



5 February 2007

To ICS officers:

RE: IUGS International Commission on Stratigraphy

This letter is directed to inform all ICS officers, and especially the ICS Vice President and the Subcommittee Chairs, about important matters which apparently have not been given the attention they deserve by the Commission as a whole. This is likely due to communication problems within the ICS, as there is significant evidence indicating that most individuals within the ICS are not aware of several documents produced by different IUGS bodies with regard to ICS activities. This may be related to the way different matters have been handled by the ICS Executive in the last years.

Please note that financial support from IUGS to ICS for the year 2007 has been conditionally approved. These funds are being held in reserve; their release depends upon a satisfactory response to the requests in this letter.

BACKGROUND

A) As an aftermath of the review of ICS by an IUGS Ad-Hoc Review Committee (Nov. 7-8/05; see attachment A), a list of concrete Actions to be taken was sent by the IUGS Executive Committee to the ICS Executive on June 2006 (see attachment B), and some additional clarifications (see attachment C) were added, at the request of the ICS Executive, on September 8th, 2006. There are several actions (all mandatory) and recommendations provided to the ICS Executive, among them:

- 1) introduce changes to the ICS Statutes and Bylaws, especially with regards to the Nominating Committee for election of the ICS Chair and ViceChair, in such a way that the final slate of elected ICS officers should reach the IUGS EC at a prescribed date well before the ordinary session of the IUGS Council;
- 2) allow for all ICS official publications to be formally approved by the IUGS EC, that specifically involve cases where ICS dictates formal changes on previous standards, procedural rules, and the like, which are expected to be followed by the International Earth Sciences community (e.g. changes in the International Stratigraphic Scale, International Stratigraphic Guide, Statutes, etc.);
- 3) be explicit in the attribution of opinions and decisions, whenever the IUGS/ICS logos are being used, and clearly state what has vs. has not been officially ratified in publications written by authors who also hold positions in the ICS or IUGS.

www.iugs.org

President:

Prof. Zhang Hongren
64 Funei Dajie
Beijing 100812, CHINA
Tel: +86-10-66557485
Fax: +86-10-66557473
E-mail: zhang.iugs@gmail.com

Secretary General:

Prof. Peter T. Bobrowsky
Geological Survey of Canada
601 Booth Street
Ottawa, Ontario, CANADA K1A 0E8
Tel: 1-613-947-0333
Fax: 1-613-992-0190
E-mail: pbobrows@nrcan.gc.ca

Treasurer:

Prof. Antonio Brambati
Dept. of Geological, Environmental
and Marine Sciences (DiSGAM)
Univ. of Trieste, Via E. Weiss 2
I-34127 Trieste, ITALY
Tel: +39 040 558 2046 (2056)
Fax: +39 040 558 2048
E-mail: brambati@univ.trieste.it

Past President

Eduardo F.J. de Mulder (The Netherlands)

Past Secretary General

Werner R. Janoschek (Austria)

Vice Presidents

Sylvi Haldorsen (Norway)
Eldridge Moores (USA)

Councillors

Jean-Paul Cadet (France)
Ryo Matsumoto (Japan)
Alberto C. Riccardi (Argentina)
Gabriele I.C. Schneider (Namibia)

IUGS Secretariat

c/o Geological Survey of Norway
n-7491 Trondheim, Norway
Tel: +47 73 904040
Fax: +47 73 502230
E-mail: iugs.secretariat@ngu.no

- B) Following a careful assessment by the IUGS EC of the recommendations produced at Leuven (September 2005) by the ICS Executive, and taking into account, important disagreements within specialized bodies and the international geological community, and several disagreements with long-standing protocol and procedural principles accepted by the international geological community, the IUGS EC requested the ICS (see attachment D):
- 1) To address properly and immediately the issue of the Quaternary, following the "Procedures for Decisions by ICS-INQUA Joint Task Group on the Quaternary".
 - 2) To maintain the Quaternary as depicted in the International Stratigraphic Chart published by IUGS in 2000.

Additionally INQUA's Executive Committee, as late as November 26, 2006, has requested to continue the dialogue on this issue, but it objected to the unilateral decisions adopted by the current ICS Chair.

PRESENT SITUATION

- A) There is no information arising from ICS on the requested changes of the ICS Statutes, especially with regards to the election of officers.
- B) The Quaternary in the Stratigraphic Chart (or GTS) published in the ICS website is not depicted as published by IUGS in 2000.
- C) The Quaternary issue has been poorly and ineffectively addressed ignoring the specific IUGS EC instructions (IUGS-INQUA Task Group) and INQUA's opinion.
- D) Personal publications included in the ICS website are not explicit with regard to attribution of opinions and decisions, and could be taken as produced by the ICS.

CONCLUSIONS

From the above it is clear that the ICS Executive is ignoring the IUGS EC, despite the fact that ICS Chair should act "within the scope of the authority delegated to him/her by IUGS" (ICS Statutes, 4.1). Because of the above, the image of ICS has suffered greatly in the eyes of the geological community, and a significant negative impact has resulted on the prestige of the ICS.

This situation must be changed. The reputation of ICS, within IUGS, must be defended, as well as the open, international collaborative process by which it should work, in order to maintain the international consensus that has been achieved through more than 100 years of hard work. Stratigraphers are the ones that need to have clear ideas about this, and should be aware that international organizations such as IUGS consist of people coming from a variety of fields, for whom all these discussions are difficult to follow. The first individuals that should be ready to take the challenge are the ICS officers



themselves, i.e. the Chairs of the ICS Subcommissions, which are responsible for the election of the ICS Executive. In that vein changes and decisions instructed by the IUGS EC must be followed, and should now be adopted, regardless of any autocratic and unconstitutional decision by the current ICS Chair.

In the light of the above considerations, the IUGS EC members agree unanimously on an immediate rectification of the current dysfunctional status of the ICS. The IUGS EC very much respects the ICS as a whole and considers the relationship with ICS to be mutually beneficial. The Chairpersons of the Subcommissions must act accordingly and collectively in the best interests of the Commission. Failure to do so promptly jeopardizes not only the strained relationship between IUGS and ICS but also the international status of the Commission in the eyes of the global geoscience community.

In addition, it is necessary to reach as soon as possible an international consensus on the Quaternary problem that has to be ratified during the 2008 IGC. The IUGS EC deems that at the moment it is appropriate to maintain the Quaternary as depicted in the International Stratigraphic Chart published by IUGS in 2000.

On behalf of the IUGS, I strongly encourage you to address this issue internally and collectively as soon as possible. The IUGS expects to come to a conclusion regarding permanent action in the next few months. Consequently we request your prompt attention and response to this message no later than 1 April 2007.

Sincerely

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Prof. Zhang Hongren
President International Union of Geological Sciences

Attachments:

- A – Minutes of the meeting of the Ad hoc review committee (ARC) on the International Commission on Stratigraphy (ICS)
- B – Actions to be taken by ICS
- C – September 8, 2006 Letter to the ICS Executive by Alberto Riccardi
- D – Undated letter to the ICS by Zhang Hongren

ATTACHMENT - A

MINUTES of the meeting of the AD-HOC REVIEW COMMITTEE (ARC) on the INTERNATIONAL COMMISSION ON STRATIGRAPHY (ICS) Paris, 7 – 8 November 2005

Review Committee members: Alberto RICCARDI (La Plata, IUGS EC member, Chair), ZHANG Hongren (IUGS President, Beijing), John CALLOMON (external expert, England), Lucy EDWARDS (external expert, USA) and Gian Battista VAI (external expert, Italy).

Interviewed participants: Felix GRADSTEIN (ICS Chair, Norway), Maria Bianca CITA (ISSC - International Subcommittee on Stratigraphic Classification - Chair, Italy), Phil GIBBARD (ISQS - International Subcommittee on Quaternary Stratigraphy - Chair, UK), Fritz HILGEN (ISNS - International Subcommittee on Neogene Stratigraphy - Chair, The Netherlands).

A PROCEEDINGS

1. Opening and background information

RICCARDI opened the meeting by welcoming and thanking the participants for attending the meeting. He explained that the present Review arises out of a general IUGS policy of reviewing periodically all its funded scientific bodies and activities. These reviews are done according to the *Statutes and Bylaws of IUGS* and the *Rules* guiding its different constituent bodies. The Terms of Reference for ARCs regulate their compositions and procedures.

2. Rationale for the Review

RICCARDI explained that the IUGS Strategic Planning Committee had recommended (2000) (a) to hold reviews of all IUGS-funded scientific activities on a regular basis, and (b) to limit both the terms of office for individual officers of Commission and the lifetimes of Commissions themselves. These recommendations were translated into action through the *IUGS Strategic Action Plan* (2001). The first recommendations resulted in the creation of Ad-hoc Review Committees (ARCs) and the second in a set of Rules for Commissions. The *Rules for Commissions* state that the duration of a Commission shall normally be 8 years but that this may be extended on request for maximally up to another period of 8 years. He mentioned that ICS has been part of IUGS since 1965, and that the last review of ICS by the IUGS Advisory Board for Research Development (ABRD) had taken place in 1995. During the 2001 meeting of the IUGS EC, Past President Ed de MULDER suggested another assessment of ICS, and the issue was again considered in the following years, but could not be realised. In 2004 an ARC reviewed IUGSs activities in the field of Geochronology, including those carried out within ICS. Finally, at its last meeting in Vilnius, Lithuania (March 2005), the IUGS Executive Committee decided that an ARC should be convened to review the IUGS ICS.

RICCARDI mentioned that other relevant information for the meeting is included in the documents available to the members of the present ARC: *IUGS Statutes and Bye-laws*; *ICS*

Statutes; ICS Annual Reports for 2000-2004; and the *ABRD Report* of the last ICS Review, 1995. Additional documentation had been requested (i) from F. GRADSTEIN, on the overall aims and objectives of ICS, its structure and working procedures, on its main accomplishments of the last years, and on its planned activities; and (ii) from M.B. CITA, P. GIBBARD and F. HILGEN, on the work of their Subcommissions during the last few years, and how this work has been integrated into ICS activities. Similar information was provided (iii) by the Chairs of other two Subcommissions who were unable to attend the meeting: T. BECKER (ISDS, Devonian Stratigraphy), and N. MORTON (ISJS, Jurassic Stratigraphy) (see Appendix 1).

RICCARDI emphasized the importance of ICS, given that one of the main goals of the 1st International Geological Congress (IGC) held in Paris in 1878 had been to obtain international agreement on matters of stratigraphic classification and terminology, and that this was the origin of a Commission for Unification of Geological Nomenclature, which was established in and active since the 2nd IGC (Bologna, 1881). At the 19th IGC in Algiers (1952), this body - transformed into a Subcommission on Stratigraphic Terminology - became a part of the then newly created ICS. It remains clear to the governance of the IUGS that the ICS is the most important Commission within IUGS, and that its activities are and will continue to be necessary as provider of important services to the international geological community.

RICCARDI proposed to continue with the Agenda by interviewing GRADSTEIN, CITA, GIBBARD and HILGEN individually.

3. Separate interviews with Chairs of ICS and three of its Subcommissions.

Main issues for discussion: structure, working procedures, main accomplishments and planned activities of ICS and its Subcommissions.

3a. F. GRADSTEIN: Chair, International Commission on Stratigraphy (ICS)

As requested, GRADSTEIN gave a presentation on a number of separated items: (i) ICS, its Organization and Products; (ii) the present status of GSSPs; (iii) ICS Awards in Stratigraphy; and (iv) the Geological Time Scale, GTS-2008.

Some highlights of accomplishment were reviewed and selected prospects for the next four years were then outlined. They were:

- 1) that there is a the need of a new and more friendly *International Stratigraphic Guide*, short, with simple and complex examples of applications, well illustrated, digital and interactive;
- 2) that most Phanerozoic Stage GSSPs will be defined in time for the IGC in 2008;
- 3) that the time-scale GTS-2008 will include a greatly expanded content reflecting the rôle of cyclostratigraphy based on orbital 'tuning', as well as planetary and archaeological time-scales;
- 4) that GSSPs, instead of GSSAs, will be defined for the Precambrian;
- 5) that in view of the fact that as soon as all GSSPs are defined, ICS will not receive further support from IUGS: it is clear that some other organization will be needed to replace it, e.g. an International Association of Stratigraphic Geologists;

- 6) that some kind of Bureau of Standards will also be needed, to record and monitor the taxonomy and nomenclature of named stratigraphic units, including then the association of GSSPs with the management of Geoparks;
- 7) that there is expected to be a natural merging of adjacent Subcommissions with new mandates, including the formalisation of intra-Stage subdivisions;
- 8) that a Special Projects Section is necessary, to communicate with Industry and national geological institutions such as BRGM;
- 9) that the increasing importance of the ICS website, and especially of the new GTS to be located at it, are strongly emphasized by a volume of downloading that is truly remarkable.

RICCARDI and VAI warmly congratulated GRADSTEIN on the many important results achieved by ICS under his chairmanship..

RICCARDI asked in what way if any ICS maintains contacts with National Stratigraphic Committees (as mentioned in the ICS 2003 *Annual Report*). GRADSTEIN answered that ICS does not have contacts of this type.

VAI pointed to the need for a consensus in stratigraphy, and considered that activities of ICS performed thus far have increased its visibility. He also expressed his agreement with most activities planned for the future, e.g. the definition of GSSPs in the Precambrian. He also pointed out that ICS should not disseminate information that has not been formally approved by IUGS.

CALLOMON stressed the importance of defining standard stratigraphic units in terms of those at the lowest level of their hierarchy of rank, e.g. Zone or Subzone, instead of some arbitrarily decreed universal level such as the Stage.

RICCARDI asked how the ICS would view the idea of its Executive of forming an Association of Stratigraphic Geologists, and how such a project would fit in with relation to the structure of IUGS. On the first question, GRADSTEIN answered that it relates to what is so far only a personal idea, and that he is only thinking about it. On the second, he answered that the question should be put to the IUGS.

RICCARDI asked whether there was some reason why the President and Secretary of ICS had published papers (2004), including the book *The Geological Time Scale*, that were the products of their personal authorship rather than of the ICS, without including any disclaimer to the effect that they were not official publications of ICS and IUGS: although some of them did include the ICS and/or IUGS logos. GRADSTEIN offered his apologies for these errors of omission, and said that more care will be taken in the future.

VAI remarked on the need, thus far not fulfilled, to explain clearly in print all new changes introduced in the International Stratigraphic Scale.

3b. Maria B. CITA: CHAIR, I S STRATIGRAPHICAL CLASSIFICATION (ISSC).

Maria CITA gave an historical account of ISSCs activities, referring among other items especially to: 1) changes in the ISSC members with twelve new members appointed; the ISSC website and *Newsletters* (eight distributed in the last three years); the formation of Working Groups on Cyclostratigraphy and Sequence Stratigraphy, two new important braches of stratigraophy not considered in the published ISG; and the ISSC Workshop on “Post-Hedberg Developments in Stratigraphic Classification” organized at the 32nd

International Geological Congress in Florence, 2004; 2) presently the ISSC activity is concentrated on the plan to publish a series of review papers on *Newsletter of Stratigraphy*, to be assembled in a new *International Stratigraphic Guide*. Simple, clear, concise, convincing, users friendly, well illustrated, multiauthored, with real world examples (case-studies); 3) CITA complained about the lack of enough economical support for ISSC activities, and mentioned the existence of differences between ISSC and the ICS Executive in relation to the procedure for approval of GSSPs and to ISSCs position on the issue of the status of the Quaternary.

RICCARDI asked why in the report produced by CITA for this meeting, she qualified as “rubber-stamping” the procedure followed by ICS to approve GSSPs. She observed that in most cases the chairs of the different Subcommissions of ICS as a whole do not discuss in detail the proposals on GSSPs made by individual Subcommissions (no “quality control” foreseen). On the question of the Quaternary, CITA mentioned that an ISSC position paper was simply ignored. In it the ISSC supported maintaining the Quaternary at the level of System/Period. In this connection she mentioned that the IS on the Neogene never in fact extended the Neogene to the Present.

Lucy EDWARDS remarked that possible changes to the *International Stratigraphic Guide* should be discussed and implemented on a regular basis. VAI agreed, and considered that any such changes should be worked as closely as possible in parallel with the North American *Code on Stratigraphic Nomenclature*, with a view to harmonizing the *Code* with the *Guide*.

EDWARDS asked how much of the *ISG* edited by HEDBERG and SALVADOR would be incorporated into the new *Guide*. CITA replied, very little. The new guide is not intended as a duplication, but as a necessary update and complement.

CALLOMON urged the need for the new *ISG* to distinguish between taxonomy and nomenclature and that it should include clear explanations of principles and practices in stratigraphic matters.

3c. P. GIBBARD: Chair, I S Quaternary (ISQS)

As requested P. GIBBARD gave an account of the activities of the IS on the Quaternary (ISQS). He stressed the important co-ordinating role of the ICS in unifying the language of stratigraphical classification and the interaction with experienced colleagues who work on systems of widely differing age. mentioned that the main task of the three existing Working Groups (WG) of ISQS is to define GSSPs for the main subdivisions of the Quaternary. Two additional WGs are planned: one is to compile regional sequences, the other- to consider the formal chronostratigraphical/geochronological status of very short-time divisions in the Quaternary, working if possible in co-operation with ISSC. GIBBARD said he sees the future of ISQS as stretching stratigraphic resolution as far as it can – down to sub-Milankovich scale and down to terms that do not yet exist. He commented on a series of problems that had arisen from attempts to suppress the term ‘Quaternary’ which acted as a distraction from the ISQSs main task:

- 1) beginning with the publication of a new Geological Time Scale, in which the Neogene was extended to the Present, this was taken to be an ICS official document despite it being only a “personal” publication under the main editorship of the Chair and Secretary of ICS;
- 2) the subsequent establishment of a WG with a membership decided mainly by the ICS Executive;
- 3) inconclusive and “not always polite” e-mail exchanges with ICS officers before the productive meeting held at Leuven in September, 2005.

GIBBARD stressed that these events “have generated deep suspicion of the motives and control of ICS within the Quaternary community”, that ICS “must serve, and be seen to serve, the community”, and that ICS needs to become more open, democratic and even-handed in its operation and decision making. He noted that the Quaternary community does not understand the nuances of IUGS vs ICS and who voted on what.

EDWARDS asked if the Quaternary community favoured the inclusion of MISs (marine-isotope stages) in the *Guide*. GIBBARD said yes, of course they should be included. Quaternary people may use the absence of MISs in the *Guide* as an excuse to feel excluded.

RICCARDI asked GIBBARD’s opinion on possible ways of improving ICSs organization and procedures. In his reply he stressed the primary need to formulate a working structure that made ICS more directly responsible to somebody. He suggested that a possible way might be found through a supervising body of -National and/or Regional Representatives.

3d. F. HILGEN: Chair, I S Neogene Stratigraphy (ISNS)

As requested F. HILGEN gave an account of the activities of the ISNS. He described the working structure of ISNS, and the recent accomplishments of its WG on GSSPs. He stressed the main approach followed by the ISNS: high-resolution stratigraphy combined with astronomical ‘tuning’; the definition of unit-stratotypes besides GSSPs; and the intercalibration of Ar/Ar and astronomical data. He stressed the need for chronostratigraphic standards at much higher levels of time-resolution than those of the Stage. He noted the activity and productivity of ICS but pointed to a certain lack of coherence and visibility on its part which in his opinion could be overcome by the formation of an International Association of Stratigraphic Geologists.

EDWARDS questioned the extension of the Neogene to the Present. HILGEN said that although there have always been those on each side of the argument, a vote shows a large majority (90%) in favour of extending the Neogene to the present day.

VAI pointed to various procedural problems in relation to the recent ballot on the Quaternary by the ISNS, claiming that the conventional procedure of a moratorium for two terms was not observed, making the ballot invalid.

RICCARDI asked his opinion on the relationship between ICS and an eventual International Association of Stratigraphic Geologists. HILGEN said he views them as separate entities.

RICCARDI asked if the Neogene chapter in the book *A Geological Time Scale 2004* (Gradstein, Ogg and Smith, editors), was an official publication of the ISNS. HILGEN

answered in the negative, saying that its responsibility rested with its authors, including himself, who participated on a personal basis.

B CONCLUSIONS and RECOMMENDATIONS

Following a discussion of the items summarized above, the ARC arrived at several conclusions and recommendations. These were grouped under two main categories, scientific and procedural.

Conclusions and recommendations on scientific matters:

There is a lasting need for an international committee of stratigraphers to stabilize stratigraphic procedure and terminology as the science of stratigraphy continues to develop new concepts and techniques. New *Guides* will be needed and will need to be amended; existing GSSPs will be challenged; subdivisions below Stage are desirable; new techniques and new terminologies will emerge.

1. ICS is to be congratulated for the important work it has done in promoting stratigraphic research. The establishment of GSSPs has produced an important byproduct: a large improvement in stratigraphy as a science, worldwide.
2. New editions of the *International Stratigraphic Guide (ISG)* should build on previous editions, but begin with clear definitions of stratigraphic principles and go on to include concise explanations of new concepts, techniques and improvements in practical applications.
3. The *ISG* should be what the title implies, a *Guide*, and not be regarded as a mandatory edict of ICS under its parent body, IUGS.
4. ICS should try to make the *ISG* compatible as far as possible with existing National or Regional *Codes* (e.g. the North American Code, *NACSN*).
5. Classifications should be standardised at and above a certain stated level.
6. Typological definitions of standard chronostratigraphical units by means of boundary stratotypes, such as Stage GSSPs, should be extended downwards, below the Stage level in the hierarchy.
7. The ways in which standard boundary stratotypes are defined are practical matters that may vary from System to System and involve different criteria and techniques. They should therefore not be closely defined or regulated by ICS.
8. The validity of parallel standard chronostratigraphic classifications, based on different practical geochronometric techniques, should be recognized. All standard classifications should be individually defined typologically in terms of boundary stratotypes, as is at present the practice in Stage GSSPs.
9. If and when several parallel standard chronostratigraphical classifications have been produced, they should be compared and intercalibrated. One of them should then be selected to be the Primary Standard, others to be designated Secondary or Auxiliary Standards.
10. Descriptions of GSSPs should include clear specifications of all the elements used in their definitions and their applicability.

11. Definitions of GSSPs should not be constrained by a deadline for completion, as such a deadline can be unrealistic, in view of the essentially voluntary nature of the contributions by those doing the work - at least, as far as ICS is concerned - and potentially dangerous in trying to arrive at sound, unforced and stable proposals.
12. The function of ICS in this respect, as in others, should be *reactive* - guiding, unifying, codifying what has been achieved and encouraging what has been suggested, certainly - rather than *proactive*, trying to generate new initiative that it is unable to resource directly itself.
13. All definitions on the *International Stratigraphic Chart* not formally approved by IUGS should be considered as having no official status.

Conclusions and recommendations on procedural matters:

1. A new edition of the *International Stratigraphic Guide* should be produced by the IS on Stratigraphic Classification (ISSC), in consultation with National and/or Regional Committees/Commissions on Stratigraphy. This could proceed in three steps: a) ISSC produces a draft of the *Guide*; b) ISSC consults National and/or Regional Committees; c) ISSC decides on the final version.
2. The *International Stratigraphic Guide* should include procedural provisions for future amendments.
3. All ICS official publications, i.e. those exhibiting the ICS logo, should be published according to the *Statutes* of IUGS and ICS, and in conformity with the provisions of the *International Stratigraphic Guide*.
4. All ICS official publications must be formally approved by the IUGS EC as far as compliance with constitutional requirements is concerned, although not as endorsement of their scientific or technical content.
5. In this connection, IUGS EC should establish a standing Advisory Committee on Stratigraphy or Stratigraphic Standards, consisting of three experts, to advise it on all matters submitted to it by ICS for consideration, but exclusively with regard to the fulfillment of all legal requirements of rules and procedures governing the establishment of international standards in stratigraphical matters.
6. The Nominating Committee for election of Officers of ICS should consist of a maximum of five members, which shall not include any of the Executive Committee of ICS nor Chairs of the Subcommissions of ICS.
7. Members of the Nominating Committee should however be proposed and elected by the Chairs of the ICS Subcommissions.
8. The Nominating Committee for election of ICS Officers should propose not more than 3 candidates for each position.
9. The ICS Officers are then elected by the Chairs of the ICS Subcommissions.
10. The whole process of electing the Nominating Committee and the ICS Officers should be conducted by the Chair of one of the ICS Subcommissions, e.g. the Chair of the IS on Stratigraphic Classification.
11. ICS *Statutes* should be modified in accord with the recommendations given above.

Appendix: a list of acronyms.

ABRD Advisory Board on Research and Development, of IUGS

ARC Ad-hoc Review Committee, to advise IUGS (q.v.)
BRGM Bureau de Recherches Géologiques et Minières, France
EC Executive Committee, of IUGS and ICS
GSSP Global Standard Section and point, defining the lower boundary of a standard chronostratigraphical unit, at present at the level of Stage and higher
GTS *A Geological Time Scale*, published (-2004) and projected (-2008)
ICS International Commission on Stratigraphy, of IUGS
IGC International Geological Congress
ISDS International Subcommittee on Devonian Stratigraphy, of ICS
ISG *International Stratigraphic Guide*, published by IUGS
ISJS International Subcommittee on Jurassic Stratigraphy, of ICS
ISNS International Subcommittee on Neogene Stratigraphy, of ICS
ISQS International Subcommittee on the Quaternary Stratigraphy, of ICS
ISSC International Subcommittee on Stratigraphical Classification
IUGS International Union of Geological Sciences
NACSN North American *Code on Stratigraphical Nomenclature*

Actions

1. Riccardi to write draft minutes of meeting.
2. Zhang, Edwards, Callomon, and Vai to comment on draft minutes.
3. Riccardi to forward final minutes to EC members.
4. IUGS EC to decide on recommendations.

ATTACHMENT - B

ACTIONS to be taken by ICS

1. ICS Statutes should be modified according to the following recommendations:
 - 1.1. The Nominating Committee for election of Officers of ICS should consist of a maximum of five members, which shall not include any of the Executive Committee of ICS nor Chairs of the Subcommissions of ICS.
 - 1.2. Members of the Nominating Committee should however be proposed and elected by the Chairs of the ICS Subcommissions.
 - 1.3. The Nominating Committee for election of ICS Officers should propose not more than 3 candidates for each position.
 - 1.4. The ICS Officers are then elected by the Chairs of the ICS Subcommissions.
 - 1.5. The whole process of electing the Nominating Committee and the ICS Officers should be conducted by the Chair of one of the ICS Subcommissions, e.g. the Chair of the IS on Stratigraphic Classification.
2. All ICS official publications must be formally approved by the IUGS EC as far as compliance with constitutional requirements is concerned, although not as endorsement of their scientific or technical content.
3. All ICS official publications, i.e. those exhibiting the ICS logo, should be published according to the *Statutes* of IUGS and ICS, and in conformity with the provisions of the *International Stratigraphic Guide*.
4. The *International Stratigraphic Guide* should include procedural provisions for future amendments.
5. New editions of the *International Stratigraphic Guide* should be produced by the IS on Stratigraphic Classification (ISSC), in consultation with National and/or Regional Committees/Commissions on Stratigraphy. This could proceed in three steps: a) ISSC produces a draft of the *Guide*; b) ISSC consults National and/or Regional Committees; c) ISSC decides on the final version.

Additional recommendations to ICS:

- a. New editions of the *International Stratigraphic Guide (ISG)* should build on previous editions, but begin with clear definitions of stratigraphic principles and go on to include concise explanations of new concepts, techniques and improvements in practical applications.

- b. The *ISG* should be what the title implies, a *Guide*, and not be regarded as a mandatory edict of ICS under its parent body, IUGS.
- c. ICS should try to make the *ISG* compatible as far as possible with existing National or Regional *Codes* (e.g. the North American Code, *NACSN*).
- d. Classifications should be standardised at and above a certain stated level.
- e. Typological definitions of standard chronostratigraphical units by means of boundary stratotypes, such as Stage GSSPs, should be extended downwards, below the Stage level in the hierarchy.
- f. The ways in which standard boundary stratotypes are defined are practical matters that may vary from System to System and involve different criteria and techniques. They should therefore not be closely defined or regulated by ICS.
- g. The validity of parallel standard chronostratigraphic classifications, based on different practical geochronometric techniques, should be recognized. All standard classifications should be individually defined typologically in terms of boundary stratotypes, as is at present the practice in Stage GSSPs.
- h. If and when several parallel standard chronostratigraphical classifications have been produced, they should be compared and intercalibrated. One of them should then be selected to be the Primary Standard, others to be designated Secondary or Auxiliary Standards.
- i. Descriptions of GSSPs should include clear specifications of all the elements used in their definitions and their applicability.
- j. Definitions of GSSPs should not be constrained by a deadline for completion, as such a deadline can be unrealistic, in view of the essentially voluntary nature of the contributions by those doing the work - at least, as far as ICS is concerned - and potentially dangerous in trying to arrive at sound, unforced and stable proposals.
- k. The function of ICS in this respect, as in others, should be *reactive* - guiding, unifying, codifying what has been achieved and encouraging what has been suggested, certainly - rather than *proactive*, trying to generate new initiative that it is unable to resource directly itself.

ATTACHMENT - C

September 8th, 2006

To the ICS Executive,

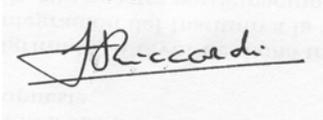
In order to address the questions raised by the ICS Executive on the Conclusions of the Ad Hoc Review Committee on the ICS it should first be noted that these were divided in **Actions**, that are mainly concerned with procedural matters and that once approved by the IUGS EC are mandatory, and **Recommendations**, which go beyond procedures and are not mandatory.

On the ICS questions:

- 1) **ICS statute revision**. The required **action** on this item only applies to the election of the ICS Chair and Vice Chair, as provisions for a Nominating Committee within the current ICS Statutes are only related to the election of these ICS officers. As for the time-line for selection of the Nominating Committee and ICS officers, they should comply, as in previous elections, with the IUGS schedule, i.e. the final slate of elected officers should reach the IUGS EC at a required date before the ordinary session of the Council.
- 2) **ICS official publications**. The required **action**, that ICS publications should be formally approved by the IUGS EC, should be understood in the context of the whole ARC report on ICS, i.e. this request applies primarily to all official publications where ICS dictates formal changes on previous standards, procedural rules, and the like, which are expected to be followed by the International Earth Sciences community, e.g. changes in the International Stratigraphic Scale, International Stratigraphical Guide, Statutes, etc. Regarding publications and the ICS logo, the first responsibility is clarity to the geologic community. Can the reader tell whether the opinions expressed are of the author (personally), the ICS executive, the voting members of the ICS, or the IUGS Executive, etc.? If familiar words such as "Quaternary" have been removed from the vocabulary or significantly changed in meaning, do these changes have the sanction of ICS and IUGS? Thus, websites and newsletters bearing the ICS/IUGS logos do not require IUGS EC approval but should be explicit in the attribution of opinions and decisions to their sources. Books written by authors who also hold positions in the ICS or IUGS should clearly state what has been officially ratified and what has not, and should not bear either ICS or IUGS logos. Journal publications advocating ICS or IUGS action should be reviewed for procedural compliance prior to submission for publication.
- 3) **Definition of boundary stratotypes**. The **recommendation** on this item does not necessarily imply changes in the current ICS procedures for definition of GSSPs. It only stresses the importance of the criteria mentioned, as methods and techniques do not necessarily have the same significance throughout the different systems.

- 4) Primary and secondary standards. The **recommendation** on this item stresses the fact that when different parallel standard classifications are compared and intercalibrated there is usually one that is superior because of its independence and precision.
- 5) Extension of typological definitions of standard units. The **recommendation** on this item stresses the existing variability in stratigraphic precision, and the possibility to use it.

Sincerely yours,

A handwritten signature in black ink, appearing to read "A.C. Riccardi", written over a horizontal line.

Prof. Dr. A.C. Riccardi

ATTACHMENT - D

Dear Dr. (ICS)

As communicated to the ICS Secretary, the recommendations on “Definition and Rank of the Quaternary”, submitted by the ICS on 28 September 2005, were considered by the IUGS Executive Committee once INQUA’s position on this issue became available.

A careful assessment of all existing information has shown:

- 1) That important disagreements exist within specialized bodies and the international geological community with regard to the recommendations submitted by ICS, as indicated by the votes and accompanying comments, of the ICS/INQUA Task Group, and of the ICS, the statements made by INQUA on August 31, 2005 and March 24th, 2006, as well as statements produced by National and Regional Stratigraphic Committees, including various articles published on this matter;
- 2) That the recommendations submitted by ICS are not in agreement with the long-standing protocol and procedural principles that have been accepted by the international geological community, and established by ICS itself in the International Stratigraphic Guide (ISG, 1994) and the “Revised Guidelines for the Establishment of Global Chronostratigraphic Standards of the ICS” (RG, 1996). This situation has been brought to our attention in comments provided by several ICS members and by the International Subcommission on Stratigraphic Classification (ISSC) in its document “Position of ISSC towards Quaternary Issues” (ISSC Newsletter No. 7, June 2005).

Thus from these documents (ISG and RG) it is clear:

- a) That the lower boundaries of Chronostratigraphic units of higher rank (series, systems, etc.) are automatically defined by the base of their lowermost stage. In other words: the lower boundary of a system is always also a series and a stage boundary;
- b) That a unit of lower rank cannot be part of two units of higher rank, i.e. a system cannot be part of two erathems, a series cannot be part of two systems, and a stage cannot be part of two series;
- c) that restraint is recommended in creating new orders of chronostratigraphic units, as sub-erathem, sub-system, sub-series and sub-stage.

Thus the principles of hierarchy mentioned above and the hierarchical structure of the Chronostratigraphic Scale are clearly violated if a sub-erathem/sub-era boundary does not coincide with either a system/period or series/epoch boundary. Accordingly, it is inappropriate to detach the beginning of the Quaternary from the beginning of the Pleistocene and to propose the Pliocene to overlap the Tertiary and Quaternary or the Quaternary to include parts of both Pleistocene and Pliocene.

- 3) The IUGS EC is also concerned that the procedure for a decision that was adopted is technically flawed. This process should have involved the Subcommissions on the Quaternary, the Neogene, and the above-mentioned multilateral ICS/INQUA Task Group. The IUGS EC is

also concerned about the evident disregard of the ICS Statutes (2002) that clearly require a sixty percent (60%) majority of delivered votes, etc. The IUGS EC gave especial consideration to the recorded polls, i.e. those by the Task Group and ICS, which in several cases resulted in statistically questionable interpretations, whilst in others were accompanied by comments indicating misgivings and formal compromise.

The IUGS EC also notes that the “Procedure for Decisions by ICS-INQUA Joint Task Group on the Quaternary” states clearly that once ICS and INQUA’s have arrived to decisions on the recommendations of the ICS-INQUA Task Group, “if necessary the Task Group will meld the ICS/INQUA documents for a second joint-commission voting round”. This point becomes especially important when considering that the INQUA EC has arrived at conclusions that differ from those of ICS, and that as a result INQUA’s EC, on March 24, 2006, has requested to ICS continue its dialogue with INQUA.

In view of the concerns stated above, especially based on procedural matters, the IUGS EC requests the ICS to immediately readdress the issue of the Quaternary, following the principles, rules, and working agreements agreed upon by all parties previously and detailed above. This request also applies to the most recent decision circulated, on August 18th, 2006, by the ICS Executive, who must postpone publishing any change on this matter unless it has been previously approved by the IUGS EC. Meanwhile the Quaternary remains as depicted in the International Stratigraphic Chart published by IUGS in 2000.

To ensure that this issue is addressed properly and promptly the Executive Committee of IUGS formally requests the officers of ICS to confirm receipt of this memorandum and acknowledge the need for re-addressing the issue within 30 days of this dated letter.

We regret that this problem has been allowed to escalate to the current situation. And we request that the officers of ICS move expeditiously towards a positive solution of this unsatisfactory state of affairs.

Sincerely

Zhang Hongren

President IUGS

Cc: IUGS EC

ATTACHMENT - A

MINUTES of the meeting of the AD-HOC REVIEW COMMITTEE (ARC) on the INTERNATIONAL COMMISSION ON STRATIGRAPHY (ICS) Paris, 7 – 8 November 2005

Review Committee members: Alberto RICCARDI (La Plata, IUGS EC member, Chair), ZHANG Hongren (IUGS President, Beijing), John CALLOMON (external expert, England), Lucy EDWARDS (external expert, USA) and Gian Battista VAI (external expert, Italy).

Interviewed participants: Felix GRADSTEIN (ICS Chair, Norway), Maria Bianca CITA (ISSC - International Subcommittee on Stratigraphic Classification - Chair, Italy), Phil GIBBARD (ISQS - International Subcommittee on Quaternary Stratigraphy - Chair, UK), Fritz HILGEN (ISNS - International Subcommittee on Neogene Stratigraphy - Chair, The Netherlands).

A PROCEEDINGS

1. Opening and background information

RICCARDI opened the meeting by welcoming and thanking the participants for attending the meeting. He explained that the present Review arises out of a general IUGS policy of reviewing periodically all its funded scientific bodies and activities. These reviews are done according to the *Statutes and Bylaws of IUGS* and the *Rules* guiding its different constituent bodies. The Terms of Reference for ARCs regulate their compositions and procedures.

2. Rationale for the Review

RICCARDI explained that the IUGS Strategic Planning Committee had recommended (2000) (a) to hold reviews of all IUGS-funded scientific activities on a regular basis, and (b) to limit both the terms of office for individual officers of Commission and the lifetimes of Commissions themselves. These recommendations were translated into action through the *IUGS Strategic Action Plan* (2001). The first recommendations resulted in the creation of Ad-hoc Review Committees (ARCs) and the second in a set of Rules for Commissions. The *Rules for Commissions* state that the duration of a Commission shall normally be 8 years but that this may be extended on request for maximally up to another period of 8 years. He mentioned that ICS has been part of IUGS since 1965, and that the last review of ICS by the IUGS Advisory Board for Research Development (ABRD) had taken place in 1995. During the 2001 meeting of the IUGS EC, Past President Ed de MULDER suggested another assessment of ICS, and the issue was again considered in the following years, but could not be realised. In 2004 an ARC reviewed IUGSs activities in the field of Geochronology, including those carried out within ICS. Finally, at its last meeting in Vilnius, Lithuania (March 2005), the IUGS Executive Committee decided that an ARC should be convened to review the IUGS ICS.

RICCARDI mentioned that other relevant information for the meeting is included in the documents available to the members of the present ARC: *IUGS Statutes and Bye-laws*; *ICS*

Statutes; ICS Annual Reports for 2000-2004; and the *ABRD Report* of the last ICS Review, 1995. Additional documentation had been requested (i) from F. GRADSTEIN, on the overall aims and objectives of ICS, its structure and working procedures, on its main accomplishments of the last years, and on its planned activities; and (ii) from M.B. CITA, P. GIBBARD and F. HILGEN, on the work of their Subcommissions during the last few years, and how this work has been integrated into ICS activities. Similar information was provided (iii) by the Chairs of other two Subcommissions who were unable to attend the meeting: T. BECKER (ISDS, Devonian Stratigraphy), and N. MORTON (ISJS, Jurassic Stratigraphy) (see Appendix 1).

RICCARDI emphasized the importance of ICS, given that one of the main goals of the 1st International Geological Congress (IGC) held in Paris in 1878 had been to obtain international agreement on matters of stratigraphic classification and terminology, and that this was the origin of a Commission for Unification of Geological Nomenclature, which was established in and active since the 2nd IGC (Bologna, 1881). At the 19th IGC in Algiers (1952), this body - transformed into a Subcommission on Stratigraphic Terminology - became a part of the then newly created ICS. It remains clear to the governance of the IUGS that the ICS is the most important Commission within IUGS, and that its activities are and will continue to be necessary as provider of important services to the international geological community.

RICCARDI proposed to continue with the Agenda by interviewing GRADSTEIN, CITA, GIBBARD and HILGEN individually.

3. Separate interviews with Chairs of ICS and three of its Subcommissions.

Main issues for discussion: structure, working procedures, main accomplishments and planned activities of ICS and its Subcommissions.

3a. F. GRADSTEIN: Chair, International Commission on Stratigraphy (ICS)

As requested, GRADSTEIN gave a presentation on a number of separated items: (i) ICS, its Organization and Products; (ii) the present status of GSSPs; (iii) ICS Awards in Stratigraphy; and (iv) the Geological Time Scale, GTS-2008.

Some highlights of accomplishment were reviewed and selected prospects for the next four years were then outlined. They were:

- 1) that there is a the need of a new and more friendly *International Stratigraphic Guide*, short, with simple and complex examples of applications, well illustrated, digital and interactive;
- 2) that most Phanerozoic Stage GSSPs will be defined in time for the IGC in 2008;
- 3) that the time-scale GTS-2008 will include a greatly expanded content reflecting the rôle of cyclostratigraphy based on orbital 'tuning', as well as planetary and archaeological time-scales;
- 4) that GSSPs, instead of GSSAs, will be defined for the Precambrian;
- 5) that in view of the fact that as soon as all GSSPs are defined, ICS will not receive further support from IUGS: it is clear that some other organization will be needed to replace it, e.g. an International Association of Stratigraphic Geologists;

- 6) that some kind of Bureau of Standards will also be needed, to record and monitor the taxonomy and nomenclature of named stratigraphic units, including then the association of GSSPs with the management of Geoparks;
- 7) that there is expected to be a natural merging of adjacent Subcommissions with new mandates, including the formalisation of intra-Stage subdivisions;
- 8) that a Special Projects Section is necessary, to communicate with Industry and national geological institutions such as BRGM;
- 9) that the increasing importance of the ICS website, and especially of the new GTS to be located at it, are strongly emphasized by a volume of downloading that is truly remarkable.

RICCARDI and VAI warmly congratulated GRADSTEIN on the many important results achieved by ICS under his chairmanship..

RICCARDI asked in what way if any ICS maintains contacts with National Stratigraphic Committees (as mentioned in the ICS 2003 *Annual Report*). GRADSTEIN answered that ICS does not have contacts of this type.

VAI pointed to the need for a consensus in stratigraphy, and considered that activities of ICS performed thus far have increased its visibility. He also expressed his agreement with most activities planned for the future, e.g. the definition of GSSPs in the Precambrian. He also pointed out that ICS should not disseminate information that has not been formally approved by IUGS.

CALLOMON stressed the importance of defining standard stratigraphic units in terms of those at the lowest level of their hierarchy of rank, e.g. Zone or Subzone, instead of some arbitrarily decreed universal level such as the Stage.

RICCARDI asked how the ICS would view the idea of its Executive of forming an Association of Stratigraphic Geologists, and how such a project would fit in with relation to the structure of IUGS. On the first question, GRADSTEIN answered that it relates to what is so far only a personal idea, and that he is only thinking about it. On the second, he answered that the question should be put to the IUGS.

RICCARDI asked whether there was some reason why the President and Secretary of ICS had published papers (2004), including the book *The Geological Time Scale*, that were the products of their personal authorship rather than of the ICS, without including any disclaimer to the effect that they were not official publications of ICS and IUGS: although some of them did include the ICS and/or IUGS logos. GRADSTEIN offered his apologies for these errors of omission, and said that more care will be taken in the future.

VAI remarked on the need, thus far not fulfilled, to explain clearly in print all new changes introduced in the International Stratigraphic Scale.

3b. Maria B. CITA: CHAIR, I S STRATIGRAPHICAL CLASSIFICATION (ISSC).

Maria CITA gave an historical account of ISSCs activities, referring among other items especially to: 1) changes in the ISSC members with twelve new members appointed; the ISSC website and *Newsletters* (eight distributed in the last three years); the formation of Working Groups on Cyclostratigraphy and Sequence Stratigraphy, two new important braches of stratigraophy not considered in the published ISG; and the ISSC Workshop on “Post-Hedberg Developments in Stratigraphic Classification” organized at the 32nd

International Geological Congress in Florence, 2004; 2) presently the ISSC activity is concentrated on the plan to publish a series of review papers on *Newsletter of Stratigraphy*, to be assembled in a new *International Stratigraphic Guide*. Simple, clear, concise, convincing, users friendly, well illustrated, multiauthored, with real world examples (case-studies); 3) CITA complained about the lack of enough economical support for ISSC activities, and mentioned the existence of differences between ISSC and the ICS Executive in relation to the procedure for approval of GSSPs and to ISSCs position on the issue of the status of the Quaternary.

RICCARDI asked why in the report produced by CITA for this meeting, she qualified as “rubber-stamping” the procedure followed by ICS to approve GSSPs. She observed that in most cases the chairs of the different Subcommissions of ICS as a whole do not discuss in detail the proposals on GSSPs made by individual Subcommissions (no “quality control” foreseen). On the question of the Quaternary, CITA mentioned that an ISSC position paper was simply ignored. In it the ISSC supported maintaining the Quaternary at the level of System/Period. In this connection she mentioned that the IS on the Neogene never in fact extended the Neogene to the Present.

Lucy EDWARDS remarked that possible changes to the *International Stratigraphic Guide* should be discussed and implemented on a regular basis. VAI agreed, and considered that any such changes should be worked as closely as possible in parallel with the North American *Code on Stratigraphic Nomenclature*, with a view to harmonizing the *Code* with the *Guide*.

EDWARDS asked how much of the *ISG* edited by HEDBERG and SALVADOR would be incorporated into the new *Guide*. CITA replied, very little. The new guide is not intended as a duplication, but as a necessary update and complement.

CALLOMON urged the need for the new *ISG* to distinguish between taxonomy and nomenclature and that it should include clear explanations of principles and practices in stratigraphic matters.

3c. P. GIBBARD: Chair, I S Quaternary (ISQS)

As requested P. GIBBARD gave an account of the activities of the IS on the Quaternary (ISQS). He stressed the important co-ordinating role of the ICS in unifying the language of stratigraphical classification and the interaction with experienced colleagues who work on systems of widely differing age. mentioned that the main task of the three existing Working Groups (WG) of ISQS is to define GSSPs for the main subdivisions of the Quaternary. Two additional WGs are planned: one is to compile regional sequences, the other- to consider the formal chronostratigraphical/geochronological status of very short-time divisions in the Quaternary, working if possible in co-operation with ISSC. GIBBARD said he sees the future of ISQS as stretching stratigraphic resolution as far as it can – down to sub-Milankovich scale and down to terms that do not yet exist. He commented on a series of problems that had arisen from attempts to suppress the term ‘Quaternary’ which acted as a distraction from the ISQSs main task:

- 1) beginning with the publication of a new Geological Time Scale, in which the Neogene was extended to the Present, this was taken to be an ICS official document despite it being only a “personal” publication under the main editorship of the Chair and Secretary of ICS;
- 2) the subsequent establishment of a WG with a membership decided mainly by the ICS Executive;
- 3) inconclusive and “not always polite” e-mail exchanges with ICS officers before the productive meeting held at Leuven in September, 2005.

GIBBARD stressed that these events “have generated deep suspicion of the motives and control of ICS within the Quaternary community”, that ICS “must serve, and be seen to serve, the community”, and that ICS needs to become more open, democratic and even-handed in its operation and decision making. He noted that the Quaternary community does not understand the nuances of IUGS vs ICS and who voted on what.

EDWARDS asked if the Quaternary community favoured the inclusion of MISs (marine-isotope stages) in the *Guide*. GIBBARD said yes, of course they should be included. Quaternary people may use the absence of MISs in the *Guide* as an excuse to feel excluded.

RICCARDI asked GIBBARD’s opinion on possible ways of improving ICSs organization and procedures. In his reply he stressed the primary need to formulate a working structure that made ICS more directly responsible to somebody. He suggested that a possible way might be found through a supervising body of -National and/or Regional Representatives.

3d. F. HILGEN: Chair, I S Neogene Stratigraphy (ISNS)

As requested F. HILGEN gave an account of the activities of the ISNS. He described the working structure of ISNS, and the recent accomplishments of its WG on GSSPs. He stressed the main approach followed by the ISNS: high-resolution stratigraphy combined with astronomical ‘tuning’; the definition of unit-stratotypes besides GSSPs; and the intercalibration of Ar/Ar and astronomical data. He stressed the need for chronostratigraphic standards at much higher levels of time-resolution than those of the Stage. He noted the activity and productivity of ICS but pointed to a certain lack of coherence and visibility on its part which in his opinion could be overcome by the formation of an International Association of Stratigraphic Geologists.

EDWARDS questioned the extension of the Neogene to the Present. HILGEN said that although there have always been those on each side of the argument, a vote shows a large majority (90%) in favour of extending the Neogene to the present day.

VAI pointed to various procedural problems in relation to the recent ballot on the Quaternary by the ISNS, claiming that the conventional procedure of a moratorium for two terms was not observed, making the ballot invalid.

RICCARDI asked his opinion on the relationship between ICS and an eventual International Association of Stratigraphic Geologists. HILGEN said he views them as separate entities.

RICCARDI asked if the Neogene chapter in the book *A Geological Time Scale 2004* (Gradstein, Ogg and Smith, editors), was an official publication of the ISNS. HILGEN

answered in the negative, saying that its responsibility rested with its authors, including himself, who participated on a personal basis.

B CONCLUSIONS and RECOMMENDATIONS

Following a discussion of the items summarized above, the ARC arrived at several conclusions and recommendations. These were grouped under two main categories, scientific and procedural.

Conclusions and recommendations on scientific matters:

There is a lasting need for an international committee of stratigraphers to stabilize stratigraphic procedure and terminology as the science of stratigraphy continues to develop new concepts and techniques. New *Guides* will be needed and will need to be amended; existing GSSPs will be challenged; subdivisions below Stage are desirable; new techniques and new terminologies will emerge.

1. ICS is to be congratulated for the important work it has done in promoting stratigraphic research. The establishment of GSSPs has produced an important byproduct: a large improvement in stratigraphy as a science, worldwide.
2. New editions of the *International Stratigraphic Guide (ISG)* should build on previous editions, but begin with clear definitions of stratigraphic principles and go on to include concise explanations of new concepts, techniques and improvements in practical applications.
3. The *ISG* should be what the title implies, a *Guide*, and not be regarded as a mandatory edict of ICS under its parent body, IUGS.
4. ICS should try to make the *ISG* compatible as far as possible with existing National or Regional *Codes* (e.g. the North American Code, *NACSN*).
5. Classifications should be standardised at and above a certain stated level.
6. Typological definitions of standard chronostratigraphical units by means of boundary stratotypes, such as Stage GSSPs, should be extended downwards, below the Stage level in the hierarchy.
7. The ways in which standard boundary stratotypes are defined are practical matters that may vary from System to System and involve different criteria and techniques. They should therefore not be closely defined or regulated by ICS.
8. The validity of parallel standard chronostratigraphic classifications, based on different practical geochronometric techniques, should be recognized. All standard classifications should be individually defined typologically in terms of boundary stratotypes, as is at present the practice in Stage GSSPs.
9. If and when several parallel standard chronostratigraphical classifications have been produced, they should be compared and intercalibrated. One of them should then be selected to be the Primary Standard, others to be designated Secondary or Auxiliary Standards.
10. Descriptions of GSSPs should include clear specifications of all the elements used in their definitions and their applicability.

11. Definitions of GSSPs should not be constrained by a deadline for completion, as such a deadline can be unrealistic, in view of the essentially voluntary nature of the contributions by those doing the work - at least, as far as ICS is concerned - and potentially dangerous in trying to arrive at sound, unforced and stable proposals.
12. The function of ICS in this respect, as in others, should be *reactive* - guiding, unifying, codifying what has been achieved and encouraging what has been suggested, certainly - rather than *proactive*, trying to generate new initiative that it is unable to resource directly itself.
13. All definitions on the *International Stratigraphic Chart* not formally approved by IUGS should be considered as having no official status.

Conclusions and recommendations on procedural matters:

1. A new edition of the *International Stratigraphic Guide* should be produced by the IS on Stratigraphic Classification (ISSC), in consultation with National and/or Regional Committees/Commissions on Stratigraphy. This could proceed in three steps: a) ISSC produces a draft of the *Guide*; b) ISSC consults National and/or Regional Committees; c) ISSC decides on the final version.
2. The *International Stratigraphic Guide* should include procedural provisions for future amendments.
3. All ICS official publications, i.e. those exhibiting the ICS logo, should be published according to the *Statutes* of IUGS and ICS, and in conformity with the provisions of the *International Stratigraphic Guide*.
4. All ICS official publications must be formally approved by the IUGS EC as far as compliance with constitutional requirements is concerned, although not as endorsement of their scientific or technical content.
5. In this connection, IUGS EC should establish a standing Advisory Committee on Stratigraphy or Stratigraphic Standards, consisting of three experts, to advise it on all matters submitted to it by ICS for consideration, but exclusively with regard to the fulfillment of all legal requirements of rules and procedures governing the establishment of international standards in stratigraphical matters.
6. The Nominating Committee for election of Officers of ICS should consist of a maximum of five members, which shall not include any of the Executive Committee of ICS nor Chairs of the Subcommissions of ICS.
7. Members of the Nominating Committee should however be proposed and elected by the Chairs of the ICS Subcommissions.
8. The Nominating Committee for election of ICS Officers should propose not more than 3 candidates for each position.
9. The ICS Officers are then elected by the Chairs of the ICS Subcommissions.
10. The whole process of electing the Nominating Committee and the ICS Officers should be conducted by the Chair of one of the ICS Subcommissions, e.g. the Chair of the IS on Stratigraphic Classification.
11. ICS Statutes should be modified in accord with the recommendations given above.

Appendix: a list of acronyms.

ABRD Advisory Board on Research and Development, of IUGS

ARC Ad-hoc Review Committee, to advise IUGS (q.v.)
BRGM Bureau de Recherches Géologiques et Minières, France
EC Executive Committee, of IUGS and ICS
GSSP Global Standard Section and point, defining the lower boundary of a standard chronostratigraphical unit, at present at the level of Stage and higher
GTS *A Geological Time Scale*, published (-2004) and projected (-2008)
ICS International Commission on Stratigraphy, of IUGS
IGC International Geological Congress
ISDS International Subcommittee on Devonian Stratigraphy, of ICS
ISG *International Stratigraphic Guide*, published by IUGS
ISJS International Subcommittee on Jurassic Stratigraphy, of ICS
ISNS International Subcommittee on Neogene Stratigraphy, of ICS
ISQS International Subcommittee on the Quaternary Stratigraphy, of ICS
ISSC International Subcommittee on Stratigraphical Classification
IUGS International Union of Geological Sciences
NACSN North American *Code on Stratigraphical Nomenclature*

Actions

1. Riccardi to write draft minutes of meeting.
2. Zhang, Edwards, Callomon, and Vai to comment on draft minutes.
3. Riccardi to forward final minutes to EC members.
4. IUGS EC to decide on recommendations.

ATTACHMENT - B

ACTIONS to be taken by ICS

1. ICS Statutes should be modified according to the following recommendations:
 - 1.1. The Nominating Committee for election of Officers of ICS should consist of a maximum of five members, which shall not include any of the Executive Committee of ICS nor Chairs of the Subcommissions of ICS.
 - 1.2. Members of the Nominating Committee should however be proposed and elected by the Chairs of the ICS Subcommissions.
 - 1.3. The Nominating Committee for election of ICS Officers should propose not more than 3 candidates for each position.
 - 1.4. The ICS Officers are then elected by the Chairs of the ICS Subcommissions.
 - 1.5. The whole process of electing the Nominating Committee and the ICS Officers should be conducted by the Chair of one of the ICS Subcommissions, e.g. the Chair of the IS on Stratigraphic Classification.
2. All ICS official publications must be formally approved by the IUGS EC as far as compliance with constitutional requirements is concerned, although not as endorsement of their scientific or technical content.
3. All ICS official publications, i.e. those exhibiting the ICS logo, should be published according to the *Statutes* of IUGS and ICS, and in conformity with the provisions of the *International Stratigraphic Guide*.
4. The *International Stratigraphic Guide* should include procedural provisions for future amendments.
5. New editions of the *International Stratigraphic Guide* should be produced by the IS on Stratigraphic Classification (ISSC), in consultation with National and/or Regional Committees/Commissions on Stratigraphy. This could proceed in three steps: a) ISSC produces a draft of the *Guide*; b) ISSC consults National and/or Regional Committees; c) ISSC decides on the final version.

Additional recommendations to ICS:

- a. New editions of the *International Stratigraphic Guide (ISG)* should build on previous editions, but begin with clear definitions of stratigraphic principles and go on to include concise explanations of new concepts, techniques and improvements in practical applications.

- b. The *ISG* should be what the title implies, a *Guide*, and not be regarded as a mandatory edict of ICS under its parent body, IUGS.
- c. ICS should try to make the *ISG* compatible as far as possible with existing National or Regional *Codes* (e.g. the North American Code, *NACSN*).
- d. Classifications should be standardised at and above a certain stated level.
- e. Typological definitions of standard chronostratigraphical units by means of boundary stratotypes, such as Stage GSSPs, should be extended downwards, below the Stage level in the hierarchy.
- f. The ways in which standard boundary stratotypes are defined are practical matters that may vary from System to System and involve different criteria and techniques. They should therefore not be closely defined or regulated by ICS.
- g. The validity of parallel standard chronostratigraphic classifications, based on different practical geochronometric techniques, should be recognized. All standard classifications should be individually defined typologically in terms of boundary stratotypes, as is at present the practice in Stage GSSPs.
- h. If and when several parallel standard chronostratigraphical classifications have been produced, they should be compared and intercalibrated. One of them should then be selected to be the Primary Standard, others to be designated Secondary or Auxiliary Standards.
- i. Descriptions of GSSPs should include clear specifications of all the elements used in their definitions and their applicability.
- j. Definitions of GSSPs should not be constrained by a deadline for completion, as such a deadline can be unrealistic, in view of the essentially voluntary nature of the contributions by those doing the work - at least, as far as ICS is concerned - and potentially dangerous in trying to arrive at sound, unforced and stable proposals.
- k. The function of ICS in this respect, as in others, should be *reactive* - guiding, unifying, codifying what has been achieved and encouraging what has been suggested, certainly - rather than *proactive*, trying to generate new initiative that it is unable to resource directly itself.

ATTACHMENT - C

September 8th, 2006

To the ICS Executive,

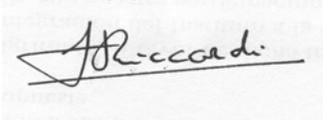
In order to address the questions raised by the ICS Executive on the Conclusions of the Ad Hoc Review Committee on the ICS it should first be noted that these were divided in **Actions**, that are mainly concerned with procedural matters and that once approved by the IUGS EC are mandatory, and **Recommendations**, which go beyond procedures and are not mandatory.

On the ICS questions:

- 1) **ICS statute revision**. The required **action** on this item only applies to the election of the ICS Chair and Vice Chair, as provisions for a Nominating Committee within the current ICS Statutes are only related to the election of these ICS officers. As for the time-line for selection of the Nominating Committee and ICS officers, they should comply, as in previous elections, with the IUGS schedule, i.e. the final slate of elected officers should reach the IUGS EC at a required date before the ordinary session of the Council.
- 2) **ICS official publications**. The required **action**, that ICS publications should be formally approved by the IUGS EC, should be understood in the context of the whole ARC report on ICS, i.e. this request applies primarily to all official publications where ICS dictates formal changes on previous standards, procedural rules, and the like, which are expected to be followed by the International Earth Sciences community, e.g. changes in the International Stratigraphic Scale, International Stratigraphical Guide, Statutes, etc. Regarding publications and the ICS logo, the first responsibility is clarity to the geologic community. Can the reader tell whether the opinions expressed are of the author (personally), the ICS executive, the voting members of the ICS, or the IUGS Executive, etc.? If familiar words such as "Quaternary" have been removed from the vocabulary or significantly changed in meaning, do these changes have the sanction of ICS and IUGS? Thus, websites and newsletters bearing the ICS/IUGS logos do not require IUGS EC approval but should be explicit in the attribution of opinions and decisions to their sources. Books written by authors who also hold positions in the ICS or IUGS should clearly state what has been officially ratified and what has not, and should not bear either ICS or IUGS logos. Journal publications advocating ICS or IUGS action should be reviewed for procedural compliance prior to submission for publication.
- 3) **Definition of boundary stratotypes**. The **recommendation** on this item does not necessarily imply changes in the current ICS procedures for definition of GSSPs. It only stresses the importance of the criteria mentioned, as methods and techniques do not necessarily have the same significance throughout the different systems.

- 4) Primary and secondary standards. The **recommendation** on this item stresses the fact that when different parallel standard classifications are compared and intercalibrated there is usually one that is superior because of its independence and precision.
- 5) Extension of typological definitions of standard units. The **recommendation** on this item stresses the existing variability in stratigraphic precision, and the possibility to use it.

Sincerely yours,

A handwritten signature in black ink, appearing to read "A.C. Riccardi", written over a horizontal line.

Prof. Dr. A.C. Riccardi

August 25, 2006

Prof. Felix Gradstein
Chairman, International Commission on Stratigraphy
University of Oslo
P.O. Box 1172 Blindern
NO-0318 Oslo
Norway

Re: Quaternary in the Time-scale Charts

Dear Professor Gradstein:

As communicated to the ICS Secretary General, the recommendations on "Definition and Rank of the Quaternary", submitted by the ICS on 28 September 2005, were considered by the IUGS Executive Committee once INQUA's position on this issue became available.

A careful assessment of all existing information has shown:

1) That important disagreements exist within specialized bodies and the international geological community with regard to the recommendations submitted by ICS, as indicated by the votes and accompanying comments, of the ICS/INQUA Task Group, and of the ICS, the statements made by INQUA on August 31, 2005 and March 24th, 2006, as well as statements produced by National and Regional Stratigraphic Committees, including various articles published on this matter;

2) That the recommendations submitted by ICS are not in agreement with the long-standing protocol and procedural principles that have been accepted by the international geological community, and established by ICS itself in the International Stratigraphic Guide (ISG, 1994) and the "Revised Guidelines for the Establishment of Global Chronostratigraphic Standards of the ICS" (RG, 1996). This situation has been brought to our attention in comments provided by several ICS members and by the International Subcommittee on Stratigraphic Classification (ISSC) in its document "Position of ISSC towards Quaternary Issues" (ISSC Newsletter No. 7, June 2005).

Thus from these documents (ISG and RG) it is clear:

- a) That the lower boundaries of Chronostratigraphic units of higher rank (series, systems, etc.) are automatically defined by the base of their lowermost stage. In other words: the lower boundary of a system is always also a series and a stage boundary;
- b) That a unit of lower rank cannot be part of two units of higher rank, i.e. a system cannot be part of two erathems, a series cannot be part of two systems, and a stage cannot be part of two series;
- c) that restraint is recommended in creating new orders of

chronostratigraphic units, as sub-erathem, sub-system, sub-series and sub-stage.

Thus the principles of hierarchy mentioned above and the hierarchical structure of the Chronostratigraphic Scale are clearly violated if a sub-erathem/sub-era boundary does not coincide with either a system/period or series/epoch boundary. Accordingly, it is inappropriate to detach the beginning of the Quaternary from the beginning of the Pleistocene and to propose the Pliocene to overlap the Tertiary and Quaternary or the Quaternary to include parts of both Pleistocene and Pliocene.

3) The IUGS EC is also concerned that the procedure for a decision that was adopted is technically flawed. This process should have involved the Subcommissions on the Quaternary, the Neogene, and the above-mentioned multilateral ICS/INQUA Task Group. The IUGS EC is also concerned about the evident disregard of the ICS Statutes (2002) that clearly require a sixty percent (60%) majority of delivered votes, etc. The IUGS EC gave especial consideration to the recorded polls, i.e. those by the Task Group and ICS, which in several cases resulted in statistically questionable interpretations, whilst in others were accompanied by comments indicating misgivings and formal compromise.

The IUGS EC also notes that the "Procedure for Decisions by ICS-INQUA Joint Task Group on the Quaternary" states clearly that once ICS and INQUA's have arrived to decisions on the recommendations of the ICS-INQUA Task Group, "if necessary the Task Group will meld the ICS/INQUA documents for a second joint-commission voting round". This point becomes especially important when considering that the INQUA EC has arrived at conclusions that differ from those of ICS, and that as a result INQUA's EC, on March 24, 2006, has requested to ICS continue its dialogue with INQUA.

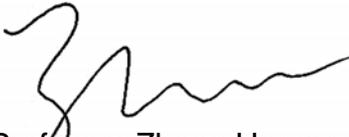
In view of the concerns stated above, especially based on procedural matters, the IUGS EC requests the ICS to immediately readdress the issue of the Quaternary, following the principles, rules, and working agreements agreed upon by all parties previously and detailed above. This request also applies to the most recent decision circulated, on August 18th, 2006, by the ICS Executive, who must postpone publishing any change on this matter unless it has been previously approved by the IUGS EC. Meanwhile the Quaternary remains as depicted in the International Stratigraphic Chart published by IUGS in 2000.

To ensure that this issue is addressed properly and promptly the Executive Committee of IUGS formally requests the officers of ICS to confirm receipt of this memorandum and acknowledge the need for re-addressing the issue within 30 days of this dated letter.

We regret that this problem has been allowed to escalate to the current situation. And we request that the officers of ICS move

expeditiously towards a positive solution of this unsatisfactory state of affairs.

Sincerely,

A handwritten signature in black ink, appearing to be 'Zhang Hongren', written in a cursive style.

Professor Zhang Hongren
President, International Union of Geological Sciences

cc: Dr. Stanley Finney, Vice Chairman
Dr. James Ogg, ICS Secretary General
IUGS Executive Committee

ATTACHMENT - A

MINUTES of the meeting of the AD-HOC REVIEW COMMITTEE (ARC) on the INTERNATIONAL COMMISSION ON STRATIGRAPHY (ICS) Paris, 7 – 8 November 2005

Review Committee members: Alberto RICCARDI (La Plata, IUGS EC member, Chair), ZHANG Hongren (IUGS President, Beijing), John CALLOMON (external expert, England), Lucy EDWARDS (external expert, USA) and Gian Battista VAI (external expert, Italy).

Interviewed participants: Felix GRADSTEIN (ICS Chair, Norway), Maria Bianca CITA (ISSC - International Subcommittee on Stratigraphic Classification - Chair, Italy), Phil GIBBARD (ISQS - International Subcommittee on Quaternary Stratigraphy - Chair, UK), Fritz HILGEN (ISNS - International Subcommittee on Neogene Stratigraphy - Chair, The Netherlands).

A PROCEEDINGS

1. Opening and background information

RICCARDI opened the meeting by welcoming and thanking the participants for attending the meeting. He explained that the present Review arises out of a general IUGS policy of reviewing periodically all its funded scientific bodies and activities. These reviews are done according to the *Statutes and Bylaws of IUGS* and the *Rules* guiding its different constituent bodies. The Terms of Reference for ARCs regulate their compositions and procedures.

2. Rationale for the Review

RICCARDI explained that the IUGS Strategic Planning Committee had recommended (2000) (a) to hold reviews of all IUGS-funded scientific activities on a regular basis, and (b) to limit both the terms of office for individual officers of Commission and the lifetimes of Commissions themselves. These recommendations were translated into action through the *IUGS Strategic Action Plan* (2001). The first recommendations resulted in the creation of Ad-hoc Review Committees (ARCs) and the second in a set of Rules for Commissions. The *Rules for Commissions* state that the duration of a Commission shall normally be 8 years but that this may be extended on request for maximally up to another period of 8 years. He mentioned that ICS has been part of IUGS since 1965, and that the last review of ICS by the IUGS Advisory Board for Research Development (ABRD) had taken place in 1995. During the 2001 meeting of the IUGS EC, Past President Ed de MULDER suggested another assessment of ICS, and the issue was again considered in the following years, but could not be realised. In 2004 an ARC reviewed IUGSs activities in the field of Geochronology, including those carried out within ICS. Finally, at its last meeting in Vilnius, Lithuania (March 2005), the IUGS Executive Committee decided that an ARC should be convened to review the IUGS ICS.

RICCARDI mentioned that other relevant information for the meeting is included in the documents available to the members of the present ARC: *IUGS Statutes and Bye-laws*; *ICS*

Statutes; ICS Annual Reports for 2000-2004; and the *ABRD Report* of the last ICS Review, 1995. Additional documentation had been requested (i) from F. GRADSTEIN, on the overall aims and objectives of ICS, its structure and working procedures, on its main accomplishments of the last years, and on its planned activities; and (ii) from M.B. CITA, P. GIBBARD and F. HILGEN, on the work of their Subcommissions during the last few years, and how this work has been integrated into ICS activities. Similar information was provided (iii) by the Chairs of other two Subcommissions who were unable to attend the meeting: T. BECKER (ISDS, Devonian Stratigraphy), and N. MORTON (ISJS, Jurassic Stratigraphy) (see Appendix 1).

RICCARDI emphasized the importance of ICS, given that one of the main goals of the 1st International Geological Congress (IGC) held in Paris in 1878 had been to obtain international agreement on matters of stratigraphic classification and terminology, and that this was the origin of a Commission for Unification of Geological Nomenclature, which was established in and active since the 2nd IGC (Bologna, 1881). At the 19th IGC in Algiers (1952), this body - transformed into a Subcommission on Stratigraphic Terminology - became a part of the then newly created ICS. It remains clear to the governance of the IUGS that the ICS is the most important Commission within IUGS, and that its activities are and will continue to be necessary as provider of important services to the international geological community.

RICCARDI proposed to continue with the Agenda by interviewing GRADSTEIN, CITA, GIBBARD and HILGEN individually.

3. Separate interviews with Chairs of ICS and three of its Subcommissions.

Main issues for discussion: structure, working procedures, main accomplishments and planned activities of ICS and its Subcommissions.

3a. F. GRADSTEIN: Chair, International Commission on Stratigraphy (ICS)

As requested, GRADSTEIN gave a presentation on a number of separated items: (i) ICS, its Organization and Products; (ii) the present status of GSSPs; (iii) ICS Awards in Stratigraphy; and (iv) the Geological Time Scale, GTS-2008.

Some highlights of accomplishment were reviewed and selected prospects for the next four years were then outlined. They were:

- 1) that there is a the need of a new and more friendly *International Stratigraphic Guide*, short, with simple and complex examples of applications, well illustrated, digital and interactive;
- 2) that most Phanerozoic Stage GSSPs will be defined in time for the IGC in 2008;
- 3) that the time-scale GTS-2008 will include a greatly expanded content reflecting the rôle of cyclostratigraphy based on orbital ‘tuning’, as well as planetary and archaeological time-scales;
- 4) that GSSPs, instead of GSSAs, will be defined for the Precambrian;
- 5) that in view of the fact that as soon as all GSSPs are defined, ICS will not receive further support from IUGS: it is clear that some other organization will be needed to replace it, e.g. an International Association of Stratigraphic Geologists;

- 6) that some kind of Bureau of Standards will also be needed, to record and monitor the taxonomy and nomenclature of named stratigraphic units, including then the association of GSSPs with the management of Geoparks;
- 7) that there is expected to be a natural merging of adjacent Subcommissions with new mandates, including the formalisation of intra-Stage subdivisions;
- 8) that a Special Projects Section is necessary, to communicate with Industry and national geological institutions such as BRGM;
- 9) that the increasing importance of the ICS website, and especially of the new GTS to be located at it, are strongly emphasized by a volume of downloading that is truly remarkable.

RICCARDI and VAI warmly congratulated GRADSTEIN on the many important results achieved by ICS under his chairmanship..

RICCARDI asked in what way if any ICS maintains contacts with National Stratigraphic Committees (as mentioned in the ICS 2003 *Annual Report*). GRADSTEIN answered that ICS does not have contacts of this type.

VAI pointed to the need for a consensus in stratigraphy, and considered that activities of ICS performed thus far have increased its visibility. He also expressed his agreement with most activities planned for the future, e.g. the definition of GSSPs in the Precambrian. He also pointed out that ICS should not disseminate information that has not been formally approved by IUGS.

CALLOMON stressed the importance of defining standard stratigraphic units in terms of those at the lowest level of their hierarchy of rank, e.g. Zone or Subzone, instead of some arbitrarily decreed universal level such as the Stage.

RICCARDI asked how the ICS would view the idea of its Executive of forming an Association of Stratigraphic Geologists, and how such a project would fit in with relation to the structure of IUGS. On the first question, GRADSTEIN answered that it relates to what is so far only a personal idea, and that he is only thinking about it. On the second, he answered that the question should be put to the IUGS.

RICCARDI asked whether there was some reason why the President and Secretary of ICS had published papers (2004), including the book *The Geological Time Scale*, that were the products of their personal authorship rather than of the ICS, without including any disclaimer to the effect that they were not official publications of ICS and IUGS: although some of them did include the ICS and/or IUGS logos. GRADSTEIN offered his apologies for these errors of omission, and said that more care will be taken in the future.

VAI remarked on the need, thus far not fulfilled, to explain clearly in print all new changes introduced in the International Stratigraphic Scale.

3b. Maria B. CITA: CHAIR, I S STRATIGRAPHICAL CLASSIFICATION (ISSC).

Maria CITA gave an historical account of ISSCs activities, referring among other items especially to: 1) changes in the ISSC members with twelve new members appointed; the ISSC website and *Newsletters* (eight distributed in the last three years); the formation of Working Groups on Cyclostratigraphy and Sequence Stratigraphy, two new important braches of stratigraophy not considered in the published ISG; and the ISSC Workshop on “Post-Hedberg Developments in Stratigraphic Classification” organized at the 32nd

International Geological Congress in Florence, 2004; 2) presently the ISSC activity is concentrated on the plan to publish a series of review papers on *Newsletter of Stratigraphy*, to be assembled in a new *International Stratigraphic Guide*. Simple, clear, concise, convincing, users friendly, well illustrated, multiauthored, with real world examples (case-studies); 3) CITA complained about the lack of enough economical support for ISSC activities, and mentioned the existence of differences between ISSC and the ICS Executive in relation to the procedure for approval of GSSPs and to ISSCs position on the issue of the status of the Quaternary.

RICCARDI asked why in the report produced by CITA for this meeting, she qualified as “rubber-stamping” the procedure followed by ICS to approve GSSPs. She observed that in most cases the chairs of the different Subcommissions of ICS as a whole do not discuss in detail the proposals on GSSPs made by individual Subcommissions (no “quality control” foreseen). On the question of the Quaternary, CITA mentioned that an ISSC position paper was simply ignored. In it the ISSC supported maintaining the Quaternary at the level of System/Period. In this connection she mentioned that the IS on the Neogene never in fact extended the Neogene to the Present.

Lucy EDWARDS remarked that possible changes to the *International Stratigraphic Guide* should be discussed and implemented on a regular basis. VAI agreed, and considered that any such changes should be worked as closely as possible in parallel with the North American *Code on Stratigraphic Nomenclature*, with a view to harmonizing the *Code* with the *Guide*.

EDWARDS asked how much of the *ISG* edited by HEDBERG and SALVADOR would be incorporated into the new *Guide*. CITA replied, very little. The new guide is not intended as a duplication, but as a necessary update and complement.

CALLOMON urged the need for the new *ISG* to distinguish between taxonomy and nomenclature and that it should include clear explanations of principles and practices in stratigraphic matters.

3c. P. GIBBARD: Chair, I S Quaternary (ISQS)

As requested P. GIBBARD gave an account of the activities of the IS on the Quaternary (ISQS). He stressed the important co-ordinating role of the ICS in unifying the language of stratigraphical classification and the interaction with experienced colleagues who work on systems of widely differing age. mentioned that the main task of the three existing Working Groups (WG) of ISQS is to define GSSPs for the main subdivisions of the Quaternary. Two additional WGs are planned: one is to compile regional sequences, the other- to consider the formal chronostratigraphical/geochronological status of very short-time divisions in the Quaternary, working if possible in co-operation with ISSC. GIBBARD said he sees the future of ISQS as stretching stratigraphic resolution as far as it can – down to sub-Milankovich scale and down to terms that do not yet exist. He commented on a series of problems that had arisen from attempts to suppress the term ‘Quaternary’ which acted as a distraction from the ISQSs main task:

- 1) beginning with the publication of a new Geological Time Scale, in which the Neogene was extended to the Present, this was taken to be an ICS official document despite it being only a “personal” publication under the main editorship of the Chair and Secretary of ICS;
- 2) the subsequent establishment of a WG with a membership decided mainly by the ICS Executive;
- 3) inconclusive and “not always polite” e-mail exchanges with ICS officers before the productive meeting held at Leuven in September, 2005.

GIBBARD stressed that these events “have generated deep suspicion of the motives and control of ICS within the Quaternary community”, that ICS “must serve, and be seen to serve, the community”, and that ICS needs to become more open, democratic and even-handed in its operation and decision making. He noted that the Quaternary community does not understand the nuances of IUGS vs ICS and who voted on what.

EDWARDS asked if the Quaternary community favoured the inclusion of MISs (marine-isotope stages) in the *Guide*. GIBBARD said yes, of course they should be included. Quaternary people may use the absence of MISs in the *Guide* as an excuse to feel excluded.

RICCARDI asked GIBBARD’s opinion on possible ways of improving ICSs organization and procedures. In his reply he stressed the primary need to formulate a working structure that made ICS more directly responsible to somebody. He suggested that a possible way might be found through a supervising body of -National and/or Regional Representatives.

3d. F. HILGEN: Chair, I S Neogene Stratigraphy (ISNS)

As requested F. HILGEN gave an account of the activities of the ISNS. He described the working structure of ISNS, and the recent accomplishments of its WG on GSSPs. He stressed the main approach followed by the ISNS: high-resolution stratigraphy combined with astronomical ‘tuning’; the definition of unit-stratotypes besides GSSPs; and the intercalibration of Ar/Ar and astronomical data. He stressed the need for chronostratigraphic standards at much higher levels of time-resolution than those of the Stage. He noted the activity and productivity of ICS but pointed to a certain lack of coherence and visibility on its part which in his opinion could be overcome by the formation of an International Association of Stratigraphic Geologists.

EDWARDS questioned the extension of the Neogene to the Present. HILGEN said that although there have always been those on each side of the argument, a vote shows a large majority (90%) in favour of extending the Neogene to the present day.

VAI pointed to various procedural problems in relation to the recent ballot on the Quaternary by the ISNS, claiming that the conventional procedure of a moratorium for two terms was not observed, making the ballot invalid.

RICCARDI asked his opinion on the relationship between ICS and an eventual International Association of Stratigraphic Geologists. HILGEN said he views them as separate entities.

RICCARDI asked if the Neogene chapter in the book *A Geological Time Scale 2004* (Gradstein, Ogg and Smith, editors), was an official publication of the ISNS. HILGEN

answered in the negative, saying that its responsibility rested with its authors, including himself, who participated on a personal basis.

B CONCLUSIONS and RECOMMENDATIONS

Following a discussion of the items summarized above, the ARC arrived at several conclusions and recommendations. These were grouped under two main categories, scientific and procedural.

Conclusions and recommendations on scientific matters:

There is a lasting need for an international committee of stratigraphers to stabilize stratigraphic procedure and terminology as the science of stratigraphy continues to develop new concepts and techniques. New *Guides* will be needed and will need to be amended; existing GSSPs will be challenged; subdivisions below Stage are desirable; new techniques and new terminologies will emerge.

1. ICS is to be congratulated for the important work it has done in promoting stratigraphic research. The establishment of GSSPs has produced an important byproduct: a large improvement in stratigraphy as a science, worldwide.
2. New editions of the *International Stratigraphic Guide (ISG)* should build on previous editions, but begin with clear definitions of stratigraphic principles and go on to include concise explanations of new concepts, techniques and improvements in practical applications.
3. The *ISG* should be what the title implies, a *Guide*, and not be regarded as a mandatory edict of ICS under its parent body, IUGS.
4. ICS should try to make the *ISG* compatible as far as possible with existing National or Regional *Codes* (e.g. the North American Code, *NACSN*).
5. Classifications should be standardised at and above a certain stated level.
6. Typological definitions of standard chronostratigraphical units by means of boundary stratotypes, such as Stage GSSPs, should be extended downwards, below the Stage level in the hierarchy.
7. The ways in which standard boundary stratotypes are defined are practical matters that may vary from System to System and involve different criteria and techniques. They should therefore not be closely defined or regulated by ICS.
8. The validity of parallel standard chronostratigraphic classifications, based on different practical geochronometric techniques, should be recognized. All standard classifications should be individually defined typologically in terms of boundary stratotypes, as is at present the practice in Stage GSSPs.
9. If and when several parallel standard chronostratigraphical classifications have been produced, they should be compared and intercalibrated. One of them should then be selected to be the Primary Standard, others to be designated Secondary or Auxiliary Standards.
10. Descriptions of GSSPs should include clear specifications of all the elements used in their definitions and their applicability.

11. Definitions of GSSPs should not be constrained by a deadline for completion, as such a deadline can be unrealistic, in view of the essentially voluntary nature of the contributions by those doing the work - at least, as far as ICS is concerned - and potentially dangerous in trying to arrive at sound, unforced and stable proposals.
12. The function of ICS in this respect, as in others, should be *reactive* - guiding, unifying, codifying what has been achieved and encouraging what has been suggested, certainly - rather than *proactive*, trying to generate new initiative that it is unable to resource directly itself.
13. All definitions on the *International Stratigraphic Chart* not formally approved by IUGS should be considered as having no official status.

Conclusions and recommendations on procedural matters:

1. A new edition of the *International Stratigraphic Guide* should be produced by the IS on Stratigraphic Classification (ISSC), in consultation with National and/or Regional Committees/Commissions on Stratigraphy. This could proceed in three steps: a) ISSC produces a draft of the *Guide*; b) ISSC consults National and/or Regional Committees; c) ISSC decides on the final version.
2. The *International Stratigraphic Guide* should include procedural provisions for future amendments.
3. All ICS official publications, i.e. those exhibiting the ICS logo, should be published according to the *Statutes* of IUGS and ICS, and in conformity with the provisions of the *International Stratigraphic Guide*.
4. All ICS official publications must be formally approved by the IUGS EC as far as compliance with constitutional requirements is concerned, although not as endorsement of their scientific or technical content.
5. In this connection, IUGS EC should establish a standing Advisory Committee on Stratigraphy or Stratigraphic Standards, consisting of three experts, to advise it on all matters submitted to it by ICS for consideration, but exclusively with regard to the fulfillment of all legal requirements of rules and procedures governing the establishment of international standards in stratigraphical matters.
6. The Nominating Committee for election of Officers of ICS should consist of a maximum of five members, which shall not include any of the Executive Committee of ICS nor Chairs of the Subcommissions of ICS.
7. Members of the Nominating Committee should however be proposed and elected by the Chairs of the ICS Subcommissions.
8. The Nominating Committee for election of ICS Officers should propose not more than 3 candidates for each position.
9. The ICS Officers are then elected by the Chairs of the ICS Subcommissions.
10. The whole process of electing the Nominating Committee and the ICS Officers should be conducted by the Chair of one of the ICS Subcommissions, e.g. the Chair of the IS on Stratigraphic Classification.
11. ICS *Statutes* should be modified in accord with the recommendations given above.

Appendix: a list of acronyms.

ABRD Advisory Board on Research and Development, of IUGS

ARC Ad-hoc Review Committee, to advise IUGS (q.v.)
BRGM Bureau de Recherches Géologiques et Minières, France
EC Executive Committee, of IUGS and ICS
GSSP Global Standard Section and point, defining the lower boundary of a standard chronostratigraphical unit, at present at the level of Stage and higher
GTS *A Geological Time Scale*, published (-2004) and projected (-2008)
ICS International Commission on Stratigraphy, of IUGS
IGC International Geological Congress
ISDS International Subcommittee on Devonian Stratigraphy, of ICS
ISG *International Stratigraphic Guide*, published by IUGS
ISJS International Subcommittee on Jurassic Stratigraphy, of ICS
ISNS International Subcommittee on Neogene Stratigraphy, of ICS
ISQS International Subcommittee on the Quaternary Stratigraphy, of ICS
ISSC International Subcommittee on Stratigraphical Classification
IUGS International Union of Geological Sciences
NACSN North American *Code on Stratigraphical Nomenclature*

Actions

1. Riccardi to write draft minutes of meeting.
2. Zhang, Edwards, Callomon, and Vai to comment on draft minutes.
3. Riccardi to forward final minutes to EC members.
4. IUGS EC to decide on recommendations.

ATTACHMENT - B

ACTIONS to be taken by ICS

1. ICS Statutes should be modified according to the following recommendations:
 - 1.1. The Nominating Committee for election of Officers of ICS should consist of a maximum of five members, which shall not include any of the Executive Committee of ICS nor Chairs of the Subcommissions of ICS.
 - 1.2. Members of the Nominating Committee should however be proposed and elected by the Chairs of the ICS Subcommissions.
 - 1.3. The Nominating Committee for election of ICS Officers should propose not more than 3 candidates for each position.
 - 1.4. The ICS Officers are then elected by the Chairs of the ICS Subcommissions.
 - 1.5. The whole process of electing the Nominating Committee and the ICS Officers should be conducted by the Chair of one of the ICS Subcommissions, e.g. the Chair of the IS on Stratigraphic Classification.
2. All ICS official publications must be formally approved by the IUGS EC as far as compliance with constitutional requirements is concerned, although not as endorsement of their scientific or technical content.
3. All ICS official publications, i.e. those exhibiting the ICS logo, should be published according to the *Statutes* of IUGS and ICS, and in conformity with the provisions of the *International Stratigraphic Guide*.
4. The *International Stratigraphic Guide* should include procedural provisions for future amendments.
5. New editions of the *International Stratigraphic Guide* should be produced by the IS on Stratigraphic Classification (ISSC), in consultation with National and/or Regional Committees/Commissions on Stratigraphy. This could proceed in three steps: a) ISSC produces a draft of the *Guide*; b) ISSC consults National and/or Regional Committees; c) ISSC decides on the final version.

Additional recommendations to ICS:

- a. New editions of the *International Stratigraphic Guide (ISG)* should build on previous editions, but begin with clear definitions of stratigraphic principles and go on to include concise explanations of new concepts, techniques and improvements in practical applications.

- b. The *ISG* should be what the title implies, a *Guide*, and not be regarded as a mandatory edict of ICS under its parent body, IUGS.
- c. ICS should try to make the *ISG* compatible as far as possible with existing National or Regional *Codes* (e.g. the North American Code, *NACSN*).
- d. Classifications should be standardised at and above a certain stated level.
- e. Typological definitions of standard chronostratigraphical units by means of boundary stratotypes, such as Stage GSSPs, should be extended downwards, below the Stage level in the hierarchy.
- f. The ways in which standard boundary stratotypes are defined are practical matters that may vary from System to System and involve different criteria and techniques. They should therefore not be closely defined or regulated by ICS.
- g. The validity of parallel standard chronostratigraphic classifications, based on different practical geochronometric techniques, should be recognized. All standard classifications should be individually defined typologically in terms of boundary stratotypes, as is at present the practice in Stage GSSPs.
- h. If and when several parallel standard chronostratigraphical classifications have been produced, they should be compared and intercalibrated. One of them should then be selected to be the Primary Standard, others to be designated Secondary or Auxiliary Standards.
- i. Descriptions of GSSPs should include clear specifications of all the elements used in their definitions and their applicability.
- j. Definitions of GSSPs should not be constrained by a deadline for completion, as such a deadline can be unrealistic, in view of the essentially voluntary nature of the contributions by those doing the work - at least, as far as ICS is concerned - and potentially dangerous in trying to arrive at sound, unforced and stable proposals.
- k. The function of ICS in this respect, as in others, should be *reactive* - guiding, unifying, codifying what has been achieved and encouraging what has been suggested, certainly - rather than *proactive*, trying to generate new initiative that it is unable to resource directly itself.

ATTACHMENT - C

September 8th, 2006

To the ICS Executive,

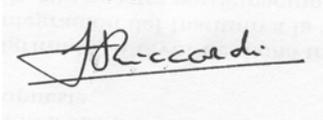
In order to address the questions raised by the ICS Executive on the Conclusions of the Ad Hoc Review Committee on the ICS it should first be noted that these were divided in **Actions**, that are mainly concerned with procedural matters and that once approved by the IUGS EC are mandatory, and **Recommendations**, which go beyond procedures and are not mandatory.

On the ICS questions:

- 1) **ICS statute revision**. The required **action** on this item only applies to the election of the ICS Chair and Vice Chair, as provisions for a Nominating Committee within the current ICS Statutes are only related to the election of these ICS officers. As for the time-line for selection of the Nominating Committee and ICS officers, they should comply, as in previous elections, with the IUGS schedule, i.e. the final slate of elected officers should reach the IUGS EC at a required date before the ordinary session of the Council.
- 2) **ICS official publications**. The required **action**, that ICS publications should be formally approved by the IUGS EC, should be understood in the context of the whole ARC report on ICS, i.e. this request applies primarily to all official publications where ICS dictates formal changes on previous standards, procedural rules, and the like, which are expected to be followed by the International Earth Sciences community, e.g. changes in the International Stratigraphic Scale, International Stratigraphical Guide, Statutes, etc. Regarding publications and the ICS logo, the first responsibility is clarity to the geologic community. Can the reader tell whether the opinions expressed are of the author (personally), the ICS executive, the voting members of the ICS, or the IUGS Executive, etc.? If familiar words such as "Quaternary" have been removed from the vocabulary or significantly changed in meaning, do these changes have the sanction of ICS and IUGS? Thus, websites and newsletters bearing the ICS/IUGS logos do not require IUGS EC approval but should be explicit in the attribution of opinions and decisions to their sources. Books written by authors who also hold positions in the ICS or IUGS should clearly state what has been officially ratified and what has not, and should not bear either ICS or IUGS logos. Journal publications advocating ICS or IUGS action should be reviewed for procedural compliance prior to submission for publication.
- 3) **Definition of boundary stratotypes**. The **recommendation** on this item does not necessarily imply changes in the current ICS procedures for definition of GSSPs. It only stresses the importance of the criteria mentioned, as methods and techniques do not necessarily have the same significance throughout the different systems.

- 4) Primary and secondary standards. The **recommendation** on this item stresses the fact that when different parallel standard classifications are compared and intercalibrated there is usually one that is superior because of its independence and precision.
- 5) Extension of typological definitions of standard units. The **recommendation** on this item stresses the existing variability in stratigraphic precision, and the possibility to use it.

Sincerely yours,

A handwritten signature in black ink, appearing to read "A.C. Riccardi", written over a horizontal line. The signature is stylized and cursive.

Prof. Dr. A.C. Riccardi

ATTACHMENT - D

August 25, 2006

Prof. Felix Gradstein
Chairman, International Commission on Stratigraphy
University of Oslo
P.O. Box 1172 Blindern
NO-0318 Oslo
Norway

Re: Quaternary in the Time-scale Charts

Dear Professor Gradstein:

As communicated to the ICS Secretary General, the recommendations on "Definition and Rank of the Quaternary", submitted by the ICS on 28 September 2005, were considered by the IUGS Executive Committee once INQUA's position on this issue became available.

A careful assessment of all existing information has shown:

1) That important disagreements exist within specialized bodies and the international geological community with regard to the recommendations submitted by ICS, as indicated by the votes and accompanying comments, of the ICS/INQUA Task Group, and of the ICS, the statements made by INQUA on August 31, 2005 and March 24th, 2006, as well as statements produced by National and Regional Stratigraphic Committees, including various articles published on this matter;

2) That the recommendations submitted by ICS are not in agreement with the long-standing protocol and procedural principles that have been accepted by the international geological community, and established by ICS itself in the International Stratigraphic Guide (ISG, 1994) and the "Revised Guidelines for the Establishment of Global Chronostratigraphic Standards of the ICS" (RG, 1996). This situation has been brought to our attention in comments provided by several ICS members and by the International Subcommittee on Stratigraphic Classification (ISSC) in its document "Position of ISSC towards Quaternary Issues" (ISSC Newsletter No. 7, June 2005).

Thus from these documents (ISG and RG) it is clear:

- a) That the lower boundaries of Chronostratigraphic units of higher rank (series, systems, etc.) are automatically defined by the base of their lowermost stage. In other words: the lower boundary of a system is always also a series and a stage boundary;
- b) That a unit of lower rank cannot be part of two units of higher rank, i.e. a system cannot be part of two erathems, a series cannot be part of two systems, and a stage cannot be part of two series;
- c) that restraint is recommended in creating new orders of

chronostratigraphic units, as sub-erathem, sub-system, sub-series and sub-stage.

Thus the principles of hierarchy mentioned above and the hierarchical structure of the Chronostratigraphic Scale are clearly violated if a sub-erathem/sub-era boundary does not coincide with either a system/period or series/epoch boundary. Accordingly, it is inappropriate to detach the beginning of the Quaternary from the beginning of the Pleistocene and to propose the Pliocene to overlap the Tertiary and Quaternary or the Quaternary to include parts of both Pleistocene and Pliocene.

3) The IUGS EC is also concerned that the procedure for a decision that was adopted is technically flawed. This process should have involved the Subcommissions on the Quaternary, the Neogene, and the above-mentioned multilateral ICS/INQUA Task Group. The IUGS EC is also concerned about the evident disregard of the ICS Statutes (2002) that clearly require a sixty percent (60%) majority of delivered votes, etc. The IUGS EC gave especial consideration to the recorded polls, i.e. those by the Task Group and ICS, which in several cases resulted in statistically questionable interpretations, whilst in others were accompanied by comments indicating misgivings and formal compromise.

The IUGS EC also notes that the "Procedure for Decisions by ICS-INQUA Joint Task Group on the Quaternary" states clearly that once ICS and INQUA's have arrived to decisions on the recommendations of the ICS-INQUA Task Group, "if necessary the Task Group will meld the ICS/INQUA documents for a second joint-commission voting round". This point becomes especially important when considering that the INQUA EC has arrived at conclusions that differ from those of ICS, and that as a result INQUA's EC, on March 24, 2006, has requested to ICS continue its dialogue with INQUA.

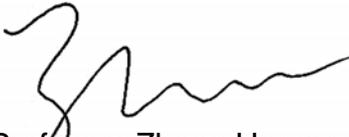
In view of the concerns stated above, especially based on procedural matters, the IUGS EC requests the ICS to immediately readdress the issue of the Quaternary, following the principles, rules, and working agreements agreed upon by all parties previously and detailed above. This request also applies to the most recent decision circulated, on August 18th, 2006, by the ICS Executive, who must postpone publishing any change on this matter unless it has been previously approved by the IUGS EC. Meanwhile the Quaternary remains as depicted in the International Stratigraphic Chart published by IUGS in 2000.

To ensure that this issue is addressed properly and promptly the Executive Committee of IUGS formally requests the officers of ICS to confirm receipt of this memorandum and acknowledge the need for re-addressing the issue within 30 days of this dated letter.

We regret that this problem has been allowed to escalate to the current situation. And we request that the officers of ICS move

expeditiously towards a positive solution of this unsatisfactory state of affairs.

Sincerely,

A handwritten signature in black ink, appearing to be 'Zhang Hongren', written in a cursive style.

Professor Zhang Hongren
President, International Union of Geological Sciences

cc: Dr. Stanley Finney, Vice Chairman
Dr. James Ogg, ICS Secretary General
IUGS Executive Committee