (2006), and the Guzhangian Stage (2007). In addition, names have been ratified for the Terreneuvian Series (2007) and Fortunian Stage (2007).

## **12. OBJECTIVES AND WORK PLAN FOR NEXT 4 YEARS (2008-2012)**

The primary objective for the immediate future for the Cambrian Subcommittee remains the completion of definition of the stages by GSSPs. It is hoped that all stages of the upper half of the Cambrian will be defined by GSSPs by 2008 or 2009. Stages of the lower half of the Cambrian are expected to be defined by GSSPs by 2012.

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

### ***Subcommission officers***

**Chairman:** Shanchi Peng, Nanjing Institute of Geology and Palaeontology, The Chinese Academy of Sciences, 39 East Beijing Street, Nanjing 210008, China, Email: [scpeng@nigpas.ac.cn](mailto:scpeng@nigpas.ac.cn)

**First Vice Chair:** Malgorzata Moczydlowska-Vidal, Department of Earth Sciences, Palaeobiology, Uppsala University, Norbyvägen 22, Box 558, 752 36 Uppsala, Sweden, Email: [malgo.vidal@pal.uu.se](mailto:malgo.vidal@pal.uu.se)

**Second Vice-Chair:** Gerd Geyer, Institut für Paläontologie, Universität Würzburg, Pleicherwall 1, 97070, Würzburg, Germany, Email: [gerd.geyer@mail.uni-wuerzburg.de](mailto:gerd.geyer@mail.uni-wuerzburg.de).

**Secretary:** Loren E. Babcock, School of Earth Sciences, 125 South Oval Mall, The Ohio State University, Columbus, OH 43210, USA, [babcock.5@osu.edu](mailto:babcock.5@osu.edu)

### ***List of Working (Task) Groups and their officers***

**Lower Half of Cambrian:** Maoyan Zhu [myzhu@nigpas.ac.cn](mailto:myzhu@nigpas.ac.cn); Konstantin Pak, [vtopor@paleo.ru](mailto:vtopor@paleo.ru)

**Stage 5:** Linda McCollum [lmccollum@ewu.edu](mailto:lmccollum@ewu.edu)

**Series 9:** Duck K. Choi [dkchoi@snu.ac.kr](mailto:dkchoi@snu.ac.kr)

**Stage 10:** Shanchi Peng [scpeng@nigpas.ac.cn](mailto:scpeng@nigpas.ac.cn)

**Geochemistry:** Matt Saltzman [saltzman.11@osu.edu](mailto:saltzman.11@osu.edu)

***List of Voting Members (other than officers)***

Per Ahlberg, Lund, Sweden [per.ahlberg@geol.lu.se](mailto:per.ahlberg@geol.lu.se)  
 José-Javier Álvaro, Villeneuve d'Ascq, France [Jose-Javier.Alvaro@uni-lille1.fr](mailto:Jose-Javier.Alvaro@uni-lille1.fr)  
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 Andrey Yu. Zhuravlev, Moscow, Russia [ayzhur@mail.ru](mailto:ayzhur@mail.ru)

**Total number of Voting Members for term 2004-2008: 18.**

***Preparer information:***

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Date: 15 November 2007



**International Commission on Stratigraphy  
Subcommission on Neoproterozoic (Ediacaran and  
Cryogenian) Stratigraphy**

**ANNUAL REPORT 2007**

**1. TITLE OF CONSTITUENT BODY**

**Subcommission on Neoproterozoic (Ediacaran and Cryogenian) Stratigraphy**

*Submitted by:*

Dr James GEHLING, Chairman  
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Tel. +61-8-8207-7441, Fax. +61-8-8207-7222  
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**2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY**

**Mission statement**

The Subcommission is the primary body for facilitation of international communication and scientific cooperation in Neoproterozoic stratigraphy, defined in the broad sense of multidisciplinary activities directed towards better understanding of the evolution of the Earth and life during the Ediacaran Period and more generally during the late Neoproterozoic (circa 800 – 542 Ma). Its first priority is the unambiguous definition, by means of agreed GSSPs, of a hierarchy of chronostratigraphic units that provide the framework for global correlation.

**Goals**

These fall into three main areas:

- (a) The definition of basal boundary stratotypes (GSSPs) and the refinement of standard chronostratigraphic scales, through the establishment of multidisciplinary Working Groups;
- (b) International coordination of and collaboration in research on late Neoproterozoic environments, through the establishment of thematic Working Groups, for example on Neoproterozoic glaciations.
- (c) International coordination of efforts to establish consensus global stratigraphic calibration schemes for the late Neoproterozoic using alternative methods of stratigraphy, such as chemostratigraphy.

In addition, the Subcommission exists to further communication with a wider public through grassroots initiatives to conserve important Ediacaran geological sites, to support International Geoscience Programme (IGCP) projects, and to encourage the wider dissemination of research findings on the World Wide Web or in popular science publications.

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

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

- (1) The development of an internationally agreed scale of chronostratigraphic units, fully defined by GSSPs where appropriate (Stages), and related to a hierarchy of units (Standard Zones, Subzones etc.) to maximize relative time resolution within the Ediacaran period;
- (2) Proceed with a program of workshops and symposia to select criteria, boundary stratotype section, and GSSP for a “Cryogenian” period and system, immediately below the Ediacaran;
- (3) Establishment of frameworks and systems to encourage international collaboration in understanding the evolution of the Earth during the late Neoproterozoic interval, in particular, cooperating with the **Precambrian Subcommittee** to subdivide the later Precambrian. The Neoproterozoic (Ediacaran and Cryogenian) Subcommittee will concentrate on the Neoproterozoic, while the Precambrian Subcommittee will work on Archean and older eras of the Proterozoic. Both subcommittees seek to establish “natural” or rock-based boundaries that will enable global correlation.
- (4) Working towards an international policy concerning conservation of geologically and paleontologically important sites such as GSSPs. This relates to, *inter alia*, the IUGS Geosites Programme.

### **3. ORGANIZATION**

#### **Officers for 2004-2008:**

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

The Subcommittee is organized by an Executive consisting of Chairman, Vice-Chairman and Secretary, who are all Voting Members of the Subcommittee. These officers were nominated and elected by voting members of the now terminated Terminal Proterozoic Subcommittee during late 2003. There are currently 37 other Voting Members, making 40 voting members in total (see appendix); there are currently 15 additional corresponding members. The Voting Members have been specifically selected for their international reputations and recognised expertise in an area of geoscience relevant to the subcommittee. Four voting members are required to be officers of the Cambrian and Precambrian Subcommittees. All responded promptly to their nominations by email; ease of contact and promptness of response are prerequisites of voting members on this subcommittee.

Two thematic working groups have been established to assess candidates for 1) subdivision of the Ediacaran Period and 2) definition and subdivision of the Cryogenian Period, respectively. These two groups fit neatly within the auspices of existing IGCP project groups (IGCP 493, 512, respectively).

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

Members of the Neoproterozoic (Ediacaran and Cryogenian) Subcommittee are lead investigators and officers in a number of international projects, normally in an individual capacity but sometimes facilitated by contacts through activities related to the Subcommittee:

IGCP 478 (*Neoproterozoic-early Paleozoic events in SW Gondwana*) led by voting members **Claudio Gaucher, Hartwig Frimmel and Paulo Boggiani;**

IGCP 493 (*The Rise and Fall of the Vendian biota*) led by voting member **Mikhail Fedonkin** (Paleontological Institute, Moscow), Pat Vickers-Rich (Monash Uni.) and Ediacaran Subcommission chairman **James Gehling**;

IGCP 497 (*The Rheic Ocean: its origin, evolution and correlatives*) led by voting member **Ulf Linnemann**;

IGCP 512 (*Neoproterozoic Ice ages*) led by subcommission secretary **Graham Shields** and voting member **Emmanuelle Arnaud**. During 2007, the IGCP 512 discussion forum became a *de facto* forum for informal discussion of subcommission matters.

## 5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2007

- Kimberley field meeting (Neoproterozoic glaciogenic successions of NW Australia) organised by Maree Corkeron (Australia) was attended by 14 participants from 7 countries (Canada, USA, China, Brazil, Germany, Spain and Australia). At this meeting, evidence for post-Elatina glaciation in Australia was presented, indicating that the c. 582 Ma ‘Gaskiers’ glaciation may be of widespread significance.
- IGCP 493: International Conference: “The Rise and Fall of the Vendian/Ediacaran Biota — Origin of the Modern Biosphere” 20-31 August 2007. Russian Academy of Sciences, Earth Science Department, Geological Institute, Paleontological Institute; IGCP National Committee of Russian Federation; Monash University (Melbourne); South Australian Museum (Adelaide).
- Seminar at Leicester University, 10 March 2007, “Leicester’s fossil celebrity: *Charnia* and the evolution of early life”. This seminar was organized by the Leicester Literary and Philosophical Society Section C (Geology) in conjunction with the Department of Geology, University of Leicester and Leicester Museums and Galleries to celebrate the 50<sup>th</sup> anniversary of the discovery of the iconic Ediacara frond-like fossil *Charnia*. Speakers from six countries, presented papers on the geochronology, geological setting and palaeobiology of the Ediacaran successions in England, Canada, Russia and Australia.
- Two discussion documents on acritarch biostratigraphy of the Ediacaran and Cryogenian Periods, respectively, were compiled by Kath Grey (Australia), circulated widely and discussed using the IGCP 512 discussion forum. This led to informal workshops in Perth, Australia (Aug. 1 and 14, 2007) and calls to hold a meeting in 2008 to discuss global taxonomic standards (Uppsala, Sweden, Aug. 18-21, 2008).
- Several special volumes and books (as well as countless articles) were published since the last annual report (2006) with specific interest for subcommission goals:
  - Kaufman, A.J., Sial, A.N. eds. (2007) Precambrian chemostratigraphy. *Chemical Geology* v. 237, p. 1-232.
  - Nedelec, A., Ramstein, G., Laskar, J. eds. (2007) Freezing and unfreezing of the Neoproterozoic snowball Earth: From field evidence to climate models. *Comptes Rendus Geosciences* v. 339, p. 181-287.
  - Pope, M.C., Algeo, T.J., Saltzman, M., Bartley, J. (2007) Neoproterozoic-Paleozoic ocean chemistry. *Palaeogeography, Palaeoclimatology, Palaeoecology* v. 256, p. 99-318.
  - Vickers-Rich, P. and Komarower, P. eds. (2007) The Rise and Fall of the Ediacaran Biota. *Geological Society, London, Special Publications* v. 286, 456 pp.
  - Xiao, S. and Kaufman, A.J. eds. (2006) Neoproterozoic geobiology and paleobiology. *Topics in Geobiology* vol. 27, Springer, 300 pp.

Zhu, M., Strauss, H., Shields, G.A. eds. (2007) From Snowball Earth to the Cambrian bioradiation: Calibration of Ediacaran-Cambrian Earth history in South China. *Palaeogeography, Palaeoclimatology, Palaeoecology* v. 254, 361 pp.

## 6. CHIEF PROBLEMS ENCOUNTERED IN 2007

- Continuing inadequate geochronological control in key sections.
- Differences in acritarch taxonomy from country to country.
- Mismatch in timing of the onset and extinction of large ornate, organic walled microfossils during the Ediacaran Period.
- Inconsistent correlation of the ‘Wonoka/Shuram’ negative isotope excursion(s), ‘Gaskiers’ glaciation and microfossil events for the Ediacaran Period.
- Cancellation of the planned field trip and business meeting in India due to illness led to there being no meeting of the Neoproterozoic Subcommittee during 2007.
- Difficulty of access to likely major candidates for the basal Cryogenian GSSP (Svalbard, NW Canada).

## 7. SUMMARY OF EXPENDITURES IN 2007 (ANTICIPATED THROUGH MARCH 2008):

### INCOME

To be carried forward to 2007	US\$485
ICS	<u>US\$1000</u>
TOTAL	US\$1485

### EXPENDITURE FROM 2007 BUDGET

TOTAL	None
To be carried forward to 2008	US\$1485

## 8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2008):

### (a) Newsletter:

A circular is currently being prepared for end 2007 to inform all corresponding members of upcoming events:

- Related field meeting: **Neoproterozoic successions of western Rajasthan** (Feb. 15-18, 2008) and **Jammu** (Feb. 22-23, 2008).
- Geological timescale workshop and IGCP 512 business meeting at University of Jammu, India (Feb. 18-19, 2008) and adjoined thematic conference on **Geology and Hydrocarbon Potential of the Neoproterozoic - Cambrian Basins in India, Pakistan and the Middle East** (Feb. 20-21, 2008).
- Neoproterozoic Subcommittee field meeting: **Cryogenian-lower Ediacaran development of the Great Otavi Bank, Namibia: A carbonate-to-bank transition recording very large amplitude glacio-eustasy** (mid-June, 2008). Over 20 geologists have so far registered interest in this excursion from Brazil, Poland, Spain, Japan, USA, Australia, Germany and UK



- Related field meeting: **Neoproterozoic glacial and associated facies in the Varanger (ex-type) area** Excursion 42 at IGC 2008 (July 29 – Aug. 5, 2008).
- IGC 2008, Oslo, Norway, in particular the subcommission-sponsored session on **Stratigraphic correlation of Neoproterozoic strata** and a specific subcommission business meeting (Aug. 6-14, 2008).
- **Swedish Workshop for Ediacaran Acritarch Taxonomy** (SWEATshop), Uppsala, Sweden (Aug. 18-21, 2008). Participating countries are likely to include Sweden, USA, China, India, Brazil, Australia, UK, Russia.
- Call for votes on stratigraphic criteria and principles

#### **(b) Preparation of GSSP proposals:**

Working groups will explore the potential of preliminary proposals and subdivision criteria and discuss them within wider spheres, generally using the IGCP 512 discussion forum. Various meetings throughout the year will explore the potential for acritarchs in Ediacaran subdivision, and isotopes in Cryogenian definition and subdivision. Firm proposals can only be envisaged after these important meetings. Towards the end of the year, we anticipate:

- Call for submission of full proposals for Cryogenian Period basal GSSP
- Call for submission of full proposals for Ediacaran subdivision

#### **(c) Voting:**

At the beginning of 2009, voting members will be asked to vote on full proposals for criteria used to subdivide the Ediacaran Period and define the base of the Cryogenian Period.

- Formal votes to follow full proposal submission (above) later during 2009.

## **10. BUDGET AND ICS COMPONENT FOR 2008**

We anticipate that at least US **\$5000** will be needed to support voting members who wish to attend the IGC 2008, related field trips and/or the following biostratigraphic workshop in neighbouring Sweden, which will be of vital importance to future discussions. The combined cost of these long meetings in a highly expensive part of the world (Scandinavia) will be extremely difficult to cover for many members of the subcommission (Appendix 1).

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

National IGCP committees and project groups for IGCP projects 478, 493 and 512.

The Neoproterozoic (Ediacaran and Cryogenian) Subcommission does not receive financial support from outside IUGS-ICS, except for office support (computer, access to internet services, telephone, etc.) from the host institutions of the Executive. Most members are supported by national research grants, normally won competitively. Specific activities, such as meetings and some Working Groups, sometimes receive small grants to Convenors and Organizers from various sources, such as host institutions and national and regional authorities of the country where the meeting is being held.

## **11. REVIEW CHIEF ACCOMPLISHMENTS OF PAST FOUR YEARS (2003-2006)**

**2003:** In September 2003, a 3<sup>rd</sup> ballot of the Terminal Proterozoic Subcommission resulted in 85% of the votes in favor of a **GSSP for the Terminal Proterozoic Period** at the base of the

Nuccaleena Formation *cap dolostone*, immediately above the Elatina glaciogenic diamictite in the Enorama Creek Section, Flinders Ranges, South Australia. The name “*Ediacaran*” received 79% of the votes cast. As a result, the Subcommittee submitted a proposal to the full International Commission on Stratigraphy (ICS) in December 2003.

**2004:** On February 16<sup>th</sup>, 2004, the ICS voted 14:1 in favor (with one abstention) on the GSSP and name for the “Ediacaran System”. The results were submitted to IUGS, which ratified the GSSP and name for the Ediacaran System and Period on March 19<sup>th</sup> (IUGS E-Bulletin, March 2004).

**2005:** Interpretive signs and a marker or “golden spike” were dedicated by the South Australian Premier at the Ediacaran GSSP on April 16 at the Ediacaran GSSP site in the Flinders ranges National Park.

Ediacaran paleobiology: paleontological, molecular, embryological, and ecological constraints) NAPC meeting in Halifax Nova Scotia (June 19-26, 2005) and a 5-day pre-conference excursion to the Ediacaran succession of SE Newfoundland.

**2006:** 2<sup>nd</sup> International Palaeontological Congress held in China from June 17-24, 2006, Chinese voting members Zhu Maoyan, Yin Chongyu and Shuhai Xiao and a team of colleagues and their students organized a *Neoproterozoic field workshop* from June 6-16, to study the Cryogenian and Ediacaran successions of south China of the Neoproterozoic Subcommittee. At the 2<sup>nd</sup> International Palaeontological Congress held on the Beijing University campus, (June 17-21), the Neoproterozoic Subcommittee organized a very-well attended symposium and poster session on *Neoproterozoic Palaeontology and Geobiology*, that extended over two days.

“*Snowball Earth 2006 appraisal conference*” was held at the Centro Stefano Franscini, Ascona, Switzerland, July 16-21, 2006. The conference brought together many of the world’s experts in Neoproterozoic Earth System Science.

## **12. OBJECTIVES AND WORK PLAN FOR NEXT 4 YEARS (2007-2010)**

The Neoproterozoic (Ediacaran and Cryogenian) Subcommittee aims to encourage research that will facilitate a consensus subdivision of the late Neoproterozoic (circa 800 – 542 Ma) by 2010. In particular, field excursions and symposia will be designed to further international cooperation and collaboration that will lead to GSSP’s for the base of the “Cryogenian”, and subdivision of the Ediacaran. Suggestions for appropriate successions that would facilitate placement of GSSP’s will determine the precise location of future meetings and excursions but some preliminary ideas are outlined below for the years 2006-2008.

### **2007**

Call for votes on stratigraphic criteria and principles (This will permit a reassessment of those voting members that are currently active, and possibly allow a reduction in their number, which was considered at 40 to be too high in previous years).

### **2008**

- Geological timescale workshop and IGCP 512 business meeting at University of Jammu, India (Feb. 18-19, 2008) and adjoined thematic conference on **Geology and Hydrocarbon Potential of the Neoproterozoic - Cambrian Basins in India, Pakistan and the Middle East** (Feb. 20-21, 2008).

- Neoproterozoic Subcommittee field meeting: **Cryogenian-lower Ediacaran development of the Great Otavi Bank, Namibia: A carbonate-to-bank transition recording very large amplitude glacio-eustasy** (mid-June, 2008). Over 20 geologists have so far registered interest in this excursion from Brazil, Poland, Spain, Japan, USA, Australia, Germany and UK
- **Neoproterozoic glacial and associated facies in the Varanger (ex-type) area** Excursion 42 at IGC 2008 (July 29 – Aug. 5, 2008).
- IGC 2008, Oslo, Norway, in particular the subcommission-sponsored session on **Stratigraphic correlation of Neoproterozoic strata** and a specific subcommission business meeting (Aug. 6-14, 2008).
- **Swedish Workshop for Ediacaran Acritarch Taxonomy (SWEATshop)**, Uppsala, Sweden (Aug. 18-21, 2008). Participating countries are likely to include Sweden, USA, China, India, Brazil, Australia, UK, Russia.

### Start 2009

- Submission of full proposals for Cryogenian Period basal GSSP
- Submission of full proposals for Ediacaran subdivision

### End 2009

- Vote on Cryogenian GSSP.
- Vote on Ediacaran Period subdivision into two or more epochs.

### 2010

- Ratifications of subcommission decisions.

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## APPENDIX 1

### NEOPROTEROZOIC (EDIACARAN AND CRYOGENIAN) SUBCOMMISSION Voting Members 2004-2008

#### *Subcommission officers*

- Chairman:** **James Gehling**, South Australian Museum, North Terrace, Adelaide, 5000 Australia; Tel. +61-8-8207-7441, email [jgehling@ozemail.com](mailto:jgehling@ozemail.com)
- Vice-Chairman:** **Shuhai Xiao**, Department of Geological Sciences, Virginia Polytechnical Institute and University, 4044 Derring Hall, Blacksburg, VA 24061-0420, USA; Tel. +1-540-231-1336, email [xiao@vt.edu](mailto:xiao@vt.edu)
- Secretary:** **Graham Shields**, Geologisch-Paläontologisches Institut, Westfälische Wilhelms-Universität, 48149 Münster, Germany; Tel. +49 (0)251 83-33937, email [gshields@uni-muenster.de](mailto:gshields@uni-muenster.de)

#### *Voting Members*

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## International Commission on Stratigraphy Subcommission on Precambrian Stratigraphy

### ANNUAL REPORT 2007

#### 1. TITLE OF CONSTITUENT BODY

##### **Subcommission on Precambrian Stratigraphy**

*Submitted by:*

Martin Van Kranendonk, *Chair*  
Geological Survey of Western Australia, Mineral House, 100 Plain Street, East Perth, Western Australia 6004,  
Australia, e-mail: [martin.vankranendonk@doir.wa.gov.au](mailto:martin.vankranendonk@doir.wa.gov.au)

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

An international subcommission under ICS that has set as its main goal to construct a 'natural' stratigraphy-based time scale for all of the Precambrian, and pin key stratigraphic boundaries with GSSPs like in the Phanerozoic (not GSSAs).

#### 3. ORGANIZATION

##### **Officers for 2004-2008:**

Chair: Dr. Martin Van Kranendonk, Geological Survey of Western Australia  
Vice-Chair: Dr. Wouter Bleeker, Geological Survey of Canada  
Secretary: Dr. Robert Rainbird, Geological Survey of Canada

*Website:* [www.stratigraphy.org/precambrian](http://www.stratigraphy.org/precambrian) -- lists all relevant information, including downloadable pdf files of key papers and reports. The page was constructed by Wouter Bleeker and is maintained and Dr. Sorin Filipescu (Dept. of Geology, Babes-Bolyai University, in Cluj-Napoca, Romania), the ICS webmaster.

#### 4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

Work of the Precambrian Subcommission interfaces closely with:

- The subcommission on the Neoproterozoic, currently chaired by Dr. Jim Gehling.
- The main body of ICS (International Commission on Stratigraphy)
- A new IGCP Project (509) led by Drs. Steven Reddy (Curtin University, Western Australia) and David Evans (Yale University, USA), et al.: Paleoproterozoic Tectonics and Global Evolution.
- A new IGCP Proposal by Dr. Graham Shields et al.: Neoproterozoic Ice Ages.

## **5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2007**

- A comprehensive questionnaire has been drafted on questions pertaining to the Precambrian time scale. This has been sent out to a preliminary group of interested participants and will be sent out shortly to Subcommittee members and a wider target group of Precambrian geologists and stratigraphers. The aim of this questionnaire is to ensure that there is a broad buy-in into formalizing the current subdivision of the Archean and into pegging suitable, agreed-upon boundaries according to the GSSP concept, where possible, and the GSSA concept, where otherwise a GSSP is impossible. Results will be compiled in February-March, 2008 and will form the basis for a paper in *Precambrian Research* (and a shorter version in *Episodes*) outlining the future direction of the Subcommittee. Only when this broad buy-in is assessed and demonstrated (in a formal publication), can we proceed with changing the boundary definitions to GSSPs. Inevitably, there will be criticism (see, for instance, the debate on the status of the Quaternary) and at that point we need to be able to demonstrate that the direction set by the Subcommittee is based on broad consultation and international majority consensus.
- Presented a workshop of the Subcommittee on Precambrian Stratigraphy in Beijing, China, in September of 2007, in conjunction with the “International Symposium on Precambrian Chronology and Tectonic Evolution”. Lead organizers were Dr. Lu Songnian of the Tianjin Institute of Geology and Mineral Resources and colleagues of the Chinese Academy of Geological Sciences. At the meeting in Beijing, there was also a workshop of IGCP 509 project on the Paleoproterozoic, with which there are significant synergies. The Beijing organizers planned four field trips for Chinese and international participants, several of which focused on well-preserved stratigraphic sections through Precambrian sequences with GSSP potential.
- In conjunction with ICS Chair Felix Gradstein, and potential co-authors, planning of the new chapter on the Precambrian time scale for the new time scale book “GTS2010”. An outline of the chapter was submitted in October, 2007.

## **6. CHIEF PROBLEMS ENCOUNTERED IN 2007**

The busy schedule of former Chair of the Precambrian Subcommittee, Wouter Bleeker, ended up with the position being offered to the Vice Chair, Martin Van Kranendonk, who accepted and is now the acting Chair of the Precambrian Subcommittee.

## **7. SUMMARY OF EXPENDITURES IN 2007:**

ICS was unable to provide a budget; and remaining carryover funds from 2006 (\$500) were largely expended in workshop and travel-related items.

## **8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2008):**

- Distribution of a comprehensive questionnaire to Subcommittee members and a larger target group of Precambrian geologists and stratigraphers.
- Compilation of results from this questionnaire on strategic directions for the Precambrian time scale. Results will form the basis for a paper in *Precambrian Research* and a shorter report in *Episodes*.
- Subcommittee workshop at the Australian Earth Sciences Convention, July 2008, and invited talk by Van Kranendonk at 33<sup>rd</sup> International Geological Congress, Oslo, 2008.
- Commence investigation of a possible Archean-Proterozoic boundary GSSP at the top of the Hamersley Basin, Western Australia.

## **9. BUDGET AND ICS COMPONENT FOR 2008**

- Support is requested for workshop expenses at the Australian Earth Sciences Convention: \$1000 (US\$), to cover venue hire, lunch for participants and printing costs of flyers.
- Support is requested for the chair to travel to the 33<sup>rd</sup> International Geological Congress, Oslo, August 2008: \$5,000 (registration, airfare, accommodation, and living costs).

## **10. REVIEW CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2002-2007)**

- The new Subcommittee on Precambrian Stratigraphy is now fully activated.
- Chapters contributed to GTS2004, the highly successful new comprehensive book on the time scale, edited by Gradstein et al.
- Proposal for new approach published in *Lethaia*.
- New website up and running (<http://stratigraphy.org/precambrian/>).
- Operational links with allied subcommittees (e.g., on the Ediacaran Period) firmly established.
- First 'concept' workshop held in Perth, Australia, in 2005.
- Previous chairman (Dr. Ken Plumb) was invited to the Perth workshop to help achieve a smooth transition from previous Subcommittee activities to those of the new Subcommittee.
- Follow-up workshop held in conjunction with IGCP 509, in 2007.
- Follow-up workshop being planned at the Australian Earth Sciences Convention, Perth, 2008.
- Chapter outline submitted for new GTS2010 book.
- Concept papers on the Precambrian time scale in general, and a GSSP-based Archean-Proterozoic boundary to be submitted in 2008.
- Proposals for some parts of the new Precambrian timescale to be unveiled at 33<sup>rd</sup> International Geological Congress in 2008.
- Active participation in the overall body of ICS.

## 11. OBJECTIVES AND WORK PLAN FOR NEXT 5 YEARS (2008-2012)

- A complete Precambrian time scale in place, based on the rock record and adhering to stratigraphic principles, with formalized Hadean and Archean eons.
- Formal GSSP for the base of the Proterozoic.
- Creation and formal definition of an Eoproterozoic Era.
- Natural subdivisions of the Archean Eon, with GSSPs for each era-rank subdivision, where possible (Eo-, Paleo-, Meso-, and Neoarchean).
- In cooperation with the Neoproterozoic Subcommittee, an advanced plan on how to naturalize the time scale for the Proterozoic.
- Full incorporation of latest insights from planetary science in the earliest part of the terrestrial Precambrian time scale.
- Prepare appropriate chapter on the Precambrian timescale for the 2010 version of the Geological Time Scale.
- Submit an IGCP project proposal to investigate the Archean-Proterozoic boundary.

In 2008, we hope to solidify the general consensus on a GSSP-based approach for the Precambrian time scale and to start making preparations for field workshops to tackle in detail the Archean-Proterozoic boundary.

\*\*\*\*\*

November 2007,  
Perth, Western Australia



## APPENDIX

### *Subcommission officers:*

**Chair:** Dr. Martin Van Kranendonk, Geological Survey of Western Australia, Mineral House, 100 Plain Street, East Perth, Western Australia 6004, Australia, e-mail:

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**Secretary:** Dr. Robert Rainbird, Geological Survey of Canada, 601 Booth Street, Ottawa, Canada, K1A0E8, e-mail: [rrainbir@nrcan.gc.ca](mailto:rrainbir@nrcan.gc.ca)

### *List of voting members (see website):*

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**International Commission on Stratigraphy  
Subcommission on Stratigraphic Classification**

ANNUAL REPORT 2007

**TITLE OF CONSTITUENT BODY and NAME OF REPORTER**

**Subcommission on Stratigraphic Classification (ISSC)**

*SUBMITTED BY:*

**Prof. Maria Bianca Cita**

*Chairman, ISSC*

**Dr. Maria Rose Petrizzo**

*Secretary, ISSC*

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15<sup>th</sup> November 2007

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

The Subcommission represents a core business for the International Commission on Stratigraphy the primary body for creating, discussing, publishing and disseminating an internationally agreed-upon guide on stratigraphic terminology and classification or-in other words standardization of the Stratigraphic Units. Its first priority is to advertise new developments in stratigraphic methods, check that the procedures are carefully followed, and monitor the application of the accepted rules. They fall in two categories: 1) the world-wide acceptance of the basic rules of stratigraphy, without which no time-scale is meaningful, because of the potential gap between knowledge and concepts; and 2) coordination of international application of stratigraphic principles and concepts, with special reference to the most important “users” of stratigraphy, as Geological Surveys, graduate and undergraduate teaching, oil companies, professionals.

The objectives of the Subcommission are relevant to IUGS policy because standardization of the stratigraphic terminology is essential to any attempt of global correlation, and requires a large and active international cooperation.

**3. ORGANIZATION**

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

Chair: Prof. Maria Bianca Cita, Italy

Vice-Chair: Dr. Ashton Embry, Canada  
Secretary: Dr. Maria Rose Petrizzo, Italy

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

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

#### **5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2007**

##### **5.1 ISSC NEWSLETTERS**

ISSC Newsletter n. 11 has been distributed in June. It was preceded by the dissemination in January of the OUTLINE of CHRONOSTRATIGRAPHY, and followed as Appendix to Newsletter 11 (June 2007) containing the full text of the chemostratigraphy. Newsletter 12 is in preparation and will be distributed after the results of the ISSC election, possibly within 2007.

##### **5.2 NEW DEVELOPMENTS IN STRATIGRAPHIC CLASSIFICATION**

###### **5.2.1 THE PROJECT**

The final goal of ISSC is to update, upgrade and implement the International Stratigraphic Guide (ISG, Hedberg, 1976-first edition; Salvador, 1994-second edition; Murphy and Salvador, 1999-abridged edition). The International Stratigraphic Guide is a most important official document of large distribution which requires a revisitation because of the fundamental advances of stratigraphy in the last approximately thirty years. A project was developed by ISSC following a workshop organized during the 32<sup>nd</sup> IGC in Florence, entitled “Post-Hedberg Developments in Stratigraphic Classification”. A bottom-up approach was initiated with the distinction of seven subjects (subdisciplines) to be developed by different groups of scientists mostly but not necessarily ISSC members. The project is not funded, and is uniquely based on voluntary participation of dedicated scientists with a team work approach.

The target is represented by undergraduate and graduate students, field geologists, professionals. Each chapter will start with an incipit summarizing the historical development of that peculiar branch of stratigraphy. Basic concepts have to be clearly presented, followed by precise definitions. Then real examples (case – studies) will be presented and discussed.

Finally recommendations and the terminology to be adopted and problems in the application of the methods will be developed.

Background and motivation of this ambitious project are clearly expressed in the presentation published on Newletters on Stratigraphy (Cita, 2007) to which reference is made.

A series of review-articles are foreseen under the umbrella of “New developments on Stratigraphic Classification”. A workshop with the same title is planned during the 33<sup>nd</sup> IGC in Oslo, in 2008 (see 5.3).

Only after the Oslo workshop and the publication of the various review articles in the coordinated series, the assemblage of the various articles in a book is foreseen after passing the prescribed check points for approval in order to obtain the permission to use the ICS and IUGS logo.

###### **5.2.2 THE ORGANIZATION**

Task Group leaders have been appointed for categories of stratigraphic units not included in previous ISG as

- Chemostratigraphy
- Cyclostratigraphy

- Sequence stratigraphy

Working Group leaders have been appointed for categories already considered as

- Biostratigraphy

- Chronostratigraphy.

- Lithostratigraphy

- Magnetostratigraphy

Each Task Group and/or Working Group consists of a limited number of scientists with broad international experience. Overall at least 24 scientists are presently involved in this project. The products of their efforts are circulated through ISSC Newsletters, first among members, then within a larger community through the national liaisons.

Participation of our large and variegated membership to the project proceeds in two steps:

STEP 1 - is the distribution of a detailed outline of each chapter (= review paper to be published in Newsletters on Stratigraphy). ISSC members have one month on-line review time to send comments or additions to ISSC chair. Comments are sent to the Group leader, who modifies the text accordingly

STEP 2 -When the text and illustrations are ready, they are sent to ISSC members for another one month on-line review. Additional comments received by ISSC chair are assembled and sent to the group leader for revision of the text prior to its finalization.

### 5.2.3 STATE OF THE ART (as of mid-November 2007)

#### Papers published:

**Cita M. B. , 2007.** New developments in stratigraphic classification. A project of the International Subcommission on Stratigraphic Classification ISSC. Newsletters on Stratigraphy 42(2), p. 69-74.

**Strasser A., Hilgen F. and Heckel P., 2007.** Cyclostratigraphy - concepts, definitions, and applications. Newsletters on Stratigraphy 42(2), p. 75-114.

#### 5.2.3.1 Task Groups

##### CYCLOSTRATIGRAPHY

**Leader: Andreas Strasser**, Switzerland, [andreas.strasser@unifr.ch](mailto:andreas.strasser@unifr.ch)

**Fritz Hilgen**, The Netherlands, [fhilgen@geo.uu.nl](mailto:fhilgen@geo.uu.nl)

**Philip Heckel**, USA [philip-heckel@uiowa.edu](mailto:philip-heckel@uiowa.edu)

Outline distributed in ISSC Newsletter 7 (June 2005).

Comments received and forwarded to the leader. Available in the ISSC archive kept by the secretary Maria Rose Petrizzo.

Full text distributed in January 2006, comments received.

Paper published: Strasser A., Hilgen F. and Heckel P., 2007. Cyclostratigraphy - concepts, definitions, and applications. Newsletters on Stratigraphy.

##### SEQUENCE STRATIGRAPHY

**Leader: Ashton Embry**, Canada, [AEmbry@NRCan.gc.ca](mailto:AEmbry@NRCan.gc.ca)

**Donald E. Owen**, USA, [owende@hal.lamar.edu](mailto:owende@hal.lamar.edu)

**Benoit Beauchamp** Canada, [bbeaucha@ucalgary.ca](mailto:bbeaucha@ucalgary.ca)

**Erik Johannessen** Norway, [EPJ@statoil.com](mailto:EPJ@statoil.com)

Piero Gianolla, Italy [piero.gianolla@unife.it](mailto:piero.gianolla@unife.it)

Outline distributed in ISSC Newsletter 8 (October 2005).

Comments received and forwarded to the leader. Available in the ISSC archive kept by the secretary Maria Rose Petrizzo.

Full text distributed in February 2007, comments received and followed by a heated on-line debate (see <http://strata.geol.sc.edu/SeqStratForm.html>). Rejected in its first version. Revised version presently under scrutiny by an ad-hoc international review committee of five experts chaired by Chris Kendall. Gianolla has not contributed to this version.

#### CHEMOSTRATIGRAPHY

**Leader: Helmut Weissert**, Switzerland, [helmut.weissert@erdw.ethz.ch](mailto:helmut.weissert@erdw.ethz.ch)

**M. Joachimski**, Germany, [joachimski@geol.uni-erlangen.de](mailto:joachimski@geol.uni-erlangen.de)

**M. Sarnthein**, Germany, [ms@gpi.uni-kiel.de](mailto:ms@gpi.uni-kiel.de)

Outline distributed in ISSC Newsletter 9 (June 2006).

Comments received and distributed in ISSC Newsletter 10 (November 2006)

Full text distributed in appendix to ISSC Newsletter 11 (June 2007), comments received

Paper almost ready, very good in the style of the cyclostratigraphy chapter.

#### 5.2.3.2 Working Groups

##### BIOSTRATIGRAPHY

**Leader: Jacques Thierry**, France, [jthierry@mail.u-bourgogne.fr](mailto:jthierry@mail.u-bourgogne.fr); [jacques-thierry2@wanadoo.fr](mailto:jacques-thierry2@wanadoo.fr)

**Stan Finney**, USA, [scfinney@csulb.edu](mailto:scfinney@csulb.edu)

**Stephen Hesselbo**, UK, [stephess@earth.ox.ac.uk](mailto:stephess@earth.ox.ac.uk)

**Yuri Gladenkov**, Russia, [gladenkov@ginras.ru](mailto:gladenkov@ginras.ru)

Outline distributed in ISSC Newsletter 9 (June 2006).

Comments received and distributed in ISSC Newsletter 10 (November 2006)

Full text in progress.

##### CHRONOSTRATIGRAPHY

**Leader: Maria Bianca Cita**, Italy, [maria.bianca@unimi.it](mailto:maria.bianca@unimi.it)

**Ashton Embry**, Canada, [AEmbry@NRCan.gc.ca](mailto:AEmbry@NRCan.gc.ca)

**Fritz Hilgen**, The Netherlands, [fhilgen@geo.uu.nl](mailto:fhilgen@geo.uu.nl)

**Jacques Thierry**, France, [jthierry@mail.u-bourgogne.fr](mailto:jthierry@mail.u-bourgogne.fr)

**Jan Zalasiewicz**, U.K., [jaz1@le.ac.uk](mailto:jaz1@le.ac.uk)

**Stan Finney**, USA, [scfinney@csulb.edu](mailto:scfinney@csulb.edu)

**Brian Pratt**, Canada, [brian.pratt@usask.ca](mailto:brian.pratt@usask.ca)

Outline distributed in January 2007.

Comments received and distributed in ISSC Newsletter 11 (June 2007).

Full text in progress, half done, five case studies well selected. To be finalized and disseminated to ISSC members.

##### LITHOSTRATIGRAPHY

**Leader: Brian Pratt**, Canada, [brian.pratt@usask.ca](mailto:brian.pratt@usask.ca)

**Stan Finney**, USA, [scfinney@csulb.edu](mailto:scfinney@csulb.edu)

**Werner Piller**, Austria, [werner.piller@uni-graz.at](mailto:werner.piller@uni-graz.at)

**Mike Easton**, Canada, [mike.easton@ndm.gov.on.ca](mailto:mike.easton@ndm.gov.on.ca)

Outline distributed in ISSC Newsletter 11 (June 2007).

Comments received and forwarded to the leader. Available in the ISSC archive kept by the secretary Maria Rose Petrizzo.

Full text in progress.

##### MAGNETOSTRATIGRAPHY

**Leader: Cor Langereis**, The Netherlands, [langereis@geo.uu.nl](mailto:langereis@geo.uu.nl)

**Wout Krijgsman**, The Netherlands, [krijgsma@geo.uu.nl](mailto:krijgsma@geo.uu.nl)

**Giovanni Muttoni**, Italy, [giovanni.muttoni1@unimi.it](mailto:giovanni.muttoni1@unimi.it)

**Manfred Menning**, Germany, menne@gfz-potsdam.de  
Outline and text in progress, very advanced.

### 5.3 ACTIVITIES FORESEEN FOR THE 33rd IGC IN OSLO

ISSC is organizing a Workshop and a Symposium as follows:

#### 1) Workshop “NEW DEVELOPMENTS IN STRATIGRAPHIC CLASSIFICATION”

conveners:

M.B. Cita (ISSC chair), University of Milano (Italy), maria.cita@unimi.it

S. Finney (ICS vice-chair), California State University - Long Beach (USA),  
 scfinney@csulb.edu

A. Strasser, University of Fribourg (Switzerland), andreas.strasser@unifr.ch

C. Kendall, University of South Carolina (USA), kendall29204@gmail.com

contact person is M. B. Cita

“Stratigraphic classification is an important tool for deciphering the complex sedimentary records of Earth History and a means of communication among scientists. The workshop wants to bring together specialists in litho-, bio-, chemo-, magneto-, cyclo-, sequence-, and chronostratigraphy to discuss ways to adapt the classification to the new developments in stratigraphic research. At the same time, the nomenclature should be attractive and easy to apply.

The workshop is organized by the Subcommittee on Stratigraphic Classification of the International Commission on Stratigraphy, but is open to the Earth community at large. The workshop will be run in a Penrose conference style, starting with a series of keynote presentations on the various subdisciplines of stratigraphy, some of which derive from the introduction of new methodologies. Discussion groups will be organized for the more controversial issues, followed by an open forum discussion. Aim of the workshop is to reach a consensus, or at least a large majority on some critical points that will allow a better understanding of the history of our planet.

The ultimate goal is an update of the International Stratigraphic Guide, which should become a widely used and respected reference for stratigraphers worldwide.”

- a) duration = two days
- b) estimated number of participants = 50 (minimum 15)
- c) the workshop is open to all IGC participants
- d) no fee

#### 2) Symposium PLIO-PLEISTOCENE AND GLOBAL CHANGE

conveners:

M.B. Cita (ISSC chair), University of Milano (Italy), maria.cita@unimi.it

Brad Pillans (INQUA Commission on Stratigraphy and Chronology chair), Australia,  
 brad.pillans@anu.edu.au

It has been requested that this important symposium, which is sponsored by ICS (of IUGS) and INQUA, is considered as a special symposium, consisting of only invited talks, in order to have the best scientists worldwide to present their views on some critical aspects of climate change, and to discuss on the basis of the most advanced scientific results the possibility to standardize the stratigraphic subdivision of the last million years of the history of our planet.

## 6. CHIEF PROBLEMS ENCOUNTERED IN 2007.

The ICS subvention allocated to ISSC was very low and disproportionate to the overall importance and significance attributed to this subcommission at the IUGS Ad-hoc Review Committee(ARC) meeting in Paris (Nov. 7-8 2005).

The commercial web-site of the International Subcommission on the Stratigraphic Classification ([http://www.geocities.com/issc\\_arg](http://www.geocities.com/issc_arg)) cannot be updated anymore because of space limits. We are moving it to a different web page (<http://users.unimi.it/issc>). The entire allocation for 2007 (only 505.33 Euro after conversion) has been devoted to this and it will include assistance with setting up and upgrading the software.

Three major problems were encountered in 2007:

- 1- in response to the IUGS strong unprecedented reprimenda to ICS with the request to modify its statute concerning the elections and to find a dialogue with INQUA on the Quaternary, a documented letter was prepared by ISSC chair and forwarded to IUGS by ICS secretary as an annex to his report.
- 2- the draft report on Sequence Stratigraphy prepared by the ISSC vice-chair (and past chair of NACSN) was disseminated in March as ISSC document and originated a heated debate with another past chair of NACSN (see <http://strata.geol.sc.edu/SeqStratForm.html>). This unfortunate situation resulted in critiques to the subcommission for the biased and unbalanced presentation of the subject. The problem is still open and originates stress and tension (see 5.2.3.1).
- 3- the refusal by IUGS to accept the result of the ICS votes on the Quaternary with the exception of the first one (recognition and rank of the Quaternary) obliged the ISSC chair to concentrate on the difficult and stressful task to present shared proposals by the Italian Stratigraphic community of the marine stages defined in Italy (see 7).

## 7. OTHER ACTIVITIES BY ISSC CHAIR AIMED AT FACILITATING THE IUGS/INQUA DIALOGUE

Several papers have been written just for the purpose to improve the knowledge of the classical marine successions from the central part of the Mediterranean.

- 1- Cita M.B., Capraro L., Ciaranfi N., Di Stefano E., Marino M., Rio D., Sprovieri R., Vai G.B., 2006. CALABRIAN AND IONIAN. for the Lower Pleistocene A proposal for the definition of Mediterranean stages for the Lower and Middle Pleistocene. *Episodes*, v. 29/2, pp. 107-114.
- 2- Cita M.B., Capraro L., Ciaranfi N., Di Stefano E., Lirer F., Maiorano P., Marino M., Raffi I., Rio D., Sprovieri R., Stefanelli S., Vai G. B. The Calabrian Stage redefined. Submitted to *Episodes* in October 2007.
- 3- Cita M. B. Presentation of the Symposium PLIO-PLEISTOCENE AND GLOBAL CHANGE following an invitation by John Clague (INQUA chair). Prepared for *Quaternary Perspectives*.
- 4- Summary of Italian marine Stages submitted in November for a special issue of *Episodes* dedicated to the Quaternary following an invitation by the editors Gibbard and Pillans.

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

### I. INCOME

2006 ICS subvention After the Exchange changes	505,33 EURO
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### II. EXPENDITURES

Website upgrade	505,33 EURO
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Total

505,33 EURO

## 9. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2008):

Publication expected:

- Chemostratigraphy.
- Magnetostratigraphy.

Preprints:

- Biostratigraphy
- Chronostratigraphy case studies finalized; general part, concepts, definitions and applications to be finalized after the general discussion during the workshop in Oslo.
- Lithostratigraphy, requires integration with Sequence Stratigraphy to be accomplished during the Oslo workshop.
- Sequence Stratigraphy forecast unknown till the response of the ad-hoc international review committee of five experts (see 5.2.3.1). The topic is highly controversial even more than six years ago (Hedberg conference, Dallas 2001).

## 10. BUDGET AND ICS COMPONENT FOR 2008

(a) General office expenses	50.00 US Dollars
(b) ISSC Newsletter n. 12 and 13	50.00 US Dollars
Contributions to help costs of Participation to the 33rd IGC in Oslo	3500.00 US Dollars
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TOTAL BUDGET REQUEST	3600.00 US Dollars

### Potential funding sources outside IUGS

The Subcommittee does not envisage being able, as an organization, to obtain significant funding from outside IUGS/ICS sources.

As in previous years, financial support will be sought by individual members from their grant-awarding bodies for specific projects such as research projects and meetings.

General support will be provided to the Secretary by University of Milano Department of Earth Sciences for equipment including computers, email access and telephones.

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

*See Accomplishments in ISSC Annual Report 2006*

## 12. OBJECTIVES AND WORK PLAN FOR NEXT 2 YEARS (2008-2010)

The FINAL GOAL of ISSC is the publication of a new ISG, a guide not a code, simple, clear, concise, users-friendly for a world wide distribution and acceptance. After the Oslo workshop, the in-depth discussion of the critical points and taking into account the important outcome of the 2006

Penrose Conference entitled *Beyond the GSSP: New developments in Chronostratigraphy* published in *Stratigraphy* vol.4 (2-3), 2007, the time will come to assemble a multi-authored, really multinational book.

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

### ***Subcommission officers***

**Chairman: Prof. Maria Bianca Cita**, University of Milano, Department of Earth Sciences “Ardito Desio”, via Mangiagalli 34, 20133, Milano, Italy, Tel +39-02-503 15529, e-mail: maria.cita@unimi.it

**Vice Chairman: Dr. Ashton Embry**, Institute of Sedimentary and Petroleum Geology Geological Survey of Canada, 3303 33rd St. N.W., Calgary, Alberta T2L 2A7, Canada, Tel +1-403-292 7125, e-mail: [AEmbry@NRCan.gc.ca](mailto:AEmbry@NRCan.gc.ca)

**Secretary and Webmaster: Dr. Maria Rose Petrizzo**, University of Milano, Department of Earth Sciences “Ardito Desio”, via Mangiagalli 34, 20133, Milano, Italy, Tel +39-02-503 15531, Fax: +39-02-503 15494, e-mail: mrose.petrizzo@unimi.it

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

#### ***Cyclostratigraphy:***

**Leader: Andreas Strasser**, Switzerland, [andreas.strasser@unifr.ch](mailto:andreas.strasser@unifr.ch)

**Fritz Hilgen**, The Netherlands, [fhilgen@geo.uu.nl](mailto:fhilgen@geo.uu.nl)

**Philip Heckel**, USA [philip-heckel@uiowa.edu](mailto:philip-heckel@uiowa.edu)

#### ***Sequence Stratigraphy:***

**Leader: Ashton Embry**, Canada, [AEmbry@NRCan.gc.ca](mailto:AEmbry@NRCan.gc.ca)

**Donald E. Owen**, USA, [owende@hal.lamar.edu](mailto:owende@hal.lamar.edu)

**Benoit Beauchamp** Canada, [bbeauch@ucalgary.ca](mailto:bbeauch@ucalgary.ca)

**Erik Johannessen** Norway, [EPJ@statoil.com](mailto:EPJ@statoil.com)

#### ***Chemostratigraphy:***

**Leader: Helmut Weissert**, Switzerland, [helmut.weissert@erdw.ethz.ch](mailto:helmut.weissert@erdw.ethz.ch)

**M. Joachimski**, Germany, [joachimski@geol.uni-erlangen.de](mailto:joachimski@geol.uni-erlangen.de)

**M. Sarnthein**, Germany, [ms@gpi.uni-kiel.de](mailto:ms@gpi.uni-kiel.de)

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

#### **Biostratigraphy**

**Leader: Jacques Thierry**, France, [jthierry@mail.u-bourgogne.fr](mailto:jthierry@mail.u-bourgogne.fr); [jacques-thierry2@wanadoo.fr](mailto:jacques-thierry2@wanadoo.fr)

**Stan Finney**, USA, [scfinney@csulb.edu](mailto:scfinney@csulb.edu)

**Stephen Hesselbo**, UK, [stephess@earth.ox.ac.uk](mailto:stephess@earth.ox.ac.uk)

**Yuri Gladenkov**, Russia, [gladenkov@ginras.ru](mailto:gladenkov@ginras.ru)

#### ***Chronostratigraphy***

**Leader: Maria Bianca Cita**, Italy, [maria.bianca@unimi.it](mailto:maria.bianca@unimi.it)

**Ashton Embry**, Canada, [AEmbry@NRCan.gc.ca](mailto:AEmbry@NRCan.gc.ca)

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**Jacques Thierry**, France, [jthierry@mail.u-bourgogne.fr](mailto:jthierry@mail.u-bourgogne.fr)  
**Jan Zalasiewicz**, U.K., [jaz1@le.ac.uk](mailto:jaz1@le.ac.uk)  
**Stan Finney**, USA, [scfinney@csulb.edu](mailto:scfinney@csulb.edu)  
**Brian Pratt**, Canada, [brian.pratt@usask.ca](mailto:brian.pratt@usask.ca)

### *Lithostratigraphy*

**Leader: Brian Pratt**, Canada, [brian.pratt@usask.ca](mailto:brian.pratt@usask.ca)  
**Stan Finney**, USA, [scfinney@csulb.edu](mailto:scfinney@csulb.edu)  
**Werner Piller**, Austria, [werner.piller@uni-graz.at](mailto:werner.piller@uni-graz.at)  
**Mike Easton**, Canada, [mike.easton@ndm.gov.on.ca](mailto:mike.easton@ndm.gov.on.ca)

### *Magnetostratigraphy*

**Leader: Cor Langereis**, The Netherlands, [langereis@geo.uu.nl](mailto:langereis@geo.uu.nl)  
**Wout Krijgsman**, The Netherlands, [krijgsma@geo.uu.nl](mailto:krijgsma@geo.uu.nl)  
**Giovanni Muttoni**, Italy, [giovanni.muttoni1@unimi.it](mailto:giovanni.muttoni1@unimi.it)  
**Manfred Menning**, Germany, [menne@gfz-potsdam.de](mailto:menne@gfz-potsdam.de)

### **List of Members**

*All the Task Groups and Working Groups members who are not presently ISSC Voting members will obtain this qualification in recognition of their highly appreciated voluntary work.*

### **VOTING**

**Berggren William A.**, Woods Hole, USA [wberggren@whoi.edu](mailto:wberggren@whoi.edu)  
**Brakel Albert T.**, Canberra, AUSTRALIA [abrakel@netspeed.com.au](mailto:abrakel@netspeed.com.au)  
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**ICS Report APPENDIX:****ICS-Sponsored Stratigraphic Symposia, Workshops and Fieldtrips proposed for the 33th IGC in Oslo in 2008**

Coordinator Felix M. Gradstein

*NOTE: This is the list of proposals, and may slightly modify once abstracts come in.*

**Symposia****1. *Geologic Time Scale 2008***

Conveners: Felix M. Gradstein, James G. Ogg and Mike Villeneuve

Duration: one day

During the 32nd IGC in Florence, ICS held a very well attended special symposium on Geologic Timescale 2004. With the major effort of 40+ specialists underway now in ICS to create a fully digital version of the GTS, with major updates in chronostratigraphy and geochronology, the Oslo IGC is the appropriate venue to present where we are now in the standard, international geologic timescale. Standard boreal chronostratigraphy will be explored and outlined also.

**2. *Pliocene-Pleistocene Correlations and Global Change***

Maria Bianca Cita, and Brad Pillans

Duration: 3/4 day

Debate on stratigraphic subdivision, regional and global correlations and ranking of units for the geologic time scale of the last 10 million years has been going on for over a century. Although this often rather boring debate pales in comparison to the importance of better understanding global change during that time interval, it bears directly on accuracy in time correlations. This symposium will highlight the current understanding of Late Cenozoic chronostratigraphy and geochronology and investigate global changes in climate and provide an outlook on the future 'around the corner'.

**3. *Oligocene Series : a time of change in earth and life history.***

Organizations supporting the symposium : ICS and ISPS

Conveners: Yuri Gladenkov , GERS, Moscow, Russia and Noël Vandenberghe, K.U.

Leuven, Belgium

Format : papers , posters and synthesis papers prepared by invited scientists.

Objective: The Oligocene time is seeing the change towards a significant cooling of the planet. An increased number of studies documented several aspects of the changing Oligocene earth and life history in different parts of the world. The symposium attempts to integrate and synthesize these results into a coherent paleogeographic and stratigraphic evolutionary history of the Oligocene as it is known today.

Subjects:

1. Contributions to improved stratigraphic resolution and understanding of the Oligocene and its transitions to Eocene and Miocene.
2. Paleogeography of land masses, seas and oceans during the Oligocene including atmospheric and oceanic circulation models for the Oligocene situation.

3. Periodicity, cycles, sequences and events: comparing and understanding observations.
4. The contrast to the Eocene and Miocene: Significance of the Oligocene Series in the evolution of earth and life history.

#### ***4. Correlation of Devonian terrestrial, neritic and pelagic strata***

Thomas Becker et al.

Duration: 3/4 day

#### ***5. Magnetic stratigraphy: the template for the construction of geologic time scales***

Conveners: Fabio Speranza and Fabio Florindo

Organization: Istituto Nazionale di Geofisica e Vulcanologia, Roma, Italy

Description: The analysis of magnetic anomaly profiles over the oceans represents the first-order template for the late Jurassic to Quaternary geomagnetic polarity time scale (GPTS). Yet, there is no oceanic crust older

than mid-late Jurassic, implying that the oceanic magnetic anomalies cannot be used for the older time scale interval. As a consequence, the pre-mid-late Jurassic (i.e. pre-Callovian-Oxfordian) GPTS may be solely defined by the bio-magnetostratigraphic integrated study of land sections or borehole cores. Obviously, this older part of the GPTS (pre-polarity chron M38) should be built through target sedimentary sections displaying: 1) a high sedimentation rate, 2) presence of biostratigraphic markers, and 3) a stable remanent magnetization of primary origin. The hunt of sections contemporaneously satisfying these conditions is progressively yielding a refinement of the pre-M38 GPTS.

In this session we welcome all bio- and magneto-stratigraphic contributions aiming at both detailing the late Jurassic to Quaternary GPTS, as well as highlighting the Triassic, Jurassic (and older) GPTS, which is poorly (or no) defined for some geologic stages. Contributions dealing with orbital forced cyclicity as a tool to better constrain the duration and boundary ages of polarity chrons and geologic stages are also encouraged.

#### ***6. Accuracy in Fossil zonation***

Conveners: David L. Bruton & J. Fredrik Bockelie, Sagex AS, Oslo

Description: How far can we trust fossils assemblages in fine scale correlation and what role do facies play in fossil distribution and preservation?

#### ***7. Global Controls on Sequence Stratigraphy***

Conveners: Peter Sharland and Ken Miller

Description: We suggest a review of global controls would be timely and interesting, and allow a wide discussion of the influence of plate motions, mid-ocean ridges, climate, gas hydrates, glacio-eustasy etc. A half day oral session would suffice for this linked to a session of posters providing some meaty data and interpretations.

### **Workshop:**

***New developments in Stratigraphic Classification***

Conveners Maria Bianca Cita, Ashton Embry, Andreas Strasser and Stan Finney

Duration: 2 days

***Milestones in Quantitative Biostratigraphy***

Conveners: Frits Agterberg and Felix Gradstein.

Duration: 3/4 day

This workshop highlights major advances in quantitative stratigraphy. This small but dedicated branch of stratigraphic science over the last decade has seen a consolidation of methods, and a good understanding of their advantages and limitations.

During the early life of quantitative (bio)stratigraphy, with IGCP Project 148 and its successor in ICS up front, new methods stood in line to be programmed and evaluated. Given the almost universally deterministic approach to stratigraphic correlation, emphasis these days is almost exclusively on creation of the most detailed (fossil event) biozonation using methods, and then correlating such zonation subjectively through (well) sections. Correlation of physical well logs or of orbitally tuned sections also is not left to a program, but quickly steered by hand, elegantly avoiding pitfalls like missing data, repetitive signals, or plain noise.

The modern biostratigraphic programs of choice are Ranking and Scaling (RASC), Constrained Optimization (CONOP) and Unitary Association (UA). Each one exploits different properties of the (often complex) fossil record to arrive at zonal answers. RASC is optimal for larger datasets with many fossil events, and handles noise well, like outliers and missing data. CONOP has taken over the niche of former 'graphic correlation' users, and does so in a far superior manner. The results of RASC and CONOP often converge well on the same zonal answer, although methods and assumptions are completely different. UA builds a robust zonation along the path of the concurrent range zone. RASC has best graphics.

Not really in the same category, and totally deterministic is the new program TSCreator. It neatly displays biozonations and its correlation from powerful global and regional datasets.

This session highlights the four methods, and tries to show the path ahead to serve Earth Sciences in the 21 Century.

**Stratigraphic Fieldtrip:*****Neoproterozoic Succession in Finmark, N.Norway - IGCP Project 512***

Leader Graham Shields

Duration: < 10 days