

International Union of Geological Sciences
International Commission on Stratigraphy

International Subcommittee on Stratigraphic Classification ISSC

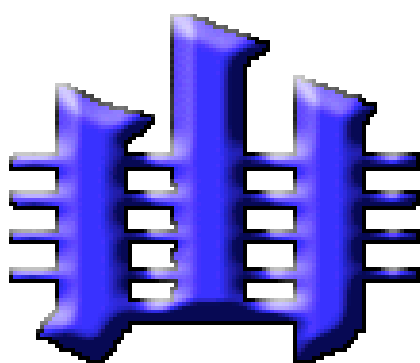
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NEWSLETTER N. 14

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Edited by M.R. Petrizzo

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1. EDITORIAL

Dear colleagues:

This is my first editorial as the new Chair of ISSC, Maria Bianca Cita having passed the baton to me officially in August at the International Geological Congress in Oslo. I am honoured that I was elected to this position by the ICS membership, even though Maria leaves dauntingly big shoes to fill, but thankfully she is still close at hand and always ready with wise counsel. I am especially delighted to introduce the two new Vice-Chairs, Jan Zalasiewicz and Helmi Weissert. Helmi is a stable isotope chemostratigrapher and Jan is at heart a graptolite biostratigrapher, and some of you may know him via his entertaining essays in the Palaeontological Association Newsletter, as well as for being the lead author of the 2005 *Geology* paper that advocates abandoning the distinction between time-rock and rock units (e.g. Early and Lower). Both have been very active in their respective working groups. Luckily for us, Maria Rose Petrizzo is staying on as Secretary, and is thus able to shoulder a large portion of the bureaucratic burden as well as serve as the 'corporate memory'. ISSC reports to ICS, and the new Chair of that is Stan Finney. Stan is someone I have known for three decades and I count him as a close personal friend. He is also active in two working groups. ISC reports to IUGS, and by good fortune the incoming President is Alberto Riccardi. Alberto not only was a previous Chair of ISSC, he is also someone I first met in the mid-1970s when he had a post-doctoral fellowship at McMaster University where I was an undergraduate. In fact he taught me my first Spanish swear word...

There cannot be any question that Stratigraphy is the heart and soul of geology. Although initially referring to layered rocks, in reality it encompasses all rock types, and consequently our various national codes and the international guide need to reflect that fact. As we have all lamented, Stratigraphy has been neglected in university curricula for a long time, some would say having been shouldered aside by sedimentology. Be that as it may, we are all aware that the rise of Sequence Stratigraphy as an intellectual approach with tremendous application especially in the petroleum industry, has helped revitalize all of Stratigraphy. Now is the time for the educators amongst you to capitalize on that and sneak the other facets of Stratigraphy into your courses.

Maria left the ship sailing under full canvas. Our job is to stay the course. As you all know, our first goal is a series of authoritative position papers on the various branches of Stratigraphy. Some of these have appeared in print already, thanks to the vigour of the working groups. We aim to have the remaining papers in press by the end of 2009. I hope everyone will contribute their suggestions to the drafts as they are circulated. There has been some juggling of the membership of one or two of the working groups, but that is to be expected, I think, given the magnitude of the task and the length of time needed to complete it. In the end, I think we will all be proud of the results which were initiated by Maria with her customary clarity of vision and alacrity of spirit. We will then know *quo vadis* the International Stratigraphic Guide.

ISSC has a role to play in other matters of terminology. *Inter alia*, Stan is also charging us with coming to a consensus about time-rock and rock units (i.e. the aforementioned Early and Lower distinction for example). That is something that we ought to think about deeply over the coming while so that we make an informed and authoritative recommendation.

Brian Pratt

ISSC chair

Saskatoon, November 2008

2. ISSC at OSLO 33rd IGC (August 2008)

2.1 Minute of the ISSC Executive Meeting, Sunday, 10 August 2008

The first meeting of the ISSC under incoming Chair Brian Pratt was held during workshop WSS-11 on *New Developments in Stratigraphic Classification*. That event took the form of a round-table discussion after a series of keynote presentations on Sequence Stratigraphy, moderated by Chris Kendall. It took place after session HPS-12, of the same name, held on Friday, 8 August, along with several other sessions to do with stratigraphy and the geological time scale.

The meeting commenced during the lunch break and continued into the early afternoon. Present were Brian Pratt, outgoing Chair Maria Bianca Cita, and Vice-Chairs Jan Zalasiewicz and Helmut Weissert. Several other individuals were present as well, including incoming Chair of ICS Stan Finney, Octavian Catuneanu, Isabella Premoli Silva, André Strasser, Manfred Menning, Marco Balini, Charles Henderson plus a few others who drifted in and out from the workshop. Discussion ranged around several topics, primarily regarding the status of the various position papers being prepared by the various ad hoc working groups. These are being published in *Newsletters on Stratigraphy*. The journal editor has agreed that a separate round of refereeing is not necessary since each is being commented upon by anyone in ISSC and ICS over a two month gestation period. The papers on Cyclostratigraphy (Strasser et al.) and Chemostratigraphy (Weissert et al.) have now been published; the one on Magnetostratigraphy (Langereis et al.) is almost ready to be sent around for comments. Those on Lithostratigraphy (Pratt et al.) and Chronostratigraphy (Zalasiewicz et al.) are still in preparation. Those on Biostratigraphy and Sequence Stratigraphy have been delayed for various reasons. Brian, with approval of Jan and Helmi, reconstituted the ad hoc Sequence Stratigraphy working group, which now is composed of Octavian, André, Chris and Vitor Abreu (ExxonMobil) and a January deadline is envisaged.

A further item was raised, the need to conduct a wide discussion in order to come up with a formal resolution to the traditional time-rock 'dual stratigraphy' challenged by Zalasiewicz et al. in their 2004 paper in *Geology*. There they urged the abandonment of 'Lower' and 'Upper' for series, because now that series are becoming more and more defined on the basis of chronostratigraphy, i.e. 'golden spikes', the separation between rock and time units has become superfluous in their view. The goal would be to then inform the stratigraphic community and journal editors of a formal ISSC position.

The executive also affirmed the appointment of Maria Rose Petrizzo to remain as Secretary, and she will receive a \$500 subsidy ISSC gets from ICS to maintain the website. Maria Bianca Cita offered to stay in close contact with the executive as Past-Chair to help maintain continuity and dispense advice when needed. In the meantime, the workshop continued with constructive discussion by all (see report below).

2.2 Symposium HPS-12 *New developments in stratigraphic classification*, 8 August, 2008

Report and comments by M.B. Cita

Conveners: M.B. Cita (ISSC chair -University of Milano, Italy), C. Kendall (University of South Carolina, USA) A. Strasser (University of Fribourg, Switzerland) and S. Finney (ISC chair-University of California, Long Beach, USA).

PROGRAM

- Cita, M.B.:** Presentation of the symposium
- 1324010 **Pratt, B.:** Lithostratigraphy stays with the times
- 1340977 **Schokker, J., Weerts, H. & Westerhoff, W.:** Integrating the concepts of lithostratigraphy and lithofacies in applied geological mapping
- 1344917 **Thierry, J.:** Biostratigraphy: past evolution and future challenges
- 1345453 **Langereis, C., Krijgsman, W., Muttoni, G. & Menning, M.:** Magnetostratigraphy - its future: possibilities, pitfalls and applications
- 1315670 **Weissert, H.:** Carbon isotope stratigraphy - potential, problems and questions
- 1312131 **Strasser, A., Hilgen, F. & Heckel, P.H.:** Cyclostratigraphy - from orbital cycles to geologic time scale
- 1344911 **Zalasiewicz, J.:** The newest geological time period: the Ediacaran
- 1345618 **Finney, S.:** The Hirnantian Stage and its GSSP: a record of rapid global climate change
- 1341461 **Melchin, M., Rong, J., Williams, S.H., Koren, T. & Verniers, J.:** Report of the first restudy of a Global Stratotype Section and Point: the base of the Silurian System
- 1324557 **Thierry, J.:** The Pliensbachian GSSP definition (Mesozoic, Lower Jurassic): a case study
- 1315734 **Cita, M.B. & Premoli Silva, I.:** K/T boundary and Danian GSSP
- 1343544 **Hilgen, F.:** Progress in chronostratigraphy: the case history of the Miocene-Pliocene boundary and Zanclean GSSP
- 1354955 **Lerch, C., Thompson, T., Apps, G. et al.:** Creation and application of a 3D synthetic stratigraphic and seismic model using systematic stratigraphic principles and realistic rock properties
- 1304736 **Singh, P., Slatt, R. & Coffey, W.:** Sequence stratigraphy of mudrocks: example of the Barnett Shale, North Texas, USA
- 1341115 **Miller, K., Browning, J., Katz, M., Wright, J., Aubry, M.-P., Wade, B., Cramer, B., Kulpecz, A. & Rosenthal, Y.:** St. Stephens Quarry, Alabama (SSQ) corehole: an integrated magneto-, bio-, isotopic, and sequence stratigraphic reference section for the Icehouse-Greenhouse transition
- 1353038 **Suc, J.-P., Clauzon, G., Bache, F. et al.:** The latest Miocene – earliest Pliocene Mediterranean mega-cycle in sea-level
- 1343651 **Cita, M.B., Ryan, W.B.F., Jadoul, F., Berra, F. & Freeman-Lynde, R.:** Depositional processes, erosional episodes and stratal geometries recorded in the deep and steep slopes of the Atlantic Ocean: a marine geologist's perspective
- 1342426 **Freeman-Lynde, R.:** Depositional processes and erosional episodes on the Bahama Escarpment

- 1345365 **Trincardi, F., Cattaneo, A., Ridente, D. & Verdicchio, G.:** Quaternary sequence stratigraphy of the Adriatic sea: the role of sediment advection and short-term sediment flux fluctuations
- 1343361 **Reijmer, J.J.G.:** Carbonate turbidites and debris flows: sea-level variations versus tectonic processes

REPORT AND COMMENTS

Aim of the symposium was to present the state of the art of the project started at the 32nd IGC in Florence in 2004 to **update, upgrade and implement the International Stratigraphic Guide**.

25 oral presentations were announced and 25 were given with just two exceptions, as will be explained later. A full list of the abstracts is here enclosed. All the abstracts can be found in the ISSC website (<http://users.unimi.it/issc/>) but are not included here, for brevity. The symposium lasted a full day (Friday August 8) and was well attended, with 50-100 participants, and people standing at times.

All the presentations lasted 15 minutes, so that there was practically no discussion time. The morning session was chaired by Cita and Finney. It started with a short presentation by Cita that briefly summarized the history of ISSC founded by H.D. Hedberg in 1952 and the importance of the International Stratigraphic Guide.

Cita also pointed out the enormous unprecedented advancements made in Stratigraphy in the last decades, resulting from the development of new techniques used in stratigraphic classification and from the exploration of the oceans, and ice caps by scientific drilling and of remote areas of our planet. Cita explained the significance of the “bottom up” approach followed in order to have the best results.

Two presentations were dedicated to Lithostratigraphy, the first approach to Stratigraphy, of special importance for geological mapping. Pratt presented the state of the art of the working group he is chairing and has an optimistic attitude toward usefulness and stability of lithostratigraphic subdivisions (lexicons or catalogues exist in the various countries). However, in vast, hostile remote areas as arctic Canada no formal Lithostratigraphy has been established yet. Schokker et al., presented a quantitative approach to lithostratigraphic units identified in the subsurface.

Then came Biostratigraphy. In absence of Thierry (chair of the biostratigraphy working group) who was unable to attend because of illness, Cita read the abstract submitted and then opened discussion on two critical points: chronozone and biozone. Palaeontologists have to realize that the first term is no more restricted to biota but is commonly used also for short duration isochronous units of different nature. As far as biozones are concerned, Pratt tends to simplify the categorization, but according to Cita, one has to recognize that different time intervals characterized by entirely different fossil groups have different necessities. For instance, in the Neogene first occurrences or last common occurrences or acme zones are commonly and successfully used for regional and global correlations. Becker insists that also for conodonts the nature of the biozone has always to be specified.

The following three presentations were dedicated to three new sub-disciplines of Stratigraphy. Strasser presented Cyclostratigraphy: excellent, clear, and concise already published in 2006 on Newsletters on Stratigraphy as first product of the ISSC program. Copies of the review paper were distributed and others are available c/o ISSC secretariat, upon request.

Weissert presented the Chemostratigraphy review and explained why he concentrated on isotope stratigraphy. C- and O-isotope geochemistry serves as powerful tools for stratigraphic correlation on a global scale. The Chemostratigraphy publication, is the second contribution of a series of planned ISSC papers, and it has been published on Newsletters on Stratigraphy in 2008.

Langereis presented the Magnetostratigraphy which is not published yet, but almost ready for distribution with three case studies (one for the Cenozoic, one for Mesozoic and one for the Paleozoic as requested).

Chronostratigraphy is the melting pot of all stratigraphies and will be written at the end of the project. The working group appointed in 2005 was chaired by ISSC chair Cita with Embry, Finney, Hilgen, Pratt, Thierry and Zalasiewicz as members. It will be chaired by Zalasiewicz in 2004-2008. Basic problems to be faced before finalizing the text include dual versus single nomenclature, and significance of chronozones. Five case studies specially selected to show the variety of criteria successfully used to define boundary stratotypes were presented as follows in stratigraphic order.

Zalasiewicz presented the Ediacaran, the first GSSP ever defined in the Precambrian, with multiple criteria, chronocorrelated in various continents and well accepted internationally (with a few exceptions in Russia and the Nordic countries).

Finney presented the Hirnantian, the youngest stage of the Ordovician system which corresponds to one of the “big five” extinctions events.

In absence of Thierry, Zalasiewicz presented the Pliensbachian, based on the publication in EPISODES. It is a typically “paleontological” definition, restricted to the basal part of the stage, which is one of the longest of the entire Jurassic.

Cita and Premoli Silva presented the K/T boundary which is an extreme example of event stratigraphy. One of the “big five” extinction events recorded both in terrestrial and marine environments, has been a hot topic for several decades (1960-1980). It seemed to be settled after the discovery of the Chicxulub astrobleme in Yucatan but controversies on dating of the Chicxulub impact continue. The importance of the deep-sea record, of Chemostratigraphy (iridium anomaly) and the prompt reaction of ICS to the scientific advancements were pointed out.

Hilgen presented the Miocene/Pliocene and Zanclean GSSP, also an example of event stratigraphy of regional, not global significance. The detailed integrated study of marine stratigraphic successions exposed all around the Mediterranean (Italy, Spain, Morocco, Greece) allowed to correlate them with biostratigraphy, magnetostratigraphy and astrocylostratigraphy. The boundary coincides with the sudden isochronous invasion of the Mediterranean by Atlantic water masses after its isolation and desiccation during the Messinian salinity crisis.

The morning session with its 12 presentations on various aspects of stratigraphic classification documented the progress of the ISSC project for the new edition of the Stratigraphic Guide.

The afternoon session was dedicated to the “hot” topic of sequence stratigraphy and was chaired by Kendall and Strasser.

Eight lectures were given each one presenting one or more case studies. In contrast with the morning session, which had a strictly stratigraphic character and where the protagonists were ISSC/ICS members, the afternoon session had a broader character and was attended by geophysicists, oil company managers and marine geologists.

Lerch et al., presented a 3D seismic model based on rock properties to investigate the Paleogene succession of the Gulf of Mexico.

Singh, et al., presented the results of their studies on the Cenozoic of North Texas.

Miller et al., interpreted with a sophisticated multidisciplinary approach, the transition from greenhouse to icehouse conditions in the Eocene/Oligocene succession of Alabama.

Suc et al., (presentation given by co-author Lericolais) showed the reaction of the Mediterranean margins to the unprecedented sudden unique sea-level drop (of 1500 meters) related to the so-called “Messinian salinity crisis” (see also Hilgen, Miocene/Pliocene boundary).

Two lectures given by Cita and Freeman-Lynde presented three case studies from the deep and steep passive margins of the Atlantic Ocean. The direct exploration by drilling (IPOD Leg 46a Cape Bojador) and by submersible exploration (Heezen canyon off Georges Bank and Bahamas

escarpment) documented gigantic hiatuses (of the order of 80-100 Ma) in the Cretaceous. Stratal geometries and erosional processes are incompatible with the modern paradigm of sequence stratigraphy as controlled by global sea-level change.

The last two lectures given in this long interesting, dense symposium similar to a “test of endurance” were by Trincardi, et al., (presented by co-author Cattaneo) on the process of sediment advection and short term fluctuations of sediment flux in the Quaternary of the Adriatic and by Reijmer on the tectonic versus eustatic significance of carbonate turbidites and debris flows (Bahamas versus Cretaceous of southern France).

2.3 Workshop WSS-11 *New developments in stratigraphic classification*, Sunday, 10 August 2008

The symposium was followed by a workshop on the same subject entirely dedicated to sequence stratigraphy. It was chaired by Kendall and Strasser. All the workshops were planned for Sunday August 10, and could be attended both by congress participants who subscribed to the first week, and by those who subscribed to the second week.

Trains were rare on Sunday, and the weather was rainy. This notwithstanding, the workshop was well attended (20-30 participants) and besides the specialists and those directly involved in the debate included ISSC and ICS officers as Finney, Pratt, Zalasiewicz, Weissert, Balini, Henderson, Premoli Silva, Menning, Melchin....

The presentations are listed below. The 30 minutes talks (some lasted longer) were followed by some discussion.

A general discussion followed which is reported in detail in the Minutes below.

In the near future, a new workshop is planned at the June 2009 AAPG meeting.

PROGRAM

- 1255505 **Kendall, C.:** Sequence stratigraphy provides a basic framework to conceptual models used to interpret depositional systems: the key to simplification of the complex terminology of sequence stratigraphy is to use simple depositional models
- 1287934 **Christie-Blick, N., Madof, A.S. & Pekar, S.F.:** Sequence stratigraphy: interpretation versus classification
- 1312997 **Catuneanu, O. & Posamentier, H.:** Stratal stacking patterns and key bounding surfaces: the basis for a standard system for sequence stratigraphic analysis
- 1316233 **Embry, A., Johannessen, E., Owen, D. & Beauchamp, B.:** Two approaches to sequence stratigraphic classification
- 1318229 **Neal, J. & Abreu, V.:** A simplified scheme to classify the surfaces and geometries of sequence stratigraphy: the accommodation succession method

2.3.1 Minutes of the ISSC Workshop on New developments in stratigraphic classification

WSS-11 at the 33rd International Congress, Oslo, Norway, August 10, 2008, 2 - 5.30 pm

These minutes below represent a record of the deliberations of the ISSC meeting and are not intended as a "Lutheran" set of edicts. Rather they show progress in understanding among the various proponents. Readers of these minutes should know that not all the listed participants were in the room during the entire workshop. The "votes on consensus" were made by the people present at the meeting at that time. Similarly the listing attendance is only of those who signed and others were present at the meeting were not listed.

The issues and conclusions of the meeting participants still remain controversial and may even be incorrect. They represent a working agenda that could form part of the focus of the discussion among the SEPM friends of sequence stratigraphy at the coming AAPG Denver that may be organized for next year.

Workshop moderator: Kendall, Christopher
Secretary: Strasser, André
Participants: Abreu, Victor
Beyer, Claus
Catuneanu, Octavian
Christie-Blick, Nick
Cita, Maria Bianca
Csaszar, Geza
Embry, Ashton
Finney, Stan
Freeman-Lynde, Raymond
Johannessen, Erik
Kurina, Ekatarina
Laursen, Gitte
Lerch, Chris
Menning, Manfred
Pratt, Brian
Räsänen, Matti
Reijmer, John
Weissert, Helmut

Background: Following the symposium HPS-12 on "New developments in stratigraphic classification", this workshop concentrated on sequence stratigraphy. The goal was to reach a consensus concerning sequence-stratigraphic nomenclature and definition of sequence-stratigraphic elements. The ultimate outcome should be a publication in the *Newsletters on Stratigraphy*, as for the other stratigraphic disciplines. This is part of an effort towards an update of the International Stratigraphic Guide as initiated by Maria Bianca Cita, outgoing chair of the International Subcommittee on Stratigraphic Nomenclature (ISSC) of the International Commission on Stratigraphy (ICS).

1. General procedure

We hope to determine common terms, standard hierarchy, and uniform methodology in sequence stratigraphy so users and teachers have a uniform understanding of this tool. At the same time we recognize that some interpretation is involved when naming a surface or a sedimentary package.

The classification proposed encompasses facies evolution, stratal geometries, and stacking patterns. Lateral *and* vertical relationships are to be considered. We recognized the importance of the lateral

continuity of a surface if it is to be of sequence-stratigraphic significance (as for example the unconformities displayed on seismic sections or wide-spread stratigraphic markers in outcrop). We recognized that in many cases the maximum-flooding surfaces are the most useful of correlation horizons.

All features used for interpretation have to be **observation-based**, whether using outcrop, core, well logs, and/or seismic sections. Systematic changes in the patterns that are correlatable and define an evolution of the sedimentary system are of prime significance.

Consensus 1: Start with observable features in outcrop, core, well-log, and/or seismic sections.

A **stacking pattern** is represented by vertical stacking of facies. All observational data that characterize facies evolution, including surfaces, have to be considered in the analysis. Geometries can be seen because of contrasts in fabric and facies (grain-size trend, lithological contrast, seismic discontinuity, well-log characteristics). This is valid for all scales.

The **lateral correlation** is based on the observation of the continuity of surfaces and/or facies pattern. Random surfaces and facies patterns are generally related to local processes, whereas consistent patterns probably have a sequence-stratigraphic significance. Lateral correlation is an iterative process that optimizes the observations (“objective description”). It is recommended that one should start with the large-scale features, then work down into the detailed ones.

Consensus 2: First describe the large-scale features of stacking and geometry to establish a framework, within which the details can be later worked on and added.

The procedure for defining stacking pattern and lateral geometries is strongly dependent on the type of data. As the identification of stacking patterns is an interpretive process and the procedure cannot be generalized, examples should be provided (in the form of figures) that demonstrate how the stacking patterns were identified. This is valid for all types of data and for all scales. Additional data (e.g., biostratigraphy, chemostratigraphy, magnetostratigraphy, radiometric ages) can be added at this or at a later stage.

2. Defining surfaces

Subaerial unconformities are identified by a break in sedimentation. They may truncate underlying strata, form incised valleys, display karst and palaeosol features, and/or show evidence of continental facies. Local subaerial exposure may be related to random processes, but a wide-spread extension is significant for sequence-stratigraphic interpretation.

Consensus 3: In order to have sequence-stratigraphic significance, a subaerial discontinuity must have an obvious lateral continuity.

Maximum-flooding surfaces are characterized by a granulometric change from fining-up to coarsening-up, a facies change from deepening-up to shallowing-up, enrichment in organic matter, high gamma-ray, hardgrounds, enrichment in certain minerals (P, Fe, Mn, glauconite), intense bioturbation, and/or downlap seen on seismic profiles. On a basin-scale, they define the turn-around from retrogradation to progradation. They generally indicate maximum condensation through sediment starvation. Maximum flooding may be expressed by a discrete surface, and/or by an interval of maximum condensation (possibly containing a series of surfaces).

Two opinions are expressed regarding the terminology:

- a. “Maximum-flooding surface” (MFS) is popular and should not be changed, although it already implies an interpretation related to relative sea-level change.
- b. “Maximum condensation surface or interval” is purely descriptive. Once the sequence-stratigraphic interpretation is established, it can become a MFS. However, condensed intervals also occur in other settings (e.g., top lowstand in the basin). On shallow platforms, maximum-flooding conditions are commonly not expressed by condensation but by maximum accommodation gain. The turn-around from retro- to progradation, however, is visible in grain-size and facies evolution.

No consensus is reached on this issue.

Ravinement surfaces occur in coastal environments and are expressed by an erosional break between underlying shallow-marine, intertidal, or supratidal facies and overlying marine facies. The overlying sediment package may have a coarse-grained base and fines (deepens) upward. These surfaces may, however, be difficult to identify in seismic sections since they have limited lateral extent.

Consensus 4: this definition of ravinement surface is accepted.

Maximum-regressive surfaces (= transgressive surfaces) form at the change of facies from coarsening-up to fining-up, respectively from shallowing-up to deepening-up. The same turn-around is expressed in the stacking pattern. These surfaces can be conformable but may also contain a hiatus. In some cases there is not a well-defined physical surface developed but the rapid turn-around indicates the position.

Consensus 5: this definition of maximum-regressive surface (= transgressive surface) is accepted.

Correlative conformities are prolongations into the basin of surfaces developed on platform, ramp, and slope. On seismic profiles, the reflectors can be followed and are important for basin analysis (although they may not be exact time lines). However, correlative conformities are not identifiable in outcrop or well log.

Consensus 6: this definition of correlative conformity is accepted.

A **basal surface of forced regression** cannot be identified in outcrop, nor in seismic sections and well logs. The term should be abandoned.

Consensus 7: “basal surface of forced regression” is not a good term and should not be used.

A **slope onlap surface** (*sensu* Embry) is difficult to define because surfaces on the slope may be created by slope failure, contour-current erosion, and other processes. The definition is not clear; at the most it could correspond to a sequence boundary (*sensu* Vail).

No consensus is reached on this issue.

3. Defining sequences

To define sequences, surfaces have to be correlated and boundaries have to be established. A sequence is a template, depending on and varying with the type of depositional setting and the type of sediment. The goal is to provide a generic definition that is applicable to the different types of sequences.

Consensus 8: a 1-day workshop is needed to work out the definition of sequences.

This workshop could be held in conjunction with the AAPG Meeting in Denver in June 2009.

The PP-presentations of Symposium HPS-12 concerning sequence stratigraphy may be sent to Chris Kendall to be put on his web site (<http://strata.geol.sc.edu/kendall.html>).

Andreas Strasser / Fribourg, Christopher Kendall/ Columbia, Maria Cita/ Milan, Brian Pratt/ Saskatoon, 25 August 2008

3. Reports from the OSLO 33nd IGC (August 2008)

3.1 ICS BUSINESS MEETINGS, Thursday 7 August – 17.30-18.45 pm



**INTERNATIONAL UNION OF GEOLOGICAL SCIENCES
INTERNATIONAL COMMISSION ON STRATIGRAPHY**

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AGENDA

ICS Business Meeting

Thursday 7 August 17.30 – 18.45 pm Tøyen Hovedgård, Oslo.

Opening of the Business Meeting of ICS and welcome (Gradstein)

Each Subcommittee introduces itself with its new main officers and gives a **2 minutes** overview of its activities and GSSP status (15 Sc's at 2 minutes each = 30 minutes); overall status of Phanerozoic GSSP slide on display (Ogg).

The Campanian-Maastrichtian boundary – proposal for ad hoc task force chaired by Prof. Andy Gale to revise and revitalize GSSP (Gradstein)

Announcements (Gradstein):

Stratigraphy, Terminology and Practice (Rey and Galeotti eds.)

Concise Geologic Time Scale 2008 (Ogg, Ogg and Gradstein)

Questions and Comments from the participants (chaired by Ogg)

Special ICS award (Gradstein)

McLaren and ICS Awards (Finney)

ICS 2008 – 2012, incl. planning for future ICS workshops (Finney)

Closing

Festive dinner for pre-registered participants, with live music (co-sponsored by ICS, NHM and TSCreator).

3.1.1 Report by Brian Pratt

The business meeting was convened during the late afternoon and early evening at the historical Tøyen Hovedgård (Tøyen Estate) which was bought by King Frederick VI in 1812 and donated to the newly established university of Christiania, as Oslo was then known. Often used by royalty and university dignitaries, the newly renovated building was a fine venue for the group of about 60 attendees.

Felix Gradstein opened the meeting and welcomed everyone. Then, the activities and future plans of the ICS subcommittees were briefly outlined by a representative from each. There were other announcements, such as the availability in English of the Rey & Galeotti book on

stratigraphic methods, and the concise Geologic Time Scale 2008 which is abridged and updated from the seminal 2005 volume.

Felix then presented a special ICS award to Maria Bianca Cita, commending her for her tireless devotion to ISSC.

Stan Finney, incoming chair of ICS and chair of the ad hoc committee on stratigraphy awards, presented the Digby McLaren and ICS prizes to Carlton Brett and József Pálffy, respectively. Both were there to receive their awards.

There followed some discussion about the next IGC and the need to start planning for future ICS workshops.

The meeting was adjourned so that attendees could enjoy a delicious buffet dinner (prepared by the royal cooks?) and a wide selection of fine wine fit for a king (no, not from his cellars but smuggled into Oslo by the attendees themselves). This was accompanied by an excellent jazz band. It was a rewarding meeting and convivial evening.

3.1.2 ICS Stratigraphy Prizes Awarded (from Episodes, September 2008)

At the 33rd International Geological Congress in Oslo, the International Commission on Stratigraphy (ICS) awarded the Digby McLaren Prize to Prof. Carlton E. Brett and the ICS Prize to József Pálffy. These prizes were established by ICS in order to emphasize the key role of stratigraphy in the full range of geologic studies.

Prof. Brett of the University of Cincinnati, Ohio, USA received the Digby McLaren Prize in recognition of his many important contributions to stratigraphy throughout his career. He has produced a prodigious quantity of articles, edited books and guidebooks covering an enormous range of stratigraphic subject matter. His most significant research contributions involve the integration of field geology, sedimentology, paleontology, paleoecology and taphonomy, within the tectonic framework of the depositional basin. Not limited to nearly 200 specialist papers, using his fine understanding of the concepts of lithostratigraphy, biostratigraphy and sequence stratigraphy he has instituted fundamental revisions to the basic stratigraphic architecture of the Ordovician, Silurian and Devonian of eastern North America, areas first studied a century and a half ago but still replete with uncertainties that have required his unique talents to solve. Dr. Brett is recognized also for the many students that he has trained to become excellent stratigraphers.

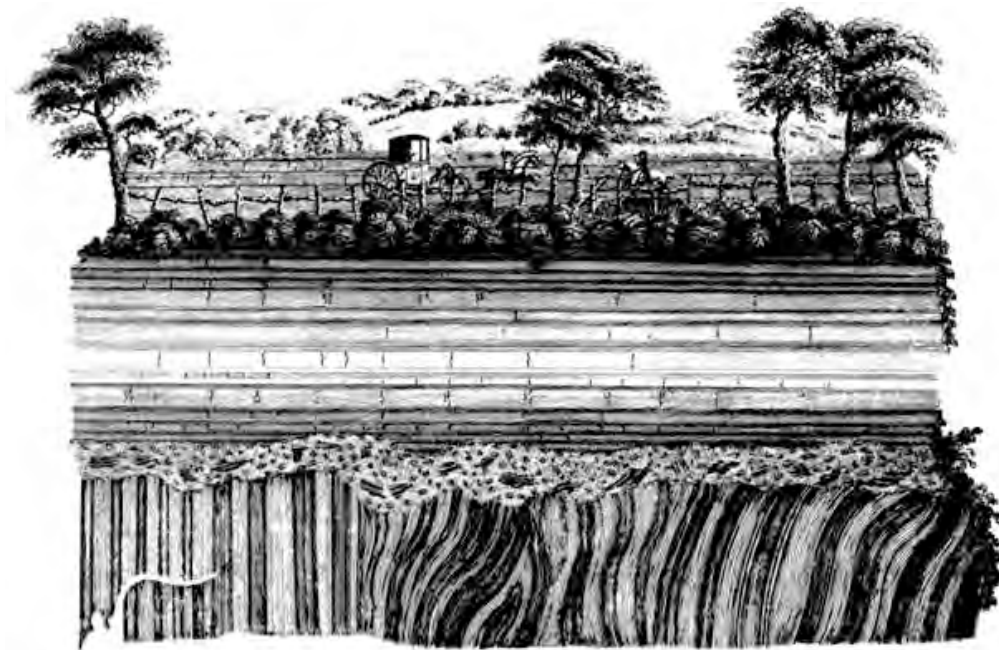


Prof. Carlton E. Brett, University of Cincinnati, Ohio, USA

Dr. Pálffy of the Hungarian Natural History Museum in Budapest, Hungary received the ICS Prize in recognition of a series of fundamental contributions to the Triassic and Jurassic portion of the geologic timescale. An experienced stratigrapher and versatile paleontologist, Dr. Pálffy led the integration of biostratigraphy, geochronology, magnetostratigraphy and chemostratigraphy to generate a highly refined understanding of the lower half of the Mesozoic. For example, his 2000 paper in *Canadian Journal of Earth Sciences* is a milestone for the calibration of Jurassic time. His integration in turn has opened the door to explore global phenomena like perturbations of the carbon cycle and mass extinction, especially at the Triassic/Jurassic boundary. In this regard, his 2001 paper in *Geology* and his 2007 paper in the thematic issue of *Palaeogeography, Palaeoclimatology, Palaeoecology* devoted to the boundary stand out as seminal contributions.



Dr. József Pálffy, Hungarian Natural History Museum, Budapest, Hungary



Hutton's unconformity at Jedburgh, southeastern Scotland, 1787. Vertically dipping beds are Dalradian greywacke schists of Cambrian age, and the horizontal strata belong to the Old Red Sandstone

3.1.3 ICS Special Service Award to Maria Bianca Cita by Felix Gradstein

At the occasion of the 7 August 2008 ICS Business Meeting and festive dinner, Prof. Maria Bianca Cita received the ICS Special Service Award from the hands of Felix M. Gradstein, Chair of ICS from 2000 – 2008.

The special occasion took place at the exquisitely restored 17th century Meeting and Reception Centre of the Museum of Natural History, University of Oslo, Norway. A great many current and incoming ICS Subcommission Chairs and Secretaries, the old and new ICS executive, and specially invited guests attended the ceremony.

Professor Maria Cita, is one of the longest standing officers of ICS, and has a truly outstanding stratigraphic science and ICS service record. Few geoscientists have achieved so much as she did in her remarkable career as distinguished educator, outstanding researcher, skilled science politician and excellent and charismatic leader of the International Subcommission on Stratigraphic Classification (ISSC).

To start with the latter: Under her clear guidance the ISSC achieved a milestone in the form of the outstanding consensus document and publication of the theory and application of cyclostratigraphy. Not surprising, she reported in 2007 that sequence stratigraphy is not getting a consensus publication soon on principles and practise. This reflects, in the opinion of undersigned, the muddled state of sequence stratigraphic applications, which often confuse sequence and chronostratigraphy. On a better note, ISSC is on its way to achieve what is needed: A web-based, interactive, colour version of the International Stratigraphic Guide. Maria clearly set the path towards this major goal with her active management of good specialty groups in stratigraphic classification; her frequent newsletters did a good job in pulling ISSC in the right direction.

Maria, as few others saw what was needed to get a better scientific balance in the often irrational debate (that was politicized by IUGS to the detriment of stratigraphy as a science), on the definition and ratification of Latest Cenozoic international and regional chronostratigraphic units. The publication of the target and/or established definition of the classical Mediterranean stages Calabrian, Sicilian, Ionian and Thyrenian, also under the auspices of the Italian Commission on Stratigraphy is a very important achievement. Well done! Boundary stratotypes and unit stratotypes are both important, a fact sometimes forgotten in the urge to get to stable GSSPs.

The one thing that many of us always have come to appreciate and admire in the scientist Maria Cita is her long view of issues, bringing together different views, listening to a wide scale of opinions, and then forging consensus. Her scientific charisma is a special gift. Having educated several generations of excellent stratigraphers truly has been her forte also.

Maria Bianca Cita had the good fortune and inspiration to become directly and closely associated with the unravelling of the ‘Messinian salinity crisis’ in the Mediterranean. That is what geoscientists outside of stratigraphy probably associate her with. For us, stratigraphers, Maria is the towering pillar of fundamental and practical knowledge of our science, with a knack to get it done. And yes she did! ICS sends its warmest regards to an outstanding scholar.

Felix M. Gradstein, Past–Chair of ICS, Oslo, 5 November 2008 (a good day to remember!)



Professor Emerita Maria Bianca Cita, University of Milan, Italy

**3.2 Symposium HPS-07 *Plio-Pleistocene Correlation and Global Change*,
Saturday 9 August, 2008
Report and comments by M.B. Cita**

A full day symposium was organized jointly by the International Commission on Stratigraphy (represented by ISSC chair M.B. Cita, from Italy) and by INQUA (represented by B. Pillans, Australia, chair of the Commission on Stratigraphy and Chronology)

PROGRAM

- Cita, M.B.:** Presentation of the Symposium: background and motivation
- 1257080 **Nikolsky, P.:** Siberia mammoth, climate and late Pleistocene extinction
- 1318592 **Magri, D.:** Adaptation, migration, extinction of biota in response to climatic change
- 1321098 **Kuzmin, M.:** Changes of the environment in the Central Asia reconstructed from deep sedimentary records obtained from Lake Baikal
- 1322377 **Oberhaensli, H.:** Lake Baikal, a continental archive registering the Pliocene climate change
- 1352229 **Prokopenko, A.:** Paleoclimate record from Lake Baikal: A link between marine and terrestrial Plio-Pleistocene
- 1322307 **Ding:** Plio-Pleistocene climate history over north-central China. Records from loess deposits
- 1323687 **Orombelli G. et al:** Quaternary stratigraphy and ice cores
- 1348485 **Naish, T. et al.:** Antarctic climate evolution during the Quaternary (last 2.6 Ma) from continental margin, Southern Ocean and ice cores records
- 1308985 **Sarnthein, M. et al.:** Pliocene oxygen isotope records of the onset of Northern hemisphere glaciation and the origin of Quaternary-style climates
- 1344344 **Khelifi, N., Sarnthein, M. et al.:** Pliocene changes in Mediterranean outflow water before and after Gibraltar
- 1324508 **Oregan, M., Backmann et al:** Constraining the Plio-Pleistocene stratigraphy of the Lomonosov ridge, central Arctic Ocean
- 1383908 **Leroy, S. :** Progress in palynology of the Gelasian-Calabrian stages in Europe: recognising trends, cycles and events
- 1322887 **Clague, J., Fraser, S.:** Louis Agassiz and the theory of the Ice Ages
- 1344085 **Hilgen, F., Aubry M-P. et al. :** The case for the undecapitated Neogene
- 1342201 **Head, M.:** The Quaternary: its character and definition
- 1345525 **Langereis, C., Hilgen, F.:** The Plio-Pleistocene marriage of magnetostratigraphy and cyclostratigraphy
- 1323894 **Lourens, L. :** On the Neogene-Quaternary
- 1342897 **Pillans, B.:** Where is the base of the Quaternary?
- 1342235 **Head, M.:** The Early- Middle Pleistocene transition: characterization and proposed guide for defining boundary
- 1345533 **Ciaranfi, N. et al:** The Ionian stage in Southern Italy
- 1261079 **Pillans, B. Cita M. B.:** Global stages, regional stages or no stages for the Plio/Pleistocene?

Poster presentations

- 1346094 **Israde-Alcantara et al.:** Climatic and tectonic significance of Neogene-Quaternary lacustrine diatomites in Central Mexico
- 1337903 **Doar, Kendall et al.:** Late Pleistocene to Holocene coastal marine terranes and sea level curves etc.: is the 125 ka high-stand the only higher present event?
- 1340594 **Tamura, I. et al.:** Plio-Pleistocene tephrochronology in central Japan
- 1341992 **Bertini A., Ciaranfi, N., et al.:** Proposal for Pliocene and Pleistocene land-sea correlations in the Mediterranean Area

REPORT AND COMMENTS

Purpose of the symposium, suggested by ISC chair Gradstein in 2006, when the escalation of the quarrel between IUGS, ICS and INQUA started to develop, was to present to the public, with a large interdisciplinary approach some of the important, novel, in part unexpected scientific results that have to be considered prior to make a long desired, possibly non controversial decision on the significance and duration of the Quaternary.

The symposium program included 21 oral presentations and four posters.

Most presentations were invited, but several were contributed.

The invited lectures were selected one by one by the conveners in order to present a wide global multifaceted scenario showing the major scientific advances obtained in the last thirty years or so by drilling in the all the oceans, by drilling through the existing ice caps all the way to the rocky basement, by drilling in endoreic lakes located in the largest continental area of our planet where continuous subaqueous deposition occurred throughout the interval considered. Vegetational reactions in response to rapid climate change, migration of vertebrates, loess deposits, spectacular inter hemispheric correlations recorded in ice cores and the marine record where isotopic stratigraphy provides the best tool to identify and correlate the astronomically controlled Milankovich cycles were presented in a series of lectures of interesting, some of them top quality talks.

From Siberia all the way to the Antarctica and back to the North Pole, the first 12 lectures (see list of presentations) gave an excellent documentation of the fundamental advances

A turning point of the symposium was represented by the talk given by John Clague (Canada), past chair of INQUA, who spoke about Louis Agassiz and the theory of ice ages (this was an assigned commitment).

The abstracts submitted to the Congress are not reproduced here for brevity, but those of you who are interested and were not present in Oslo may find them in the ISSC website.

At the beginning the conveners Cita and Pillans were close to panic, because of the small number of persons present in the assigned room, at 8.30 and decided to wait until there were twenty scientists in the room. Meanwhile they were alerted by the personnel that on Saturday the train from Oslo to Lillestrom runs much less frequently than on working days and all the sessions shared the same problem. So, we waited until 9 am and the room was full and so stood ?????, all the day. Unfortunately, the limited time allocated for discussions disappeared. All presentations had duration of 15 minutes, including question time.

The posters were visited and discussed during the lunch break.

The afternoon session was dedicated to papers presenting personal or institutional positions on the definition, duration, internal subdivisions of the Quaternary. It has to be mentioned here

- 1) that during the INQUA Congress held in Cairns (Australia) in 2007 a consensus was reached to extend the base of the Quaternary, coincident with the base of the Pleistocene, to the Gelasian GSSP

- 2) that a special issue of Episodes was published just prior to the Oslo Congress and distributed to all the congress participants. This special issue is entirely dedicated to the Quaternary and edited by Phil Gibbard, chair of the ICS subcommission on the Quaternary and by Brad Pillans, chair of the Stratigraphy and Chronology Commission of INQUA
- 3) that several papers published in the special issue were also presented at Symposium HPS-07(see below)
- 4) that Hilgen had published on Newsletters on Stratigraphy the paper on what he calls the “under capitated Neogene” presented at the symposium as well as at the public discussion meeting

The eight papers dealing with status, duration and internal subdivisions of the Quaternary started with the Hilgen et al paper arguing for the extension of the Neogene to the present.

My comment here is that the SNS subcommission that Hilgen chairs never took this position before 2004. First chair of SNS was Selli, followed by Senes, followed by Steininger as acting chair, followed by Cita, followed by Rio, followed by Zachariasse, and during all this time (over thirty years) the Neogene included Miocene and Pliocene. The first Neogene stage to be formally recognized with a GSSP, starting from top down, when the definition was considered mature and with the previous (informal) approval by the ICS chair, was the Gelasian.

The second lecture by Martin Head et al, the fourth one by Lourens, the fifth one by Brad Pillans, and the sixth one by Martin Head, Brad Pillans and S.A. Farquhar were all published on Episodes, and beautifully presented here.

Something not particularly new, but presented in a brilliant and attractive way was the presentation by Cor Langereis on the Plio-Pleistocene marriage of magnetostratigraphy and cyclostratigraphy.

Beyond any doubt this combination has the best global correlation potential in the deep marine sections but is also applicable in terrestrial sections, if sedimentation is continuous.

Then Ciaranfi presented the state of the art on the investigations on the Montalbano section, proposed as middle Pleistocene (regional ?) stage, but potentially usable worldwide.

The last talk by Cita and Pillans argued for the use of stages as basic units in Chronostratigraphy (the only category defined on typological criteria), in contrast with the contention by a number of specialists working on continuous marine or non marine successions with high resolution (numerical code).

The cyclically bedded, astronomically controlled successions exposed in Sicily and Calabria already shown in several previous lectures by various authors allow to understand the path that a field geologist/stratigrapher has to follow, step by step, for the definition of a TIME/ROCK UNIT OF GLOBAL SIGNIFICANCE. Once identified and measured the best outcrop, sampling and identification of lithostratigraphic boundaries, identification of biostratigraphic markers (at least planktonic foraminifera and calcareous nannofossils) follow. Magnetostratigraphy and chemostratigraphy comes next, if the signal is good. Cyclostratigraphy comes last, being based on the interpretation of cyclically repeated lithologic changes or changes in physical properties. In other words, if stages are usable and used for the Pliocene, the same is true also for the Pleistocene as long as there are expanded, open marine, fossiliferous successions properly investigated and correlated, to be proposed as standard.

As a general comment, the Symposium was well conceived, well attended and very informative. We learnt a lot. We appreciated to have the protagonists of the drilling campaigns

carried out in the last season in Antarctica (ANDRILL project) and at the Lomonosov Ridge of the central Arctic Ocean sharing with us the results of their new discoveries.

We do hope that the decision-making bodies will consider all this.

The Symposium HPS-07 was followed at 5.30 by a public session on the Quaternary, held in the same building, chaired by Stan Finney (chair of ICS) and John Clague (past-chair of INQUA). A special issue of the INQUA journal *Quaternary International* is planned to publish a collection of the papers presented at the Oslo Congress. A call for papers was launched by the conveners in September.

3.3 Redefinition of the Quaternary and Pleistocene: Open discussion, 9 August

33rd International Geological Congress, Oslo, Norway

Redefinition of the Quaternary and Pleistocene: Open Discussion

Open Meeting • 9 August 2008

Stanley C. Finney, *vice-chair and chair-elect of the International Commission on Stratigraphy (ICS-IUGS)*,
scfinney@csulb.edu

John J. Clague, *past-president, International Union for Quaternary Research (INQUA)*,
jclague@sfu.ca

The Quaternary is a system/period with its base coinciding with that of the Pleistocene series/epoch and is defined by the Global Stratotype Section and Point (GSSP) at Vrica, Italy, which has been dated at ca. 1.806 Ma. In the late 1990s and again today, many Quaternary scientists have argued that the boundaries of these units should be redefined to coincide with the GSSP for the upper Pliocene Gelasian Stage, which has been dated at ca. 2.588 Ma. This proposal has been resisted by those who prefer that the definitions remain unchanged and others who propose that the Quaternary System/Period be eliminated and that the Neogene be extended upward to include the Pleistocene and Holocene. Others even wish to reinstate the Tertiary.

These issues are contentious and controversial, but they must be settled if the upper and recent parts of the International Stratigraphic Chart and Geologic Time Scale, respectively, are to be finalized and given permanent stability. Now is the time to settle them. Accordingly, a special two-hour meeting will be held at the International Geological Congress (IGC) in Oslo to hear positions on all sides of the issues. All IGC attendees who wish to contribute to or observe these discussions are welcome. Proponents wishing to present positions at the meeting should contact either of the co-chairs, who will organize the discussion to ensure that all major positions and arguments on the issues are presented. Following this discussion meeting and extensive collaboration at the IGC, the International Commission on Stratigraphy will develop a plan to receive formal proposals for stratigraphic revisions and will move forward expeditiously with their consideration and evaluation.

This open evening meeting will directly follow Symposium HPS-07 (Pliocene-Pleistocene correlations and global change). The science presented in that symposium will be a basis for positions and arguments in the discussion meeting.

3.3.1 Report by Stan Finney and John Clague

Many Quaternary geologists want to redefine the Quaternary System/Period and Pleistocene Series/Epoch so that their bases are lowered to that of the GSSP that defines the base of the Gelasian Stage, presently the highest stage in the Neogene System/Period and Pliocene

Series/Epoch. The purpose of the open discussion session at the 33rd IGC was to allow various parties to present all positions on this issue. The meeting took place from 5:30–8:00 pm, 9 August. Three very different positions were presented and the meeting concluded with several contributors making brief statements with regard to their positions. The meeting was chaired by Stanley Finney (Chair, ICS) and John J. Clague (Past-President, INQUA).

Alan Chivas, the President of INQUA, Brad Pillans, the President of the INQUA Commission on Stratigraphy and Chronology, and Phil Gibbard, the Chair of the ICS Subcommittee on Quaternary Stratigraphy, made three short presentations in succession in which they argued for redefining the Quaternary and Pleistocene to the base of the Gelasian Stage. They have several reasons for this position. Primarily, a majority of the community of Quaternary geoscientists desire that the beginnings of the Quaternary and Pleistocene be defined at the first significant clustering of cooling events initiating the Plio-Pleistocene icehouse conditions that began at 2.7 to 2.4 Ma – well before the time of deposition of initial Pleistocene/Quaternary strata as presently defined by the Vrica GSSP, a stratigraphic level that has been dated at 1.8 Ma. The Monte San Nicola GSSP dated at 2.588 Ma, which defines the base of the Gelasian Stage, occurs at the approximate mid-point of the initial cooling and close to the Gauss-Matuyama Chron boundary; thus it serves as a globally correlative chrono-horizon at which to redefine the base Quaternary and base Pleistocene so that the Quaternary and Pleistocene include the full extent of stratigraphic successions that record icehouse conditions with which they are synonymous to vast numbers of geoscientists. Questions were raised as to whether or not it was acceptable to use the term Plio-Pleistocene to refer to the time of Icehouse conditions, rather than to redefine the Pleistocene and Quaternary. Also, it was pointed out that cooling events preceded the time represented by the Monte San Nicola GSSP, and the question was raised as to the possibility that the Quaternary community would again want to lower the Quaternary and Pleistocene to one of these lower levels at some future time. Gibbard replied that because the earlier cooling events were few and isolated, that because the dramatic cooling trend occurs between 2.7 and 2.4 Ma, and that because the Monte San Nicola GSSP is a globally correlative horizon, the Quaternary community had confidence in this level as the best choice for the boundary. In addition, it was a level that many Quaternary geoscientists had wanted for two or more decades. It was agreed that, should the Quaternary and Pleistocene be redefined at this level, the desires of the Quaternary community would be met and the community would move on to other matters, satisfied with the stability the redefinition would bring. Finally, Gibbard stated that Plio-Pleistocene was used only because the Vrica GSSP marked a point within the time of Icehouse conditions; thus requiring a two part term, whereas redefinition would better fit the general consensus of the terms Pleistocene and Quaternary.

Gian Battista Vai, a former member of the Quaternary and Neogene subcommissions, argued that the Quaternary and Pleistocene should not be redefined. As defined by the Vrica GSSP, they have been used for more than 20 years, and the boundary is reliably correlated worldwide with no significant deficiencies. Thus, the concept of the Quaternary and Pleistocene and their lower boundary have remained stable, which is the primary reason for defining chronostratigraphic units with GSSPs. Vai contended that redefinition of such well defined, long defined, and reliably correlated units would lead to initiatives to redefine other already defined chronostratigraphic units. Vai was asked if his position means that no unit can ever be changed after it is defined by a GSSP and if all decisions are perfect. He was also asked why a significant community of geoscientists can not change a unit on which their work is concentrated if the large, global community, the community that most uses the unit, desires that such a change be made.

Randall Orndorff of the United States Geological Survey also argued against redefinition of the Quaternary and Pleistocene. Orndorff is Program Coordinator of the USGS National Cooperative Geologic Mapping Program. The USGS has been making maps with the extent of the Quaternary and Pleistocene being that defined by the Vrica GSSP and used for more than 20 years. Accordingly, to change that definition would mean that the maps would be outdated. Orndorff was asked if it was not the case that the concept of other chronostratigraphic units (e.g. Silurian, Devonian) changed as they were defined formally by GSSPs, and he was also asked how significant the impact on existing maps would be, given that the USGS tended to map lithostratigraphic units, not chronostratigraphic units.

Marie-Pierre Aubry, a voting member of both the Paleogene and Neogene subcommissions, presented a very different position. She argued that the cooling of the Earth began in the Miocene and that the period of Earth history from 23 Ma to the present is characterized by trends in climate change and by evolution of organisms (e.g. horses) that give a distinctive character to the last 23 million years, i.e. to the Miocene, Pliocene, and Pleistocene. Therefore, she argued that this interval should be referred to as the Neogene, that the Neogene should extend to the present, that the Quaternary should be eliminated as a formal chronostratigraphic/geochronologic term, and that the Pleistocene should remain as it is defined by the Vrica GSSP. Aubry was asked if it mattered whether the last 23 million years was referred to as Neogene or as Neogene and Quaternary.

Frits Hilgen, chair of the ICS Subcommittee on Neogene Stratigraphy, also argued for extending the Neogene to the present. His opinions were that the Neogene was widely used as extending to the present, that the original definition of the Neogene included the Pleistocene and possibly the Holocene, that the Quaternary community had an ongoing campaign to transfer more and more of the Pliocene to the Quaternary and that this campaign would not stop at the base of the Gelasian, and that redefining the Quaternary and Pleistocene would redefine the Neogene and Pliocene. He argued that biostratigraphic records and astronomically tuned sedimentary cycles demonstrated a more or less continuous record from the Miocene to the Pleistocene that should not be subdivided at the system/period level. He also argued that, in lowering the boundary of the Quaternary/Pleistocene to include the full extent of the Icehouse conditions, the units were being used as climatostratigraphic units rather than as chronostratigraphic units. It was pointed out to Hilgen that until 2004 a stratigraphic chart on the covers of the newsletters of the Neogene Subcommittee showed only the Neogene as composed only of the Miocene and Pliocene and not the Pleistocene. It was also pointed out that the base Gelasian is a chronostratigraphic horizon and thus using it to define the Quaternary and Pleistocene ensures that these units are chronostratigraphic.

After Hilgen, a number of participants made brief presentations. Manfred Manning of the German stratigraphic commission stated that the position of the German commission is that the Quaternary and Pleistocene begin at 2.55 Ma.

Yuri Gladenkov, a member of the Paleogene Subcommittee and the Russian stratigraphic community, argued that the Pleistocene and Quaternary units as defined by the Vrica GSSP are stable, that the Russians have been using them as so defined for two decades, and that no decision should be made without more time for consideration.

Koji Okumura, Vice-President of INQUA, stated that the Japanese Quaternary community was nearly unanimous in wishing the base of the Quaternary to be placed at ca. 2.6 Ma.

Jan Zalasiewicz, Chair of the Stratigraphy Commission, Geological Society of London, stated that the Stratigraphy Commission favoured redefining the base of the Quaternary and base Pleistocene to the base Gelasian GSSP.

Kim Cohen of Utrecht University supported moving the bases of the Quaternary and Pleistocene to the base Gelasian GSSP.

Jan Piotrowski, University of Aarhus, Denmark, and Freek Busschers, TNO-Deltares, Netherlands, also supported the INQUA position.

3.3.2 Report by Maria Bianca Cita

The meeting was attended by several dozen scientists of many nationalities and lasted from 5.30 to 8.00 pm. During this time, after a short presentation by conveners, seven short announced talks were given, followed by seven unannounced free contributions, as follows:

Alan Chivas (Australia), president of INQUA, argued for redefining the Quaternary and Pleistocene with their base coinciding with the Gelasian stage GSSP. A unanimous vote on this issue was expressed at the 2007 INQUA Congress in Cairns.

Brad Pillans (Australia) president of INQUA Commission on Stratigraphy and Chronology presented a supporting proposal.

Phil Gibbard (UK) president of IUGS Subcommittee on Quaternary Stratigraphy (SQS) presented the same view.

It has to be pointed out that the INQUA proposal and the SQS proposal had been presented also at the HPS-07 Symposium and were published in the special issue of EPISODES edited by Gibbard and Pillans and entirely dedicated to the Quaternary that was published just prior to the Oslo Congress, and distributed to all the congress participants.

Gian Battista Vai (Italy) presented a different view. For sake of stability he insisted that the Quaternary and Pleistocene must not be redefined, and the Vrica GSSP as first approved by INQUA in 1982 as Plio/Pleistocene boundary should be kept.

Randall Orndorff (USA) presented the point of view of the US Geological Survey that currently uses the extent of Quaternary and Pleistocene, as defined more than 20 years ago and formally accepted by IUGS.

Marie Pierre Aubry (USA) presented a different view point arguing that the Quaternary has climatostratigraphic significance, and that cooling started much earlier. She strongly supports the extension of the Neogene to the present and considers the Quaternary an informal unit.

Frits Hilgen (Holland), president of the IUGS Subcommittee on Neogene Stratigraphy (SNS) presented the same talk given a few hours before the Symposium HPS-07, where he proposed the extension of the Neogene to the present and considers the Quaternary an informal unit.

At this stage of the game, it was apparent that no consensus could be reached on the spot, since not only the Neogene and Quaternary subcommittee of the International Commission on Stratigraphy had opposite positions, but that a third party appeared, which pretended that nothing could be changed, notwithstanding the large scientific, institutional, international support.

During the remaining time (half an hour) seven free interventions were given as follows:

Manfred Menning (Germany) strongly supported the option to keep the Quaternary as formal Chronostratigraphy unit with the rank of system/period, and to lower its base to 2.6 Ma

(Gelasian GSSP). The German Commission on Stratigraphy is unanimous in this position. Moreover, a survey of all the existing geologic maps published in Summary shows that the Quaternary is always represented and that the Neogene extends to the present.

Yuri Gladenkov (Russia) was in favor of keeping the Vrica GSSP as base Quaternary, and no decision should be made without more time for consideration.

Koji Okumara (Japan) vice-chairman of INQUA, stated that the Japanese Quaternary community was nearly unanimous in wishing the base Quaternary at 2.6 Ma.

Jan Zalasiewicz (UK) chair of the British Stratigraphic commission stated that the commission supports the base Gelasian as base Quaternary.

Kim Cohen (Holland) support he base Gelasian GSSP.

Jan Piotrowsi (Denmark) shared this position, as did.

Freek Busshers (Holland)

Talking with a number of participants to the meeting afterword, I found a general sense of disappointment. Science is advancing much faster than in the past, as shown by the contributions presented at the Symposium HPS-07 and the world is changing at an incredible rate. Quaternary Science is extremely important, and to waste so much time and energy for quarrelling about terminological problems seems insane to me.

4. ICS Executive Meeting at the GSA in Houston, October 2008 Based on report by Stan Finney

ICS chair Stan Finney, vice-chair Shanchi Peng and secretary-general Paul Bown met in Houston, Texas during the Geological Society of America Annual Convention. Peter Bobrowsky, secretary-general of IUGS, joined the group for lunch. Brian Pratt, incoming chair of ISSC, and former ICS secretary-general Jim Ogg attended part of the meeting.

Peter Bobrowsky reported on the potential for ICS to receive a significant increase in its support budget. An increased budget will allow ICS to hold a workshop in Spring 2010. Such workshops normally include only subcommission chairs but a significant increase in funding may allow ICS to sponsor also the vice-chairs and secretary of each subcommission. The first priority for any budget augmentation will be to support work by subcommissions and their boundary working groups on pending GSSPs. Support can also be allocated for new initiatives for those subcommissions that have completed GSSPs for all their stages.

In return for increased support, the IUGS executive committee asks that ICS and its subcommissions establish more obvious ties and linkages with IUGS, such as: using the IUGS logo as well as the ICS logo on all products; publishing subcommission products, when possible, with the Geological Society of London, the official IUGS publication outlet, and in *Episodes*; developing new initiatives (new or revitalized projects); and planning major products (publications, correlation charts, etc.) in 2010 as part of the 50-year anniversary of IUGS. Consequently, ICS subcommission members need to give serious thought to developing new initiatives as soon as possible.

Changes to the ICS website were discussed and a significant re-design is planned, probably using the Neogene Subcommission website as a model. The other subcommissions might consider re-designs along this line. Fan Junxuan of Nanjing Institute of Geology and Palaeontology has been appointed the new webmaster for ICS.

The Subcommission on Stratigraphic Classification (ISSC) is producing educational articles on each of the subdisciplines of stratigraphy (Lithostratigraphy, Biostratigraphy,

Chronostratigraphy, Magnetostratigraphy, Chemostratigraphy, Cyclostratigraphy, and Sequence Stratigraphy). A special workshop at the 33rd IGC in Oslo was devoted to sequence stratigraphy which continues to be controversial. ISSC is directed to take the lead in a consideration of other issues, namely: (1) the dual use of Stage for both chronostratigraphic and geochronologic units, in place of Age; (2) the question of a single versus a dual stratigraphic terminology as proposed by the stratigraphic commission of the Geological Society of London; and (3) the production of a blanket "Suggestions to authors and editors" article that provides suggestions and examples of best usages of stratigraphic terminology that can be adopted all journal editors to ensure consistent adherence to stratigraphic nomenclature and practice.

The highest priority is to maintain progress on approval of GSSPs. At this time, the Neogene and Quaternary subcommissions are considering two very different proposals to redefine the Quaternary, Pleistocene, Neogene and Pliocene. Depending on the vote of the two subcommissions, one or both proposals will come forward to ICS for approval. This long contentious issue needs to be settled soon, but it must be done through a procedure of careful consideration and deliberation, as well as ballots.

It is also hoped that ICS will soon consider a GSSP proposal for the base of the Jurassic System and the Hettangian Stage.

The GSSP proposal for the base of the Upper (Late) Pleistocene was not approved by the IUGS executive committee. If significantly revised, likely it can be approved following resubmission. It appears that the IUGS executive committee will be expected to examine GSSP proposals more critically than in the past to ensure that they meet all guidelines. Alberto Riccardi, former chair of ISSC, an ammonite biostratigrapher and long-time member of the Jurassic subcommission, is the new President of IUGS. Although he may look critically at GSSP proposals, he is very supportive of ICS and wants ICS to be a most visible entity within IUGS.

5. State of the art of the ISSC PROJECT *NEW DEVELOPMENTS IN STRATIGRAPHIC CLASSIFICATION* (as of end October 2008)

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.

Weissert H., Joachimski M., Sarthein M., 2008. Chemostratigraphy. Newsletters on Stratigraphy 42(3), p. 145-179.

Task Groups

CYCLOSTRATIGRAPHY

Leader: Andreas Strasser, Switzerland, andreas.strasser@unifr.ch

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Philip Heckel, USA 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 42(2), p. 75-114.

SEQUENCE STRATIGRAPHY

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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.

Second revised version rejected by an ad-hoc international review committee of five experts chaired by Chris Kendall. Gianolla has not contributed to this version.

Task Group disbanded.

A new group has been appointed by the ISSC Officers at Oslo:

Leader: Octavian Catuneanu, Canada, octavian@ualberta.ca

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Outline in preparation.

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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 published: Weissert H., Joachimski M., Sarnthein M., 2008. Chemostratigraphy. Newsletters on Stratigraphy 42(3), p. 145-179.

Working Groups

BIOSTRATIGRAPHY

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Outline distributed in ISSC Newsletter 9 (June 2006).

Comments received and distributed in ISSC Newsletter 10 (November 2006)

Full text not arrived yet.

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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 and to be finalized and disseminated to ISSC members as soon as possible.

LITHOSTRATIGRAPHY

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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

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Manfred Menning, Germany, menne@gfz-potsdam.de

Outline distributed in ISSC Newsletter 12 (December 2007).

Comments received and forwarded to the leader. Available in the ISSC archive kept by the secretary Maria Rose Petrizzo.

Full text will be distributed in November 2008.

6. NEWS and ANNOUNCEMENTS

6.1 Sequence Stratigraphy and the Canadian Society of Petroleum Geologists

Ashton Embry, previous Vice-Chair of ISSC and staff scientist with the Geological Survey of Canada, has been publishing a series of informative essays entitled "Practical Sequence Stratigraphy" in *The Reservoir*. This is the monthly newsletter of the Canadian Society of Petroleum Geologists and is distributed to all 3300 members plus subscribing institutions. The series started in the May 2008 issue and will continue to 2010. They can be downloaded for free via the CSPG's website:

<http://www.cspg.org/publications/reservoir/reservoir-archive-2008.cfm>

6.2 Sequence Stratigraphy Terminology

Almost three years ago Octavian Catuneanu, a member of NACSN, set up an ad hoc international working group to prepare a review of sequence stratigraphic methods with the aim to standardize its terminology. That manuscript, written with the help of 27 co-authors, is now in press with *Earth-Science Reviews*. Here is the title and abstract:

Toward the Standardization of Sequence Stratigraphy

O. Catuneanu, V. Abreu, J.P. Bhattacharya, M.D. Blum, R.W. Dalrymple, P.G. Eriksson, C.R. Fielding, W.L. Fisher, W.E. Galloway, M.R. Gibling, K.A. Giles, J.M. Holbrook, R. Jordan, C.G.St.C. Kendall, B. Macurda, O.J. Martinsen, A.D. Miall, J.E. Neal, D. Nummedal, L. Pomar, H.W. Posamentier, B.R. Pratt, J.F. Sarg, K.W. Shanley, R.J. Steel, A. Strasser, M.E. Tucker and C. Winker

Abstract

Sequence stratigraphy emphasizes facies relationships and stratal architecture within a temporal framework. Despite its wide use, sequence stratigraphy has yet to be included in any stratigraphic code or guide. This lack of standardization reflects the existence of competing approaches (or models) and confusing or even conflicting terminology. Standardization of sequence stratigraphy requires the definition of model-independent concepts, units, bounding surfaces and workflow that outline the foundation of the method, as opposed to model-dependent choices that are left to the discretion of the practising geoscientist.

A sequence stratigraphic framework includes genetic units that result from the interplay of accommodation and sedimentation (i.e., forced regressive, lowstand and highstand normal regressive, and transgressive), which are bounded by 'sequence stratigraphic' surfaces. Each genetic unit is defined by specific stratal stacking patterns and identifiable bounding surfaces, and consists of a tract of correlatable depositional systems (i.e., a 'systems tract'). The mappability of systems tracts and sequence stratigraphic surfaces depends on depositional setting and the types of data available for analysis. The integration of outcrop, core, well-log and seismic data affords the optimal approach to the application of sequence stratigraphy. Missing insights from one set of data or another may limit the 'resolution' of the sequence stratigraphic interpretation.

A standardized workflow of sequence stratigraphic analysis requires the identification of all genetic units and bounding surfaces that can be delineated within a stratigraphic section. Construction of this model-independent framework of genetic units and bounding surfaces ensures the success of the sequence stratigraphic method. Beyond this, the interpreter may make model-dependent choices with respect to which set of sequence stratigraphic surfaces should be elevated in importance and be selected as sequence boundaries.

The nomenclature of systems tracts and sequence stratigraphic surfaces is also model-dependent to some extent, but a standard set of terms can be recommended to facilitate communication between all practitioners.

6.3 News from the North American Commission on Stratigraphic Nomenclature

Brian Pratt reports that the NACSN held its yearly meeting on 6 October 2008 during the Geological Society of America annual conference in Houston, Texas. As Newsletter readers will

know, NACSN is the alma mater of ISSC because it was the first organization established in order to stabilize the procedures for naming rock units. The North American Stratigraphic Code was the inspiration for the International Stratigraphic Guide. Several Very Important Persons attended the meeting, including Peter Bobrowsky as representative for the International Union of the Geological Sciences, Vitor Abreu, one of the two representatives for the American Association of Petroleum Geologists, and Brian Pratt who is Chair of ISSC and also one of the two representatives for the Canadian Society of Petroleum Geologists. NACSN includes representatives from a variety of relevant geological organizations in the USA, Canada and Mexico. Various items of business were discussed. One that will be of interest to the international community is the on-going effort to bring the Spanish translation of the North American Stratigraphic Code up to its most recent edition (2005). By the way, the English version of that edition was published in *AAPG Bulletin*, v. 89, p. 1547–1591 and, thanks particularly to the efforts of Randy Orndorff of the U.S. Geological Survey, can be downloaded via:

http://ngmdb.usgs.gov/Info/NACSN/05_1547.pdf

The homepage of NACSN is hosted by the American Geological Institute:
<http://www.agiweb.org/nacsn/>

6.4 News from the Australian Stratigraphy Commission

Albert Brakel advises that after more than 12 years as National Convener of the Australian Stratigraphy Commission (longer than any of his predecessors) he is stepping down from the position, and therefore also stepping down as the ASC representative on ISSC.

His successor is Cathy Brown of Geoscience Australia. Cathy was appointed as the new ASC National Convener by the Council of the Geological Society of Australia at its recent meeting in Perth, Western Australia. She is highly qualified for the position. For 12 years she headed the Australian Stratigraphic Index, where she did a great deal of valuable work, especially in getting the online version of the Australian Stratigraphic Units Database up and running. She has a thorough knowledge of stratigraphic guidelines, and has been a member of the Australian Stratigraphy Commission for eight years. She takes over as the Australian representative on ISSC
Her contact details are:

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Five stratigraphic luminaries posing at the Oslo IGC. From left to right: Isabella Premoli Silva, Brian Pratt, Neri Ciaranfi, Maria Bianca Cita and Chris Kendall.

7. PAPERS RECEIVED

Kulinkovich A. Ye., Yakymchuk, 2008. Geochronological calendar as an alternative to the “geologic time scales”. Management and Marketing Centre in the Field of Earth Sciences of the Institute of Geological Sciences at the National Academy of Sciences of Ukrainian, preprint, 31 p.