INTERNATIONAL SUBCOMMISSION ON STRATIGRAPHIC CLASSIFICATION (ISSC)

OF

IUGS INTERNATIONAL COMMISSION ON STRATIGRAPHY

CIRCULAR NO. 97

July 10, 2000

INTERNATIONAL SUBCOMMISSION ON STRATIGRAPHIC CLASSIFICATION
OF
IUGS INTERNATIONAL COMMISSION ON STRATIGRAPHY

CIRCULAR NO. 97

JULY 10, 2000

CONTENTS

I. MEETING OF THE ISSC AT THE 31ST INTERNATIONAL GEOLOGICAL CONGRESS IN RIO DE JANEIRO, AUGUST, 2000

The meeting of the ISSC during the 31st International Geological Congress in Rio de Janeiro has been scheduled to take place on Monday, August 14, 2000, at RIOCENTRO Convention Center. Thus far I have not been informed on the Room number and time, but ISSC members attending the Congress should be able to find that out by reading the Congress Program when arriving in Rio.

I hope that all members of the Subcommission attending the Congress will be present at the meeting.

The principal purpose of the ISSC meetings at the International Geological Congresses is to provide those members who can be present with an opportunity to review and discuss the ISSC accomplishments since the last International Geological Congress and the plans and objectives for the years until the next Congress. The meetings are also a good occasion to meet and establish personal contacts among members of the Subcommission attending the meetings.

The meetings are primarily for Members of the Subcommission, but other interested stratigraphers are welcome to attend. Speakers should identify themselves and their class of membership when they are given the floor. Normally only a minority of the total number of members can be present or represented at the Congress meetings of the Subcommission. Any matters importantly affecting the Subcommission as a whole will be discussed freely at these meetings but decisions on such matters must be deferred for a written vote of the entire membership.

The tentative Agenda for the Meeting should be:

1) Report of Chairman for period since last meeting in Beijing on August 8, 1996 (membership changes, circulars, publications, finances, etc.)
2) Announcement of officers for term 2000-2004
3) Discussion of procedures, objectives and program of ISSC
a. Membership of Subcommission
b. Diffusion of the Abridged version of the ISG and means of promoting compliance of rules on stratigraphic classification
c. Proposals of the WG on Sequence Stratigraphy
d. Proposal of the WG on Cyclostratigraphy
e. Plans for working on other possible units of stratigraphic classification (e.g. chemostratigraphy)
f. Translation of stratigraphic terms into various languages
4) Report on “A Lithuanian Stratigraphic Guide: a concept and implementation” by A. Grigelis.
5) Other

If any of the members of the Subcommission who plans to attend the meeting would like to discuss other subjects, I would appreciate being advised to that effect as soon as possible so I can include the item or items in the agenda of the meeting.

II. SHORT VERSION OF THE GUIDE

As announced in a circular dated April 17th, 2000, the **International Stratigraphic Guide. An Abridged Version**, with Michael Murphy and Amos Salvador as Editors, was published in the December 1999 issue of *Episodes* (vol. 22 No. 4, pp. 255-271) and reprints with covers are available at US$ 5.00 including postage and mailing.

To accomplish the objective of the preparation of an abridged and cheap version of the *Guide* it will be necessary to give its publication as much publicity as possible.

Thus far publicity of the *Guide* is well underway: 1) For March, 2000, Dr. Moujahed Al-Husseini, editor of GeoArabia, a journal published in Saudi Arabia and distributed (3,000 copies) throughout the Middle-East, has asked permission to reprint the abridged *Guide* in his journal. According to Dr. Moujahed Al-Husseini the abridged *Guide* is "superbly concise and extremely useful" because in the Middle East they were "struggling with most of the issues raised in" it. Permission, of course, was granted by IUGS and the advertisement was going to be included in an issue of GeoArabia, and the abridged *Guide* in the issue after (published in vol. 5, no. 2, p. 231-266). 2) Algimantas Grigelis, also wanted to reprint in Lithuania the abridged *Guide* and permission has also been granted. 3) Salvador Reguant offered to translate the abridged *Guide* into Catalan and Spanish. 4) Glenn Caldwell, Chairman of the IUGS Advisory Board for Publications, was going to get the abridged *Guide* reviewed and the advertisement included in Canadian journals. 5) Amos Salvador got an agreement to have the abridged *Guide* reviewed and the advertisement included in Geotimes, the Journal of Geoscience Education, GSA Today (published in the June 2000 issue), Geology and the GSA Bulletin. The Guide is advertised in the IUGS website www.iugs.org/iugs/pubs/stratguide.htm and inclusion of the Guide in the IUGS web is under consideration.

It is expect that the ISSC members will be very active in providing as much publicity as possible: advertisements and reviews in geological journals, newsletters, etc. of their respective countries.

III. SEQUENCE STRATIGRAPHY

ISSC Circular No. 96 included two documents (App. B & C), produced by the WG on Sequence Stratigraphy: one entitled "Review of the concept and recommended terminology for Unconformity-related units" and the other "Alternative recommendations for the terminology of Unconformity-related units". Those documents summarized a great deal of work done by the ISSC Working Group on Sequence Stratigraphy: 16 memos adding to over 250 pages, several internal questionnaires and several reports to the ISSC.

Comments and suggestions concerning those documents, in particular on seven specific points, were requested. Since then the following comments have been received:

1. Unconformity-bounded and sequence stratigraphic units as "objective" and "subjective" units.

Franceso Barbieri. Difference is not so evident.

Henk de la R. Winter. Unconformity-bounded and sequence stratigraphic units are objective.

2. Desirability to unify the terminology of unconformity-bounded and sequence stratigraphic units.

Franceso Barbieri. Better to unify the terminology.

Henk de la R. Winter. Yes, unify the terminology.

3. Abandonment of the terminology of UBUs and allostratigraphy.

Franceso Barbieri. Abandonment of UBU and Allostratigraphy.
Henk de la R. Winter. Abandon the terminology of UBU's and allostratigraphy.

4. <u>Formal adoption of "sequence" as main term for unconformity-related units.</u>

Franceso Barbieri. Formal adoption of "sequence".

Henk de la R. Winter. Recognise that sequences are equal to chronostratigraphic units.

5. <u>Recognition of correlative conformities of bounding unconformities as an option and not a necessity for the definition of a sequence.</u>

Franceso Barbieri. Recognition of correlative conformities only as an option (when desirable and possible).

Henk de la R. Winter. Not necessary to map to correlative conformities (Hedberg, 1978).

6. <u>Generalized vs. restricted definition of "sequence".</u>

Franceso Barbieri. Generalized definition of sequence.

Henk de la R. Winter. A sequence represents the preserved material of a chronostratigraphic unit.

7. <u>Single vs. twofold scheme of classification and nomenclature.</u>

Franceso Barbieri. Single scheme of classification

Henk de la R. Winter. Apply the chronostratigraphic scheme of classification and nomenclature.

Other comments and suggestions on Sequence Stratigraphy

Tim Anderson

I support an agreement with the sequence stratigraphic text ("Review of the Concept and Recommended Terminology for Unconformity-Related Units") authored by Hallam, Owen, Posamentier, Salvador, Vail, Van Wagoner, Watkins, and Weimer. They have described, clearly and thoroughly, sequence stratigraphy as I see it being applied daily within the petroleum industry. In the time I have been involved with the Subcommission, the most effective additions to a stratigraphic guide or code have been those which have recognized and organized actual practice. Attempts to alter practice to suit a definition or desired end have not been successful.

Ki-Hong Chang

Proposed the following recommendations:

1) Terms "synstratigraphy" and synstratigraphic units" are proposed here to cover all terms around the unconformity-bounded units such as sequence stratigraphic, "allostratigraphic" and "unconformity-related" units. The latter appear mutually different as so contended frequently, but they must come under a single category. It is just like the fact that lithostratigraphy/units covers the

relevant stratigraphic units under one category in spite of their enormous difference depending on their geologic settings: say, cratonic, mobile zone, accretionary complex, etc. The lithostratigraphic units/classification of an intra-cratonic platform and an accreationary prism in an oceanic trench tremendously differ mutually, distinctly more different that say, seismology based "depositional sequences" and any other set of unconformity-bounded ("unconformity-related") units. Therefore, all of the latters are one thing just as various lithostratigraphic units are satisfactorily under one and the same category.

2) Likewise, (in line with the same logic), it is rationally required that a hierarchical set of a single term such as SYNTHEM might desirably be applied to all synstratigraphic units. It is envisioned that a set of Megasynthem, Supersynthem, Synthem, Subsynthem, Meiosynthem, etc. may well serve for synstratigraphic schemes.

3) If geologists continue to use the term "sequence" as a material (stratigraphic) unit on an excuse that it is a special "depositional sequence" tacitly so being agreed among our geological circle, we should be continuously sorry to English-speaking people and also sorry to new students in geology, because such a usage is a pollution in language because it is a time-honored well-defined term as an order/arrangement in time: stratigraphic sequence. Aren´t stratigraphic sequence and depositional sequence same thing? A schizophrenic teaching has been inevitable to persuade new comers in stratigraphy. Such a awkward teaching is nothing but a contribution toward the increase of entropy, reverse to human reason. The term sequence must be duely resumed for a simple usage: only the time-sequence/stratigraphic order – an abstract term, not a material unit.

4) It was clearly after the IGCP actions for the recognition and the terminology of the unconformity-bounded units that the scheme of alloformation, allogroup, etc. was introduced by a North American committee.

5) Stratigraphy is different from an exact science. In lithostratigraphy, an arbitrary cut-off is inevitable. Likewise, in synstratigraphy, a synstratigraphic boundary defined at an unconformity must be arbitrarily extended to draw in a laterally traced "continuous" section. Isn´t such a flexible application a common sense in geology?

Wang Hongzhen

1. As a stratigraphic unit, the sequence is peculiar in that its boundaries or boundary surfaces are isochronous in nature. That is why a sequence may be analyzed and interpreted by a chronostratigraphical frame, thus different from a lithostratigraphic unit. In this respect, a sequence is in fact more akin to a chronostratigraphic unit. Although the boundaries of the rock bodies defining a sequence in the field may be diachronous, so is also the chronostratigraphic unit (Stage) observed in the field. Probably we should retain the unique position of chronostratigraphy and chronostratigraphic units, which are by definition isochronous and conceptually worldwide. But a sequence is by definition also isochronous at least within a basin. It is therefore essential that the definition of a sequence should contain the "correlative conformities", because a sequence contains two parts, one part being bounded below and above by unconformities with consequent gaps and breaks, and another part of apparent "correlative conformity", being bounded by correlative surfaces. It is this part that makes the full amount of strata and provides for the characteristic synchroneity of the sequence. Otherwise, a sequence with only its unconformity-bounded part will be no more than a special case of lithostratigraphic unit.

2. The different opinions between Appendix B and Appendix C seem to comprise two points. First, whether sedimentary cyclicity in marine basins is due primarily to eustatic change, which is the main controversy in sequence stratigraphy. From the viewpoint of global chronostratigraphic correlation, a biozone that is found across the continents with a recognizable basal surface denoting a sedimentary break or nondeposition caused by lowering of sea level will be a proof of eustatic change.

Such required conditions were found to be satisfied in the Lower Devonian and Middle Permian in South China, which may be correlated with Europe, Siberia and North America, although there are many breaks caused by local superimposed tectonism. The second is whether the term sequence could be used in a unspecified way to cover all unconformity-bounded and unconformity-related units. If we admit there are different ranks of sequences, discontinuity surfaces of different length scales including the Sloss sequence may be all included. Most of them are formed by base level changes, a few exceptions not related to base level changes occurring in olistostromes and turbidites may be assigned to the lithostratigraphic unit Formation but not a sequence.

Mike Murphy

In Appendix B, p. 2, 2nd paragraph – "great drawback" is an opinion not a description of the situation. The fact that unconformities become more difficult to trace as one moves basinward is simply the usual geological condition that we must deal with in our work.

The next paragraph is one that really should draw fire. It seems to me that what the authors are saying here is that **the interface (correlative conformity) between two different lithologic units can be inferred to be a time unit and that this interface between two lithologies is correlative in time with the related unconformity**. I believe that this is unsound for two reasons: 1) there is no theoretical reason why the "correlative conformity" has to be a chronohorizon; 2) Unconformities represent spans of time that vary in duration and stratigraphic position from place to place and even in the case where the correlative conformity is a chronohorizon, you can´t equate an instant of time to a span of time.

The pinch-out of an unconformity on any particular profile is a unique point. It represents only where and when the transgressive phase began on that particular profile. In some cases (without local tectonics and controlled by sea-level change), it may be correlated in time with all other points where the unconformity pinches out. This pinch out line separates the map region where the unconformity exists from that where it does not. Unconformities have only one intrinsic property and that is topography. They have no other property that enables us to infer the age of the various points on them. Therefore, the "correlative conformity" of seismic stratigraphers in the general case can only be correlated with the unconformity at one point, the point where it dies out on a particular seismic profile.

Pag. 5. The definition of sequence. Why not leave out "relatively conformable"? We all know that channeling, levees, splays, foresets, etc. make relations that don´t look conformable in outcrop.

The end of the definition is awkward because, I believe of the authors being forced to use the term "correlative conformity". Why not get ride of it, since it is a misnomer anyway? I would recommend a term such as Pinch-Out-Horizon or Pinch-Out-Interface. Then definition should read: **A sequence is a stratigraphic unit composed of a succession of genetically related strata that are bounded above and below by unconformities and that may be extended basinward along the pinch-out-horizons of the unconformities.**

I underlined "may" because I think it conveys that this is an option, not a necessity, as is stated in the following
text.

I am in complete agreement that synthems, and allo- units should be forgotten.

My definition for unconformity would be: **An unconformity is an interface between a stratigraphic unit and another rock body that represents a measurable gap in geologic history.**

It has to be measurable to separate it from short term phenomena. The agents of its creation are not necessary to the definition and in some cases cannot be elucidated

Pag. 7, 2. I prefer pinch-out-horizon for the reason that correlation in the sense of time equivalence is not implied, just the tracing of an interface.

Pag. 7, 1st paragraph under 2. Because two strata are conformable does not mean that the boundary between them is everywhere of the same age.

This next paragraph refutes what Hedberg fought so hard to overcome – the idea that rock and fossil units are not time units. There may be some units that are deposited instantly geologically speaking, such as, turbidites, but seismic reflections don´t come with labels "I am a turbidite".

Why is it in this document the authors are afraid to admit that it is o.k. to use indicators to separate bundles of strata even if they don´t know the origin of the indicator? They seem to be hung up on the idea that these bundles have to be bounded by chronohorizons. I think knowing the ages of the rocks is certainly desireable, but not necessary for basin analysis of the formulation of hypotheses regarding history, facies, and structural relations.

Pag. 9. I would like to stress again that unconformities have only one intrinsic property, topography. Everything else that is known about them comes from the rock bodies that they separate. Therefore, an interface between two rock bodies cannot be distinguished from another such interface on the basis of intrinsic properties. All data regarding age of the interface come from the associated rock bodies.

I prefer one of the options outlined by the dissenting members of the committee, the use of unconformity-bounded-units and unconformity-related units. However, their definition of unconformity cannot be used because it contradicts the term as defined in the AGI Glossary p. 765.

I like the terms sequence and depositional sequence as defined in their option 2 except for the use of the term correlative surfaces, by which they mean correlative horizons in the sense of the Glossary in the Guide.

Henk de la R Winter

In defense of this stance **[see above under responses to questionnaire]**, I have prepared a MS, "Unconformity-bounded sequence procedure: a path to objective, practicable chronostratigraphy" in motivation, suggesting therein the way stratigraphy may have to go. I have attempted therein to resolve remaining points of dissent from Amos Salvador [Pers. Comms. 1993-1996], who by then was committed by his editorship of the *International Stratigraphic Guide, 1994.* Progress reports in Chapter IV and research into the *Guide* further clarified that the dichotomy can perhaps be resolved by references to conceptual advances by such as Harry Wheeler, Larry Sloss, Hollis Hedberg, Peter Vail and his teams, and Frank Brown, with his colleagues.

The MS **[passed to the WG on Sequence Stratigraphy and available upon request]** is concurrently being submitted to *Terra Nova* for publication review and to interested parties for comment. I consider that the Seq. Strat. Wk. Gp. of ISSC has a first right to comment on or even participate in the publication. Meanwhile I am still actively testing the theory against case histories, but find it increasingly difficult to counter the reluctance of most referees to guide or recommend publication. However, several illustrated publications are available on request.

Comments on Chapter IV: There is no need to pursue sequence chronostratigraphic boundaries basinward to conformity [Hedberg, 1978], only to find that there the distinct surfaces have blurred to gradational lithological changes. There is a one-to-one correlation between sequence orders and

chronostratigraphic ranks, but this natural hierarchy is still officially suppressed for the former category. The "Alternative recommendations" by the minority will fall away if the premises and conclusions of the MS are accepted.

Comments on Appendix B: Summary: Problems of chronostratigraphic equivalence can be solved if sequences can be seen as strata naturally ranked into orders related to the increasing magnitude of their bounding unconformities from conformable depocentres towards the hinterland. This step takes care of sporadic deposition (p. 7).

Theoretically there would be full representation had deposition been uninterrupted, but practically the preserved material is bounded diachronously by a hierarchy of visible transgressive-regressive unconformity surfaces. The geochronological equivalents are theoretically fully represented basinwards of lines where conformity is reached but increasingly intermittent in the proximal direction (Wheeler, 1964, Vail *et al.*, 1977 pp. 54, 78, 81, 87, 95, 104, 106, 139, 153, 157-158, 162). A basin analyst selects those ranks he needs for his geohistory. The unconformity surfaces are measured by seismic profiling, field tracing, and subsurface, map, cross-section and outcrop correlations from representative types to limits. **Observational** indeed !

Maria Bianca Cita, kindly note that the analysis of the minor chronostratigraphic sequences normally unspecified and within the smallest formal rank, or within a chronozone, can also be named cyclostratigraphy (viz. the GIS, of Dan Busch).

Sequence chronostratigraphic units are regionally limited, and only their time equivalents can be correlated globally, hence only a Standard Global *Geochronologic* Scale. Chronostratigraphic (time-rock) correlation is both regional and observational. Chronocorrelation can be regional and global, but is then no longer stratigraphic (Salvador, 1994), but only time.

The basinwards merging of lithologies as conformity is attained implies that only the persistent major units need to be mapped and named across a basin. Minor orders cannot be discriminated basinwards.

Stratigraphers need to reach full agreement on the above before the terminology and nomenclature can be reviewed. This is the motive for my contribution.

Some definitions are still too vague. A sequence is a stratigraphic unit composed of a hierarchy of continuously deposited strata, *defined* by being bounded by interruptions in deposition. Such is geometrically descriptive and non-genetic, and in accordance with the term 'stratigraphy'. Stratigraphic definitions should exclude calibration or mapping techniques, such as methods of dating or biostratigraphic substantiation. A sequence thus defined can have any one of the chronostratigraphic ranks. Similarly, my definition of a depobasin, though it is a sequence chronostratigraphic unit, does not commit to rank, but to subsidence tectonics, the sole reason for its need. Use of the term avoids erroneous applications to stratigraphy, which has contributed to the loss of its prominence in earth science studies and education. Another cause is the deemed subordinate role of stratigraphy to sedimentology. The reverse is required for the best geohistorical interpretations, as clearly revealed by the works of the Vail and Brown teams, and recognised as the main purpose of stratigraphy.

Unconformity. A sharp or distinct surface representing an interruption, break or discontinuity in deposition usually accompanied by erosion. The time range (duration) of both non-deposition and of the strata truncated at any point is the *hiatus*, which ranges from non-detectable at virtual conformity to a maximum in the direction of the depobasin limit. This lateral change in the hiatus reflects the diachronous material boundary of a sequence and is the most neglected geometric factor when the nature of an objective chronostratigraphic unit is considered (cf. Wheeler, 1964).

IV. CYCLOSTRATIGRAPHY

ISSC Circular No. 94 of May 24, 1999, announced the organization of a working group to produce a proposal on Cyclostratigraphy to be discussed by the ISSC members.

The idea to appoint this working group was to undertake a review of this "new" stratigraphic approach as well as its relationship to other related schemes of stratigraphic classification.

In the last edition (1994) of the International Stratigraphic Guide the ISSC introduced, besides Litho- Bio- and Chronostratigraphic units, two other kinds of stratigraphic units, i.e. Unconformity-bounded and Magnetostratigraphic units. When discussing the manuscript of the Guide (completed in 1992) it was recognized the existence of many others (informal) units based on other criteria, but it was considered that it was no yet demonstrated that they would be useful or widely used.

It should be mentioned that the significance of "cyclostratigraphy" was in some way addressed by Dr. N. Hornibrook in ISSC Circular 66 (June 15, 1984) in relation to "Cyclothems related to glacio-eustatic sea level episodes". This proposal was barely discussed in ISSC Circular 67 (March 21, 1985) and never pursued farther.

With the second edition of the Guide published, the ISSC began to consider new approaches to stratigraphic classification. Thus, a WG was appointed to review "sequence stratigraphy" and the related fields of seismic stratigraphy, Unconformity Bounded Units and Allostratigraphy. At that time it was thought that the same WG could also "review and discuss ... event stratigraphy, cyclostratigraphy, etc. and their possible relationship to sequence stratigraphy". That WG produced a set of documents, which were attached to ISSC Circular 96 (October 29, 1999), and deal exclusively with "sequence stratigraphy". Therefore, other stratigraphic approaches such as cyclostratigraphy, eventstratigraphy and chemostratigraphy are still in need to be discussed by the Subcommission.

As informed the WG was formed by inviting some of the best qualified stratigraphers to carry out the proposal: Frits Hilgen, André Strasser and Walther Schwarzacher. Upon their acceptance it was suggested to produce a document, where would be important to clarify: 1. The different types of sedimentary cycles, their origin and significance on a local, regional, or global scale. 2. If stratigraphic cycles of diverse origin could be used as different approaches to stratigraphic classification, or all or some of them could be part of some kind of "event stratigraphic" units. 3) If it is necessary to introduce a new type of stratigraphic units, and if so what terms should be used.

As a first results the WG has produced a Report, dealing with concepts, applications, terminology and operational problems of Cyclostratigraphy. This **Report** and a related **Questionnaire** are included as **App. A** & **B** to this circular and will also be circulated to other interested and knowledgeable stratigraphers.

It is expected that the feedback would help to improve the document and finally to reach a consensus.

Your PROMPT answer to the questionnaire are ESSENTIAL if the Working Group is to attain its objectives.

V. GLOSSARY OF STRATIGRAPHIC TERMS

In ISSC Circulars No. 92, 93 and 94 it was mentioned the project to produce a glossary of stratigraphic terms in several languages (for previous information see ISSC Circulars 57, 63, 64 and the Glossary of Stratigraphic Terms included in the last edition of the International Stratigraphic Guide). As it was informed several positive comments were received and Professor Ivo Chlupác, who kindly agreed to take a leading role on the subject, proposed some guidelines for the preparation of the Glossary and included a list of terms (see ISSC Circular 96, p. 4-5 and Appendix D).

Comments and suggestions from the ISSC membership were requested, but thus far only one has been received from Mike Murphy, who asks for comparison between the list of Appendix D and the glossary of stratigraphic terms that were in the manuscript of the second edition of the International Stratigraphic Guide.

It is evident that **we need more input from the whole ISSC membership to go ahead with this project**.

VI. ICS NEWS

ISC Bureau (2000 – 2004)

A Nominating Committee which was to propose candidates for the position of Chairman, 1st and 2nd Vice-Chairman of ICS was proposed by the ICS Bureau and elected by the Full Commission. The five members of the NC were: Frits Agterberg (Canada), Fritz Steininger (Germany), Jun Yugan (China), Dorothy Guy'Ohlson (Sweden), and Barry Webby (Australia). The candidates proposed by the NC were elected by the Full Commission: F. Gradstein, Norway, was elected as Chairman, he nominated J. Ogg, USA, as Secretary General. H. R. Lane, USA, was reelected as 1st Vice-chairman, and S. Finney, USA, was elected as 2nd Vice-chairman. The Vice-chairman at large will be nominated by the country organizing the next IGC.

Committee on Sequence Stratigraphy

This should originally have been organized by N. Morton, Chairman of such a working group within the Jurassic SC, but having been elected as Chairman of the Jurassic SC for the period 2000-2004, another convener for that Committee had to be found. Paul Wignall agreed to take over, he plans to run the committee from a website.

ICS program at the IGC in Rio de Janeiro

The following symposia will be presented at IGC: a. Special Symposium J-5—"Quantitative Stratigraphy: Documenting the Geobiological Record" H. Richard Lane and Antonio Rocha-Campos (August 9). b. General Symposium 1-1—"Stratigraphy and Timescales in the 21st Century" Felix Gradstein and James Ogg (poster August 8, oral August 9). c. General Symposium 1-4—"Paleontological, Stratigraphical and Paleogeographical relations among South America, Laurentia, Avalonia, and Baltica in the Ordovician" Stanley Finney (poster August 9, oral August 11). d. General Symposium 1-5—"Paleogene Events and Subdivisions" Hans Peter Luterbacher (poster August 10, oral August 11).

R. Lane and Jim Ogg will be responsible for organizing an ICS business meeting at the IGC. The meeting is scheduled for August 8. Interested people should be able to find out what time of the day and place by reading the agenda when arriving in Rio.

Decision about Carboniferous chronostratigraphic nomenclature

In 1987, the Carboniferous Subcommission (SCCS) had decided to use only one period for the time interval which, according to American usage included two independent periods, Mississippian and Pennsylvanian. A very large majority was in favor of subdividing the Carboniferous into two subsystems/subperiods, but no decision as to their name was taken.

In 1996, the boundary between the two subsystems (mid-Carboniferous boundary) was defined by a GSSP in Arrow Canyon, Nevada, USA. The stratigraphic position of the GSSP coincides with the traditional Mississippian/Pennsylvanian boundary. In November 1999 the Secretary of SCCS organized a new vote about the rank of the two main subdivisions of the Carboniferous, but the Chairman of ICS declared this poll invalid and invited the members of SCCS to confirm the 1987 decision and to decide about the nomenclature. A majority voted in favor of subdividing the Carboniferous in two subsystems/subperiods named Mississippian (below) and Pennsylvanian (above). This decision was ratified by the IUGS EC in January 2000.

GSSP

The ISSC Bureau distributed a ballot on the GSSPs defining the base of:

the **Ordovician** System and of the **Tremadocian** stage at Green Point, Newfoundland, Canada, ratified in Jan. 2000

the **Sinemurian** Stage at East Quantoxhead, West Somerset, SW England.

Meeting of the ICS Bureau (Neuchâtel, Switzerland, March 31- April 2, 2000)

The meeting was attended by J. Remane, Chairman of ICS, O. Michelsen, Secretary General, H. R. Lane, 1st Vice-chairman and also 1st Vice-chairman elect for the period 2000-2004 and F. Gradstein, Chairman elect.

The 4-year report established by the Chairman of ICS was discussed and completed. The work plans for the period 2000-2004 were provided by F. Gradstein new Chairman elect, and H. R. Lane, 1st Vice-chairman and in the same time 1st Vice-chairman elect of ICS and discussed in great detail. A revision of the statutes was discussed, but the execution was left to the incoming members and Bureau.

Plans for the period 2000-2004 include a "New status of the Jurassic WG on Sequence Stratigraphy", which "should originally have been organized by N. Morton, Chairman of such a working group within the Jurassic SC, but having been elected as Chairman of the Jurassic SC for the period 2000-2004, another convener for that Committee had to be found. Paul Wignall agreed to take over, and he plans to run the committee from a website. As soon as the Chairman of ICS is in possession of a concrete project about the structure of the new Committee, this will be submitted for approval to the Full Commission."

1996-2000 Report

It includes a summary of all activities and accomplishments of ICS. The publication in Episodes of the abridged version of the International Stratigraphic Guide by ISSC, is mentioned as "very valuable". Other statements about ISSC read: "The creation of a WG on Cyclostratigraphy promises to give interesting results. As in 1998, no direct information was received from the Working Group on Sequence Stratigraphy, but apparently the problems of redundance resulting from the terminological overlap of Sequence Stratigraphy and Allostratigraphy are on the way of being resolved through the abandon of the allostratigraphic terminology".

Bureau and Subcommission officers Mail List

R. Lane has established an ICS alias mail list of all Bureau and Subcommission officers. This mail list can be reached at ics@nsf.gov. Messages sent to this address will reach all officers and online discussions of items of interest to all the Commission can be held through this e-mail address.

Geological Map of the World and Global Stratigraphic Chart

A draft and questionnaire on the Global Stratigraphic Chart, prepared by ISC Chairman, J. Remane, was included as Appendix C to ISSC Circular No. 92. Comments from ISSC members (see ISSC Circulars 93 & 96) were forwarded to the ISC Chairman. I have also received the following comments from Wang Hongzhen, Organizational Member for China:

"1. The Global Stratigraphic Chart is a success in cooperating with the CCGM and in providing a clear perspective of the situation of GSSC studies. It is also good to have omitted the too much complicated stages and substages in the 1989 Chart and in Harland´s GTS 1989. But it seems that not all indicated GSSPs are satisfactory and practical. The GSSP discipline may have overemphasized the continuity and comparatively overlooked the geoevents that may supply useful signatures in surface discrimination. It is difficult to designate the lower limit of a biozone, and still more difficult to trace its lateral extension. In our experience, it is practicable first to locate the approximate lower limit of the selected biozone, and then try to designate, by all methods, sedimentary, geochemical, and geomagnetic, a recognizable physical surface downwards, before the next biozone is met with. The boundary surface may be selected where the biozones are most complete, and the selected biozone and adjacent biozones are lacking elsewhere, so as to ensure its position in the basin center, and its horizon representing the lowest sea level at the time. The extent of lowering of sea level is most essential for designation of sequence boundaries of all ranks.

2. In regard to the stratigraphic notation recommended in the Chart, I agree with Zamoida that the letter P should be used for Permian, E (Eugene) for the Palaeogene, which are traditional and customary. We have two capital letters for Eons (AR, PH), which are however rarely used. It is also traditional to have only the first letter capitalized for Eras, as Pz, Mz and Cz, and for the same reason we may have Ae, Ap, Am and An for the Archaean, and Pp, Pm and Pn for the Proterozoic, in order to make the customary A and P more outstanding. We may follow Harland´s use of small letters notation for Stage (1990), but may use 2 letters instead of 3, and put it on the upper right corner of the System notation, as Cvs, in the maps below 1/250 000 scale."

Meanwhile the International Stratigraphic Chart has been approved by IUGS and will see this Chart published at the upcoming IGC in Rio.

VII. PUBLICATIONS ON STRATIGRAPHIC CLASSIFICATION, ETC.

Following is a list of publications on stratigraphic matters kindly sent to me by some ISSC members:

Aubry, M.-P., Berggren, W.A., Van Couvering, J.A. & Steininger, F., 1999. Problems in chronostratigraphy: stages, series, unit and boundary stratotypes, global stratotype section and point and tarnished golden spikes. Earth-Science Reviews 46: 99-148.

Naidin, D.P., 1998. Global and Regional Standard in Stratigraphy. Russian Geology and Geophysics 39(8): 1023-1032.

VIII. MEMBERSHIP MATTERS

I would appreciate receiving from each individual and organizational member the e-mail where they could be reached. **This information is essential to speed-up ISSC activities.**

APPENDIX A (TO ISSC CIRCULAR NO. 97)

APPENDIX B (TO ISSC CIRCULAR NO. 97)

FIRST QUESTIONNAIRE ON CYCLOSTRATIGRAPHY

1. Should the term **"sedimentary cycle"** be restricted to those repetitive changes in sedimentary successions that have a time significance and are periodical or near-periodical?

Yes
No
Comments:

2. Should the term **"sedimentary sequence"** be used for a succession of lithofacies in the sedimentary record that repeats itself but has no a-priori time significance?

Yes
No
Comments:

3. Is there a **conflict with sequence stratigraphy** by the use of "cycle" and "sequence" in the terms mentioned above?

Yes
No
Comments:

4. Should the term **"proxy cycle"** be applied for describing cyclic variations in proxy records (e.g., stable isotopes, geochemical proxies)?

Yes
No
Comments:

5. Do we need to introduce a **cycle hierarchy or orders** to differentiate sedimentary cyclicities in different frequency bands (Milankovitch, sub-Milankovitch, annual, sub-annual)?

Yes
No
Comments:

6. Should the term “sedimentary cycle” also be applied to the sedimentary record of **annual and sub-annual periodic processes** (e.g., varves, tidal laminae)?

Yes
No
Comments:

7. Should cyclostratigraphic units that are calibrated to the astronomical record and underlie the standard geological time scale be formally **stratotypified** in a section or core?

Yes
No
Comments: