

# North American Commission on Stratigraphic Nomenclature

## Note 66: Records of Stratigraphic Commission, 2003-2013

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Note 66 summarizes activities of the North American Commission on Stratigraphic Nomenclature (NACSN) from November 2003 to October 2013 and is condensed from the minutes of the NACSN's 58<sup>th</sup> to 68<sup>th</sup> annual meetings<sup>1</sup>. The purposes of the Commission are to develop statements of stratigraphic principles, recommend procedures applicable to the classification and nomenclature of stratigraphic and related units, review problems in classifying and naming stratigraphic and related units, and formulate expressions of judgment on these matters.

The Commission's activities during this period can be divided into five main categories:

- 1. REVISIONS AND AMENDMENTS TO THE NORTH AMERICAN STRATIGRAPHIC CODE (NACSN, 2005),**
- 2. INTERACTION WITH OTHER ORGANIZATIONS, PRIMARILY OTHER GROUPS FOCUSED ON STRATIGRAPHY AND STRATIGRAPHIC NOMENCLATURE,**
- 3. DISCUSSION OF ISSUES RELATED TO STRATIGRAPHY, CHRONOSTRATIGRAPHY, AND GEOLOGICAL TIME-SCALES,**
- 4. OUTREACH ACTIVITIES RELATED TO THE DISCUSSION AND PROMOTION OF THE SCIENCE OF STRATIGRAPHY AND THE APPLICATION OF THE NORTH AMERICAN STRATIGRAPHIC CODE, AND**
- 5. COMMISSION BUSINESS. IN ADDITION, TWO RESOLUTIONS PASSED BY THE COMMISSION DURING THIS PERIOD ARE INCLUDED AS APPENDIX 1 AND 2.**

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# REVISIONS AND AMENDMENTS TO THE NORTH AMERICAN STRATIGRAPHIC CODE

## Introduction

One of the roles of NACSN is to periodically review the *North American Stratigraphic Code* (1983, 2005), hereafter referred to as the Code, to ensure that it meets the present and emerging needs of the profession. This is done through consideration and publication of proposed amendments to the Code, as provided for in Article 21. As noted below, not all suggestions for amendment to the Code result in the publication of proposed amendments to the Code. Nonetheless, they are included here for the record, in the event that these suggestions may be acted upon in future.

## Revision of the 1983 Code

As noted in Easton et al. (2005), much of the Commission's activities between 1997 to 2001 were devoted to revision of the 1983 edition of the *North American Stratigraphic Code*. Proposed changes to the 1983 Code were first published as Notes 63 (Ferrusquía-Villafranca et al., 2001) and Notes 64 (Lenz et al., 2001); these proposals were subsequently accepted at the 57<sup>th</sup> Annual Meeting in 2002. Under the leadership of Commissioner Orndorff, a completely revised version of the Code was prepared, and submitted to the *American Association of Petroleum Geologists* (AAPG) for publication. Publication took place in November 2005 (NACSN, 2005), and since then, the revised Code has been available for download from the NACSN website (from 2005 to 2013 at <http://www.agiweb.org/nacsn/>; from 2014 onward at [www.nacstrat.org](http://www.nacstrat.org)).

## Spanish Translation of the 2005 Code

Between 2007 and 2010, Commissioner Ferrusquía-Villafranca, with assistance from many Mexican colleagues, spearheaded an effort to translate the 2005 Code into Spanish. The translation involved consultation with many Latin American countries in order to find consensus on suitable vocabulary. The translation was completed in 2010 (Barragán et al., 2010) and since then, has been available for download from the NACSN website (from 2010 to 2013 at <http://www.agiweb.org/nacsn/>; from 2014 onward at [www.nacstrat.org](http://www.nacstrat.org)).

## French Translation of the 2005 Code

Following publication of the Spanish version of the 2005 Code, informal discussions began regarding a French translation of the 2005 Code, especially since there was already a French version of the 1983 Code available (hard-copy only, MERQ, 1986). In 2011, Commissioner Aubry offered to look into what would be involved in such a translation, and to this end, Commissioner Easton supplied her with a copy of MERQ (1986).

## Proposed Revision, Article 13c

Article 13c of the Code (NACSN, 2005), following common geologic practice, specifies that different time units are used for ages compared to durations of time. Thus, subsequent to the first suggestion by the International Union of Physics and Chemistry (IUPAC) that dual units for ages and durations of time be abandoned (Renne and Villa, 2009; see also section on

“discussion of issues related to stratigraphy, chronostratigraphy, time, and geological time-scales”), a motion was put forth by Commissioner Owen at the 2009 meeting to amend Article 13c of the Code to further clarify this dual usage. The proposed wording of this draft amendment was as follows:

(c) Convention and abbreviations. -The age of a stratigraphic unit or the time of a geologic event, as commonly determined by numerical dating or by reference to a calibrated time-scale, may be expressed in years before the present. The unit of time is the modern year as presently recognized worldwide. Recommended (~~but not mandatory~~) abbreviations for such ages are SI (International System of Units) multipliers coupled with “a” for the Latin “annus” meaning year ~~annum~~: ka, Ma, and Ga<sup>5</sup> for 10<sup>3</sup> (kilo-) ~~annum (years)~~, 10<sup>6</sup> (Mega-) ~~annum (years)~~, and 10<sup>9</sup> (Giga-) ~~annum (years)~~, years before present respectively. Use of these letters ~~terms~~ after the age value follows the convention established in the field of <sup>14</sup>C ~~€-14~~ dating. The “present” refers to AD 1950 ~~AD~~, and such qualifiers as “ago” or “before the present” are omitted after the value because measurement of the duration from the present to the past is implicit in the designation. The letter “a” alone is not used to express dates between AD 950 and AD 1950. In contrast, the duration of a remote interval of geologic time, as a number of years, should not be expressed by the same symbols. The recommended abbreviations for numbers of years, without reference to the present, is “yr” (multipliers, k, M, G, etc. may be applied). ~~are informal (e.g., y or yr for years; my, m.y., or m.yr. for millions of years; and so forth, as preference dictates):~~ For example, boundaries of the Late Cretaceous Epoch currently are calibrated at 65.5 Ma and 99.6 Ma, but the interval of time represented by this epoch is 34.1 Myr. ~~m.y.~~

Due in part to the difficulty in trying to create a comprehensive and precisely worded proposal to amend the Code on short notice, as well as the decision made at the same meeting to send a Resolution (Appendix 1) to geoscience journal editors reminding them of the provisions of the *North American Stratigraphic Code* (NACSN, 2005) with respect to geologic time, no further action on this proposed amendment was undertaken.

## Proposed Revision, New Unit Submember, Articles 25, 26 and 30

In 2005, Commissioner Landing discussed the merit of introducing the rank of “sub-member” as a formal unit into the Code, as there was a need for an additional lithostratigraphic unit between “bed” and “member”. An ad-hoc committee consisting of Commissioners Landing, Pratt and Edwards offered in 2006 to prepare a draft proposal for an amendment to the Code in response to this suggestion, as it would require at a minimum changes to Articles 25, 26 and 30 of the Code. However, no proposal for amending the Code to include sub-members was forthcoming subsequent to these initial discussions.

In 2005, Commissioner Landing also made a recommendation that lithostratigraphic units should retain their rank within their boundaries (e.g., the lithostratigraphic unit does not change its rank from formation to group as a result of changes in

thickness of that lithostratigraphic unit). He also suggested that the name of lithostratigraphic units should be retained across political boundaries, using the principle of historical priority in deciding what names should be used. It was suggested that these conventions be listed as “recommendations”, rather than “requirements” in the Code. In the end, no proposal for amendment of the Code was submitted to the Commission.

### Proposed Revision, Article 37, Intrusive Complexes

At the 2004 meeting, Commissioner Easton presented, on behalf of Dr. N. Ratcliffe, the suggestion that the term “complex” be extended to include masses of intrusive rock consisting of multiple intrusive plutons, stocks, lopoliths, and dikes. After discussion, it was agreed by consensus that Dr. Ratcliffe, with the assistance of Commissioners Orndorff and Easton, would draft an amendment to the Code for consideration at the next annual meeting of the Commission.

Between 2004 and 2010, progress on this file proceeded slowly, in part due to discussions as to whether the amendment should be broader and scope any address other possible refinements to the Code (e.g., Articles 70 and 71a) and expanding the number of recognized lithodemic units, as proposed by Gillespie et al (2008). Another example came from the 2005 meeting, where there was a discussion on the problems associated with the term “batholith”, which has a long history of non-standardized usage. As summarized by Commissioner Easton, the term “batholith” has a variety of meanings, which, depending on scale, could refer to a unit equivalent to a pluton, a suite, or a supersuite. Where equivalent to suites or supersuites (e.g., the Coastal Batholith of Peru, or the Sierra Nevada batholith), batholiths consist of individual plutons. In contrast, in the context of much of North American Precambrian geology usage, a batholith is simply a large pluton (>30 km<sup>2</sup>).

By the 2010 meeting, it had been decided to restrict the amendment to the original suggestion by Dr. N. Ratcliffe. At the same meeting, the need for the amendment was discussed once again. Commissioner Orndorff explained that preparation of a large state map by the Vermont Geological Survey and the United States Geological Survey (USGS) for publication in 2011 had raised again the question of how to formalize the unit names for intrusive complexes. He was in favour of an amendment to allow “Complex” to become a formal unit. Such a proposal was discussed at past Commission meetings, found general agreement, but had languished while waiting for Dr. N. Ratcliffe (USGS) to draft formal amendment language. A draft amendment to allow igneous complexes had been circulated by e-mail just prior to the 2010 annual meeting, but not all commissioners had received it.

The ensuing discussion at the 2010 meeting noted: 1) that the *International Stratigraphic Guide* (Salvador, 1994) allows “igneous complexes” in the sense of rocks not yet mapped in detail, whereas the current need relates to well-mapped rocks; 2) that the term igneous complex is already widely used, especially for alkalic intrusions; 3) that the suggested change is more analogous to a structural complex; i.e. involving cross-cutting relationships between rock bodies of different geometry but bodies which are all related to one another; 4) that the language already circulated to some was a first pass at a complicated issue and that there was a need to seek advice related unintended domino effects before a final amendment is drafted; and 5) that (Article 41) both a single pluton and a plutonic suite can have the same name (much like a subspecies repeating the species name). Commissioner Edwards cautioned that the Commission needed to avoid setting a precedent

for “fast-track” ratifications; the earliest ratification would be at the 2012 meeting, assuming that the current discussion led to approval for publication of the amendment at the 2011 meeting in Minneapolis. Subsequently, Commissioner Scott proposed and Commissioner Lasca seconded a *motion* “to form an ad-hoc committee that will carefully edit the amendment language and forward it with justification to NACSN.”

The motion carried without opposition or abstention.

Chairman Donovan appointed ad-hoc committee members Nancy Stamm, Lucy Edwards, and Mike Easton (Chairman), left them the option of appointing an external member and suggested that they aim to submit amendment language to Chairman Sadler by March 2011.

A preliminary draft of the proposed Amendment was circulated just prior to the 2011 meeting by Commissioner Easton, but Commissioners had little time prior to the meeting to properly review and comment on the draft. There was also some confusion as to whether or not the proposed Amendment needed a lengthy explanatory note or whether it could stand on its own merits. For example, recent proposed amendments to the Code (e.g., Notes 60, 63, 64) were accompanied with minor explanation. At the time of writing, the proposed amendment should be available for voting on at the 2014 NACSN annual meeting. If accepted for publication, then comments from the geoscience community would be gathered for a year after publication, at which time the comments would be considered, prior to a final vote on approval or rejection of the amendment (see Article 21 of the Code).

### Proposed Revision, New Class of Units, Hydrostratigraphic Units

Between 1984 and 1992, the late Paul Seaber had spearheaded an effort to include nomenclature of Hydro-stratigraphic units in the Code. A note, proposing to amend the *North American Stratigraphic Code* to include Hydrostratigraphic Units, was approved by the NACSN in 1985, and was submitted in 1986 to *AAPG Bulletin* for publication. At the time, AAPG’s Hydrostratigraphic Committee requested a preamble outlining the background and reasons for classifying and naming hydrostratigraphic units. Because this preamble was never completed, the note was never published, and the subject lay dormant for many years.

Interest in an amendment to the Code to include Hydrostratigraphic Units was renewed in 2007, following a session on “Hydro-stratigraphic Nomenclature” that was held at the Geological Society of America Southeastern Section in March 2007 [https://gsa.confex.com/gsa/2007SE/finalprogram/session\\_18798.htm](https://gsa.confex.com/gsa/2007SE/finalprogram/session_18798.htm) last accessed March 31, 2014). At this meeting, T. Scott (Florida Geological Survey) reported on the background and application of formalized hydrostratigraphic nomenclature in Florida. At the 2007 meeting of the Commission, T. Scott and Commissioner Orndorff summarized the need in the wider hydrologic and geoscience communities for a more formal, stable and natural hydrostratigraphic nomenclature. To further this initiative, Commissioner Orndorff offered to propose a topical session on the subject for the 2008 Geological Society of America Annual Meeting. At the same time, an ad hoc committee of Commissioners Orndorff, Edwards, and Fakundiny was established to work with T. Scott on the subject of formal hydrostratigraphic nomenclature. Progress reports were provided at the 2009 and 2010 meetings of the Commission, but to date, no formal proposal has been received

by the Commission for consideration.

At the 2013 meeting, Commissioner Lasca reported that all documentation related to Commissioner Seaber's work on the Hydrostratigraphic Unit amendment was now in the NACSN archives.

### Interaction with Other Organizations

#### American Geosciences Institute

The NACSN is a member society of the American Geoscience Institute (AGI) and the Commission Chairman or his delegate regularly attends AGI member society meetings and reports back to the commission. Most of these reports deal with broad issues facing the geological community, and are not repeated here, as they can be found either in the minutes of the Commission or are available from the AGI website <http://www.americangeosciences.org> (last accessed September 23, 2014).

At the 2010 meeting, Commissioner Lasca proposed, and Vice-Chairman Sadler seconded the motion "to vote in favor, when asked, for inclusion of the International Medical Geology Association and the National Cave and Karst Research Institute within AGI."

The motion was carried unanimously.

At the 2012 meeting, Chairman Easton noted that since NACSN came under the AGI umbrella, communication between AGI and NACSN has been improving, but steps could be taken to make this more efficient. In particular, there was a need for continuity, as the NACSN Chairman changes each year and it may take several months for AGI to adapt to this change. Following discussion, Commissioner Lasca (NACSN archivist) was nominated to be the point person between NACSN and AGI on an ongoing basis.

At the 2013 meeting, Commissioner Lasca brought forward to the Commission several items from AGI that needed action. First, was for the Commissioners to pass on to their respective societies the advice that when scientists are dealing with the media, it is best to articulate that they are a geoscientist first, then specify their subdiscipline, if relevant. The purpose of this suggestion is to show a more united front to the public (i.e. one geoscience community), rather than appearing as a diverse group of strange sounding subdisciplines. Second was a call for a vote on the request by the Geological Association of Canada to join AGI. Commissioner Lasca proposed, and Commissioner Easton seconded the motion "to vote in favor for inclusion of the Geological Association of Canada within AGI."

The motion was carried unanimously. It should be noted that the two Geological Association of Canada representatives on NACSN abstained from the vote. AGI officially welcomed the Geological Association of Canada as a member society in January 2014.

Third was a request for NACSN to sign on to the Consensus Statement on Ethics in the Geosciences (not yet available publicly), of which several major societies, such as the American Geophysical Union and the Geological Society of America, have already approved. The purpose is to show solidarity throughout the geoscience community. Commissioner Lasca proposed, and Commissioner Edwards seconded the motion "to agree to the Consensus Statement on Ethics in the Geosciences statement proposed by the AGI."

The motion was carried unanimously.

#### Canadian Stratigraphy Commission

The creation of the Canadian Stratigraphy Commission was first brought to the attention of the NACSN in 2010, with additional details provided at the 2011 meeting. Members are appointed by the Canadian Federation of Earth Sciences and members represent Canada on the International Stratigraphic Commission. The terms of reference of the Canadian Stratigraphy Commission are available from their web site at <http://earthsciencescanada.com/cfes/index.php?page=stratigraphy-commission> (last accessed September 23, 2014). One of the goals of the Canadian Stratigraphic Commission is to publicize stratigraphy to the Canadian public. One project they are undertaking is to produce a geologic time scale poster for Canada (similar to the Geological Society of America Time Scale poster).

#### International Commission on Stratigraphy (ICS)

The International Commission on Stratigraphy (ICS) is a scientific body in the International Union of Geological Sciences (IUGS). Its primary objective is to precisely define global units (systems, series, and stages) of the International Chronostratigraphic Chart, that are the basis for the units (periods, epochs, and age) of the International Geologic Time Scale; thus setting global standards for the fundamental scale for expressing the history of the Earth [from <http://www.stratigraphy.org/> last accessed September 23, 2014]. The content of reports presented by ICS representatives at NACSN annual meeting vary from meeting to meeting. Only material of broader interest is summarized below.

At the 2010 meeting, Commissioner Finney reported: 1) that the recent ICS meeting in Prague was opened to attendees beyond the Chairmen of the 16 member subcommissions, and that the meeting attracted many attendees at their own cost; 2) that discussion of a proposal to drop the use of "System" and so on, retaining only "Period" and so on, was rejected in favor of keeping the dual system for clarity of distinguishing rock units from time units; 3) that the non-equivalence of Stage and Age was emphasized; 4) that a widespread opinion emerged that favored allowing flexibility to use Ma for both age and duration, without wanting to take a position on whether or not Myr should be permitted; and 5) that ICS was opening its business, such as votes on Global Boundary Stratotype Section and Point (GSSPs), to a wider audience and with more time for comments and e-mail discussion.

In the subsequent discussion of the report by Commissioner Finney, Commissioner Orndorff contrasted the handling of the differences between chronostratigraphers and geochronologists with the conduct of factions with opposed opinions about the term "Tertiary." Commissioner Finney assured NACSN that it is his habit and intent, as ICS Chairman, to solicit opposing statements in an effort to challenge any hyperbole and misinformation that enters into ICS discussions. Guest Nancy Stamm reported severe difficulties in linking national lexicons via ICS. She and Commissioner Finney will work together on what is essentially a website issue, stemming in part from the loss of NSF funding for the Chronos project (<http://www.chronos.org/> last accessed September 23, 2014).

In 2012, Commissioner Finney reported on several ICS activities. First, the *International Stratigraphic Guide* (Salvador, 1994) is out-of-print, but that a new print run through the Geological Society of America is in progress. However, the current guide does

not include chemostratigraphy, cyclostratigraphy or astronomical forcing concepts. The guide was developed by groups worldwide, and is a guide not a code because of the divergence of opinion by those involved in its preparation. A new version needs to be prepared, however, this will require at least 6 years, involving many groups. There is a condensed version of the existing guide on the ICS web-site, but it is not the real guide <http://www.stratigraphy.org/index.php/ics-stratigraphicguide> (last accessed September 23, 2014). Commissioners were invited to submit ideas regarding revisions to the guide to Commissioner Finney.

Second, a draft “Quaternary Stratigraphic Guide of Finland” has been produced (Räsänen et al., 2012) which Commissioner Finney agreed to distribute to all members of NACSN. Matti Räsänen, the Chairman of the Stratigraphic Commission on Finland would like to know the opinion of members of NACSN on the guide and any specific parts of it. This led to a brief discussion regarding the Russian Stratigraphic Guide and the fact that it uses a different philosophy than most other guides.

Third, the 2012 Stratigraphic Chart is now available from the ICS website. <http://www.stratigraphy.org/index.php/ics-chart-timescale> (last accessed September 23, 2014).

At the 2013 meeting, Commissioner Finney invited all commissioners to participate in the 2nd International Congress on Stratigraphy – STRATI 2015, new directions in stratigraphy, to be held in Gratz, Austria, July 19-23, 2015 (<http://www.stratigraphy.org/index.php/ics-news-and-meetings/96-strati-2015-2nd-international-congress-on-stratigraphy-to-be-held-in-graz-austria-19-23-july-2015> last accessed September 23, 2014).

Also at the 2013 meeting, Commissioner Finney reported on the dedication ceremony for the Turonian Stage GSSP (Upper Cretaceous), located west of Pueblo, Colorado, which was held on October 25<sup>th</sup>, 2013, just prior to the NACSN meeting. Those attending included the President, Secretary-General, and Treasurer of IUGS and the President of the Geological Society of America. This was the first GSSP in the United States to have a public dedication ceremony, as summarized by Finney (2014). There was a good turnout from the local community. The GSSP is in a state park, and where a plaque has been mounted and binoculars provided for the public to view the GSSP, which is located on a hillside.

Guest and commissioner-elect B. Ellwood raised a question about access to the GSSP, as much of the literature related to the GSSP is from a railroad cut near the GSSP. Commissioner Finney noted that the GSSP is in the park, not on the railroad because of safety and liability, but that scientists can ask the park or railroad for access.

#### **International Subcommittee on Stratigraphic Classification (ISSC)**

The International Subcommittee on Stratigraphic Classification (ISSC) is part of the International Commission on Stratigraphy (ICS). The purpose of the ISSC is to advertise new developments in stratigraphic methods, check that the procedures are carefully followed, and monitor the application of the accepted rules (modified from the ISSC website <http://users.unimi.it/issc/webapp/index.php> last accessed September 23, 2014). The content of reports presented by ISSC representatives at NACSN annual meeting vary from meeting to meeting. Only material of broader interest is summarized below.

At the 2003 meeting, Maria Bianca Cita discussed the revitalization of the ISSC and their efforts related to cyclostratigraphy and sequence stratigraphy. She reported that there has been much conversation, but little consensus on “regulating” sequence stratigraphy. Dr. Cita mentioned the two workshops (one sponsored by ISSC and the other by Gian Battista Vai, Lucy Edwards, and Robert Jordan) related to stratigraphy for the International Geological Congress (IGC) to be held in Florence, Italy in August 2004 and felt it was important that each workshop report to the other. Commissioners Edwards and Jordan agreed to report to the ISSC workshop since theirs will occur first. Dr. Cita agreed to continue to forward the ISSC Newsletter to Commissioner Lasca who will send them out to NACSN members (available from <http://users.unimi.it/issc/webapp/index.php?r=newsletter/index> last accessed September 23, 2014).

At the 2004, 2005 and 2006 meetings, Ashton Embry stated that the main goal of the ISSC, which meets once every four years, was to gather advice for revisions of the *International Stratigraphic Guide* (Salvador, 1994) and that it wanted to complete revisions to the Guide by 2008. The ISSC wants to maintain a liaison between the ISSC and the NACSN as revisions to the Guide are worked upon by task groups on for the various chapters on biostratigraphy, magnetostratigraphy, chronostratigraphy, sequence stratigraphy (which has been a problem for both the ISSC and the NACSN), cyclostratigraphy (periodicity is part of a stratigraphic unit), and astrocylicity. As task group leader for sequence stratigraphy, Embry stressed the need for interaction between the Commission and the ISSC. Once preliminary drafts of the chapters become available, the ISSC would very much appreciate feedback.

In 2007, Embry provided an update on revisions to the *International Stratigraphic Guide* (Salvador, 1994). Discussion from several Commissioners followed. Commissioner Embry offered to post finished revised chapters on a publicly accessible ftp site as they become available. Embry also reported that nominations were being accepted for the next ICS Chairman and that the next business meeting of the ISSC is scheduled during the upcoming 33<sup>rd</sup> International Geological Congress in Oslo.

At the 2009 and 2010 meetings, Commissioner Pratt reported that working groups on magnetostratigraphy and sequence stratigraphy are making progress; the lithostratigraphy group is moving more slowly; and the biostratigraphy group is dormant for lack of a leader. Commissioner Finney noted that the next edition of the *International Stratigraphic Guide* is not under consideration until all ISSC working group papers are complete.

#### **Precambrian Subcommittee**

At the 2004 meeting, Commissioner Rainbird reported that a new Subcommittee on subdivision and calibration of the Precambrian timescale was formed recently under the auspices of the ICS (<http://precambrian.stratigraphy.org/> last accessed September 23, 2014). Officers at the time were Dr. Wouter Bleeker (Chairman), Dr. Martin Van Kranendonk (Vice-Chairman), and Dr. Robert Rainbird (Secretary). Details of the rationale and goals of the Subcommittee are outlined in Bleeker (2004). Bleeker (2004) points out a number of flaws in the present scheme that is based solely (with the exception of the recently defined Ediacaran period) on arbitrary geochronometric boundaries (Global Standard Stratigraphic Age (GSSAs)). The principal goals of the Subcommittee will be “to propose [by 2008], a comprehensive and internally consistent, as well as a practical, natural timescale, complete with agreed-upon GSSPs for all Precambrian eon and era boundaries, and, where needed, for those of periods.” In doing so, the Subcommittee will try to preserve existing

nomenclature and formalize informal eon, era and period names. The Subcommittee has solicited ideas and suggestions from Precambrian researchers worldwide and will hold its first meeting at the Supercontinents and Earth Symposium in Perth Australia, September 26-30, 2005. The meeting will focus attention on identification of key stratigraphic boundaries and type sections and discuss the most appropriate ways for correlating global events in the absence of biostratigraphic information.

The work of the Precambrian Subcommittee is still ongoing, and the suggested approach of the Precambrian Subcommittee has been recently articulated by Van Kranendonk (2012).

#### **National Science Foundation**

At the 2003 meeting, Commissioner Lane updated the Commission on stratigraphic research at the National Science Foundation (NSF). He felt that an important step toward NSF supporting stratigraphy is that they were subdividing their Geology and Paleontology Program into three programs: Sedimentology, Stratigraphy, and Paleobiology. Commissioner Lane also discussed NSF's involvement in preserving core, collections, and electronic information generated by NSF research. Commissioner Wardlaw updated the Commission on the NSF project Chronos that integrates all databases that establish time. Chronos was in the first of a two-year funded project that can be re-established in 2005 for a longer term. He stressed the fact that it is an open organization that needs community involvement.

#### **DISCUSSION OF ISSUES RELATED TO STRATIGRAPHY, CHRONOSTRATIGRAPHY AND GEOLOGICAL TIME-SCALES**

##### **Sequence Stratigraphy**

###### *Introduction*

Since the mid-1990s, the Commission has been following the discussion on sequence stratigraphic terminology that has been occurring in the broader geoscience community. The purpose of this monitoring is so that the Commission is prepared whenever a proposal is put forward to formalize sequence stratigraphy terminology. This section highlights some of the key discussions that have taken place on this subject at the Commission since 2003.

###### *2003 Activities*

At the 2003 annual meeting, guest Ashton Embry discussed the lack of progress on sequence stratigraphic terminology by the Sequence Stratigraphy Working Group between 1995 and 2001. They have recently formed an international task group that will include the NACSN to try one more time. Because of workshops being held at International Geological Congress in Florence, Commissioner Jordan felt that it was important that the Commission have a formal stand on the issues. Commissioner Mancini moved and Commissioner Jordan seconded a motion "that the Commission submit abstracts to both workshops stating our stance at this time on the issue of unconformity/disconformity-bounded units."

The motion passed unanimously.

Vice-Chairman Orndorff agreed to make sure this happens with the help of Commissioners Edwards, Mancini, and Jordan, who will represent the Commission in Florence. Reports on these workshops were provided at the 2004 meeting.

###### *Report on International Geological Congress Workshop #4*

Commissioner Edwards reported on the International Geological Congress' Workshop #4 entitled: "Unconformity/disconformity Bounded Units." Approximately 20 people attended and agreed upon the following:

Allostratigraphic units of the North American Code and Unconformity-bounded units of the International Stratigraphic Guide are conceptually the same and have utility.

Utility is currently limited because other surfaces are excluded.

Utility could be expanded by the incorporation of conformable correlative surfaces into the recognition of allowable boundaries.

There are other surfaces that are potentially useful and are not completely addressed.

We await the revision of the International Stratigraphic Guide. Individuals from the NACSN and from the ISSC will participate in each other's deliberations.

Commissioner Edwards stated that we are talking about surface bounded units such as have been used for the past 30 years in biostratigraphy. The abstract of the talk presented at the workshop by the NACSN was distributed (Orndorff et al., 2004a).

###### *Report on International Geological Congress Workshop #15*

Commissioner Edwards reported that a series of position papers were given, several by Commission members, at Workshop #5 entitled: "Post-Hedberg Developments in Stratigraphic Classification." Forty-six participants listened to keynote lectures, and were given position papers and miscellaneous contributions to consider. Discussion followed among the participants. Commissioners Orndorff, Edwards, Easton, Pratt and Ferrusquía-Villafranca presented a report entitled "Regional Stratigraphic Commissions: Testing Grounds for New Avenues in Stratigraphic Concepts" (Orndorff et al., 2004b).

###### *International Working Group on Sequence Stratigraphy*

At the 2006 meeting, Octavian Catuneanu reported that he had organized an international working group, consisting of 20 members including three from the NACSN, with the aim of eventually formalizing sequence stratigraphic material in the Code. The group intends to provide feedback to the Commission and an alternative viewpoint to that being developed by Ashton Embry and the ISSC working group. A great deal of discussion on the many relevant points occupied much of the remaining meeting time. Many Commissioners reiterated the official NACSN position taken several years ago, that sequence stratigraphy nomenclature is still in an interpretive phase and that formalization is currently too premature, but could be entertained in future when, and if, a formal proposal is presented. Several Commissioners, and guest Vitor Abreu, suggested that the time is actually near for the Commission to tackle formalization, and that the efforts of these two working groups would result in proposals to the Commission. In the end, Vice-Chairman Hamblin suggested that the Commission would look forward to reports from both working groups at the next Annual Meeting.

At the 2007 meeting, Octavian Catuneanu reported that the final document is not yet completed. He summarized the history and status of the report, and suggested that it is too soon to assemble a NACSN working group to address this issue. Discussion from Commissioners Edwards and Holbrook followed, including the nature of the

sequence stratigraphic units described in the International Working Group Report and the need or lack thereof for formal units. It was stressed that any formally proposed units must be flexible in order to maximize their usefulness and fit multiple conceptual models.

#### *ISSC Sequence Stratigraphy Report*

Also at the 2007 meeting, Ashton Embry summarized the history and development of the ISSC report on sequence stratigraphy and sequence stratigraphic units. The revised document was completed in summer of 2007 and is currently in external review. He also discussed several reasons why formal sequence stratigraphic units are unlikely in the future, including ongoing controversy regarding the fundamental nature of the units (empirical versus theoretical) and the need for uniform recognition of sequence boundaries and their surface hierarchies.

The two reports presented at the 2007 meeting led to a discussion of the philosophical role of the NACSN in sequence stratigraphic discussions. Commissioner Jordan provided a review of the Commission's role relative to sequence stratigraphic units. He emphasized that (1) the Commission must always be open to responsible revisions to the Code, especially those revisions from external sources; (2) codification of sequence stratigraphic terminology is possible, if desired by the geological community, and conventions can be constructed to provide for this codification; (3) the primary concern of the Commission is formal nomenclature and any number of informal units are possible without NACSN intervention; and (4) the Commission should continue its traditional role as an arbitrator. Chairman Hamblin suggested that the Commission revisit this topic next year. Commissioner Fakundiny suggested the informal circulation of ideas regarding the philosophical aspects of the Commission's role in the sequence stratigraphic nomenclature issue.

#### *2008-2013 Activities*

At the 2011 meeting, copies of some recent abstracts concerning recent proposals with respect to Sequence Stratigraphy nomenclature were circulated prior to the meeting (Snedden and Liu 2011; Miall and Miall, 2001, 2004). These were provided for information, and were not a request for ratification. At the same meeting, it was noted by Commissioner Catuneanu that the ISSC report on Sequence Stratigraphy was in press in *Newsletters in Stratigraphy*, which will be available on the ISSC website once it is published (Catuneanu et al., 2011). Commissioner Finney reported that a chapter on Sequence Stratigraphy would likely be part of the next edition of the *International Stratigraphic Guide*, however it will be a couple of years before a draft of that chapter would be ready.

During the discussion at the 2011 meeting that followed on this topic, it was noted that it had been 10 years since the Commission had sponsored a successful Hedberg Conference on Sequence Stratigraphy (in 2001) and that consideration should be given to hold a similar conference in the next couple of years. Although there was general agreement that this was an excellent suggestion, no specific action was agreed upon. At the 2013 meeting, however, the AAPG representatives to the Commission agreed to follow-up the possibility of having another Hedberg, or similar type of conference, on Sequence Stratigraphy.

#### **Units of Time and Duration of Time**

At the 2009 meeting, there was considerable discussion of recently published proposals by the International Union on Physics and Chemistry (IUPAC) with respect to the designation of time units

(see summaries by Renne and Villa, 2009; Christie-Blick, 2009). IUPAC proposed the use annus for both absolute time and duration of time, which contradicts Article 13c of the Code. The result of the discussion was the preparation of a resolution (Appendix 1) explicitly stating the view of the Commission that absolute time and duration of time were separate concepts. The resolution was sent to all journal editors whose journals recommend the use of the *North American Stratigraphic Code* (NACSN, 2005) in their Guide to Author instructions.

The issue was discussed again at length at the 2011 meeting following publication by IUPAC-IUGS in both *Episodes* and *Pure and Applied Geochemistry* (Holden et al. 2011a, 2011b) recommending the use of annus for both absolute time and duration of time. Several commissioners felt it was necessary to re-inform journal editors and others that the usage recommended in Article 13c of the Code (a for absolute age, y for duration of time) was unchanged despite these recommendations. This had been done in late 2009 when these proposals first surfaced, but it was felt that restatement was needed. It was also resolved that the 2009 resolution be published in *Stratigraphy* (see Appendix 1).

It should be noted that in the past, IUPAC recommendations have been adopted inconsistently by the geological community. For example, the IUPAC recommended spelling of sulfur (versus sulphur) has been widely adopted in North America, however, the recommendation made at the same time to use caesium and aluminium (versus cesium and aluminum), have not.

#### **Time Scales**

At the 2006 and 2007 meetings, Commissioner Orndorff reported that U.S. Geological Survey (USGS), in response to requests, and in conjunction with the American Association of State Geologists, had developed a USGS Time Scale. The names on the "Divisions of Geologic Time" chart follows the International Commission on Stratigraphy (ICS) geologic time scale (Gradstein et al., 2004), with the exception of subdivisions for the Cenozoic, which will continue to follow the U.S. Geological Survey's "Suggestions to Authors", 7<sup>th</sup> edition (Hansen, 1991). The U.S. Geological Survey time scale was included in the special issue of *Stratigraphy* devoted to NACSN (U.S. Geological Survey Geologic Names Committee, 2009).

Also at the 2007 meeting, Guest James Ogg provided an update on the latest ICS time scale, which includes recent refinement of the lower Paleozoic and upper Cenozoic intervals. This led to additional discussion by several Commissioners and guests about what role the Commission should play in issues regarding the acceptance of geologic time scale units and placement of unit boundaries, especially regarding the Quaternary, Pleistocene, and Tertiary. It was suggested that additional research was needed regarding the identities of the appropriate contact liaisons between NACSN member organizations and the International Union of Geological Sciences (IUGS). Commissioner Donovan made a motion that the Commission should draft a statement to the appropriate person about the need to use lower/middle/upper (or early/middle/late) within geologic time scale series (or epoch) subdivisions instead of the existing regional geographic terms used within the Cambrian, Ordovician, Silurian, and Permian. The motion was seconded but did not pass.

At the 2012 meeting, the Chairman Easton noted that a new version of the Geological Society of America (GSA) time scale was available. A pdf of it can be downloaded for free from <http://www.geosociety.org/science/timescale/> (last accessed September 23, 2014).

## The Anthropocene

At both the 2008 and 2012 meetings, the topic of the Anthropocene was discussed. In particular, the question being asked was what, if anything, does the Commission have or need to say on it – are we actors or observers? In particular, at the 2012 meeting, it was noted that Elsevier is publishing a new journal called “*Anthropocene*” and that there is a task group in the ICS Quaternary Subcommission (<http://quaternary.stratigraphy.org/workinggroups/anthropocene/> (last accessed September 23, 2014) considering a time stratigraphic unit called the Anthropocene for the geological time scale, at the rank of an Epoch. Commissioner Finney noted that the many members of the task group were “on the bandwagon”, but regardless there needed to be an open process in place before anything is proposed for formalization. Commissioner Edwards asked the question as to whether stratigraphers alone should be deciding this, as other stakeholders would be affected by any proposal. Guest Ed Landing noted that any change would affect the existing Holocene division. Commissioner Tew asked about the time frame, since there is a forthcoming Geological Society of London volume on the subject. Commissioner Edwards noted that the current Code has a way of handling this, namely as a diachron unit (in this case, diachronous across the world) – the Anthropocene diachron? Following discussion, the Commission decided that it needed to develop a question on the topic in order to inform and get feedback from our respective societies. Commissioner Finney agreed to prepare a one-page document to circulate to the commissioners once his manuscript of the subject, being prepared for a Geological Society on London volume on the Anthropocene, was ready (Finney, 2013; Waters et al. 2014).

## Tertiary and Quaternary

At the 2004 and 2005 meetings, there was considerable discussion of the omission of the Quaternary from the IUGS time scale published in *Episodes* by Gradstein et al. (2004), and the relationship between the Quaternary and the Tertiary, the latter which was abandoned on the ICS time charts in 1989. The decision to abandon the Tertiary has not been widely accepted by many workers in North America. The question put before the Commission was what, if anything, should the Commission do about this problem? Commissioner Edwards suggested that we speak to our various communities about both the Tertiary (a chronostratigraphic unit) and the Quaternary. Commissioner Jordan indicated that our charter doesn’t apply to time scales, but that the terms have been in use for a very long time and we defend precedent. Commissioner Edwards stated that the U.S. Geological Survey time scale is hierarchical: Era: Cenozoic; divided into Periods: Tertiary and Quaternary; divided into Sub-periods: [Tertiary only] Paleogene, Neogene; divided into Epochs: Tertiary into Paleocene, Eocene, Oligocene, Miocene, Pliocene; Quaternary into Pleistocene, Holocene. This system is also found in most American textbooks. The ICS also used a hierarchical system with the Cenozoic divided into Periods: Paleogene, Neogene and Quaternary; divided into Epochs: Paleogene into Paleocene, Eocene, Oligocene; Neogene into Miocene, Pliocene; and Quaternary into Pleistocene, Holocene (Cowie and Bassett, 1989). Now the ICS has dropped both Tertiary and Quaternary, instead dividing the Cenozoic into the Paleogene, with the Paleocene, Eocene, Oligocene as Epochs; and the Neogene, with Miocene, Pliocene, Pleistocene, and Holocene as Epochs.

A lively discussion ensued with all Commissioners joining the debate. Commissioner Edwards proposed and Commissioner Jordan seconded a motion “that a response be sent to the ISSC in support of the base of the Quaternary being the base of the Pleistocene as defined by the base of the Calabrian beds in Italy.” Discussion followed, with resulted in a motion to amend the motion (moved by Commissioner Manger, seconded by Commissioner Ferrusquía-Villafranca) to state explicitly “that a response be sent to the ISSC in support of the Tertiary and Quaternary being retained as Periods.”

After discussion, the amendment passed on a vote of 8 yeas, 2 nays, 4 abstaining. More discussion followed. Commissioner Tew noted that we were the only voice for the overall geologic community in North America. Commissioner Jordan stated that as a matter of principle we should respect the tradition of long established formal nomenclature. The amended motion was then voted on, and passed on a vote of 9 yeas, 4 nays, 1 abstaining. Vice-Chairman Lasca and Commissioner Edwards were to formulate the formal response.

At the 2005 meeting, Guest Jim Ogg made remarks on the ICS task group’s latest position of the Tertiary/Quaternary boundary. The proposal is to assign the Quaternary the rank of sub-era, with the base equal to the base of the Gelasian stage/age (at 2.6 Ma). This date approximates a magnetic reversal, and also approximates the first major advance of ice in North America. In this case, the base of the Quaternary (2.6 Ma) would be older than the base of the Pleistocene as defined by the base of the Calabrian stage/age (1.8 Ma). This position represents a compromise that will go to International Quaternary Association (INQUA) in December 2005, and subsequently to the International Union of Geological Sciences.

## The Quaternary and the Pleistocene

From 2006 to 2013 there was considerable debate at each NACSN annual meeting regarding the changes proposed and subsequently ratified by the International Commission on Stratigraphy (ICS) with respect to the definition of the base of the Pleistocene. Only key aspects of these discussions are summarized below.

First, by way of background, the ICS proposal, developed by their Quaternary Subcommission and subsequently ratified by the IUGS in 2009, kept the bases of the Quaternary System/Period and Pleistocene Series/Epoch coincident, placing both at an established GSSP at the base of the Gelasian Stage/Age (at 2.6 Ma). The decision amounted to the first formal definition of the base of the Quaternary and a redefinition of the base of the Pleistocene. The default “status quo” would have left both boundaries coincident at an established GSSP at the base of the succeeding Calabrian Stage/Age. Relative to the status quo, the ICS-IUGS decision extended the Pleistocene and Quaternary back in time by approximately three quarters of a million years. A third option, proposed by the Neogene Subcommission was rejected; it would have decoupled the bases of the Quaternary and Pleistocene, leaving the base of the Pleistocene Series/Epoch at the base of the Calabrian and placing the base of a Quaternary Subsystem at the base of the older Gelasian Stage. The ICS-IUGS procedure encompassed at least three matters of convention: the definition and relative age of the bases of the Quaternary and Pleistocene; the status of the names Quaternary and Neogene in the hierarchy of stratigraphic units; and the position of the Pliocene Series/Epoch and Gelasian Stage/Age relative to higher-order units. It used existing GSSPs, ratified in 1985 and 1996; both have astronomically calibrated ages. Papers

by Gibbard and Head (2010) and Finney (2010) summarize the proposals and the process followed in their adoption.

At the 2010 meeting, Commissioner Aubry asked the Commission to consider two issues, the top-down procedure leading to ratification and the consequences for the profession. Although the public ICS-IUGS debates included matters of historical precedent and current practice, the discussion at the NACSN focused primarily on matters of practical application. Commissioners Aubry, Ferrusquía-Villafranca and Finney discussed the difficulties of correlation between marine and non-marine strata and the distinction between climate change events and biochronologically defined horizons. Several Commissioners suggested that Commission's role is to establish nomenclatural frameworks and provide forums for discussion and education, rather than advancing opinions about particular boundary decisions. Commissioner Edwards recalled that the Commission had stated support for the status quo. Commissioner Orndorff reported that U.S. Geological Survey saw greater merit in accepting that their preferred position had lost the vote, rather than continuing dissent. As noted by Commissioner Finney, the ratification followed review, discussion, and a clear majority vote. If the decision is to be reconsidered, it was his opinion that the case for opposing the previous choice would need to be much better advocated.

At the 2010 meeting, Commissioner Van Couvering proposed, and Commissioner Aubry seconded a motion "that NACSN form a task group to consider the issue of the new definition of the Pleistocene; whether that new definition is a problem for our profession and, if it is, how it should be dealt with."

Discussion of the motion followed. Those speaking against were of the opinion that the issue had been discussed, settled, and should not take any more of the Commission's time and energy. The first vote was tied (10 for, 10 against, 0 abstentions). Reconsideration of who should and should not vote led to a second tie (9-9-0), which the Chairman broke in favor of the motion. Chairman Donovan solicited Commissioners Scott and Harper to initiate the task group. The task group was advised to focus on mechanism, to gather data and remain neutral with regard to outcome.

The Task Group on the Impact of New Definition of the Pleistocene presented their report at the 2011 meeting. The task group had determined that conducting a survey of affected geoscience groups was the first step in determining the impact of the new definition. The report on the survey results was circulated prior to meeting, and was included as an attachment to the minutes. Key results from those that completed the survey were that: 40% were unaware of the change, even though 70% said that they worked in the Quaternary, Pleistocene or Pliocene, however, 80% said that it would not affect their work.

Considerable discussion followed, much of it related to the process by which the new definition was reached rather than on the specific results of the survey. Several commissioners felt it was necessary to include additional groups in the survey, such as physical anthropologists. Consequently it was decided that Commissioners Harper and Scott would expand the survey to additional groups, with a March 31, 2012 deadline for data collection. Results were reported at the 2012 meeting, and were similar to the previously reported results. At the 2012 meeting, Commissioner Finney reviewed the history of Quaternary debates. He emphasized that with respect to the Pleistocene, the issue was discussed over a long time, was presented and

published in many places, and disseminated in many venues. Although perhaps not perfect, the extensive discussion that did occur was in marked contrast to previous practice.

## OUTREACH ACTIVITIES

### History of the Commission

Between 2003 and 2009, Commissioner Jordan prepared a report on the history of the Commission. The report traces the origin of the NACSN from the birth of interest in stratigraphic nomenclature back to the 1840s when northeastern State geological surveys gathered to discuss standardization of geologic names, to the efforts of the U.S. Geological Survey and State Geologists in 1929 that led to the 1933 *Stratigraphic Code*, and how the 1961 *North American Stratigraphic Code* led to the current structure of the Commission. The report was published in 2009 in a special issue of *Stratigraphy* devoted to NACSN (Jordan, 2009) and is also available from the NACSN website.

### Promoting Stratigraphy at National Geoscience Meetings

A half-day Topical Session on "Challenges in Geoscience Publishing: The Use of Nomenclature" was organized by the NACSN and the Association of Earth Science Editors (AESE) at the 2007 Geological Society of America Annual Meeting ([https://gsa.confex.com/gsa/2007AM/finalprogram/session\\_19762.htm](https://gsa.confex.com/gsa/2007AM/finalprogram/session_19762.htm) last accessed September 23, 2014). Presentations included difficulties in adequately distributing the 2005 version of the *North American Stratigraphic Code* and the need for more international participation and collaboration on questions pertaining to nomenclature. Commissioners Easton and Orndorff, as well as AESE co-organizer Monica Easton gave presentations in the session.

A half-day Topical Session on "Stratigraphic Standards: Where Have They Gone, What Should They Do, Where Should They Go?" was held at the 2010 Geological Society of America Annual Meeting and was well attended and generated lively discussion ([https://gsa.confex.com/gsa/2010AM/finalprogram/session\\_26202.htm](https://gsa.confex.com/gsa/2010AM/finalprogram/session_26202.htm) last accessed September 23, 2014). Commissioner Harper suggested that the Commission could have annual events of this type concerning standards. Intrusive complexes and Precambrian stratigraphy were suggested as possible topics.

Two stratigraphy sessions co-sponsored by NACSN were proposed for the 2011 Geological Society of America Annual Meeting, but neither session gathered enough participants to proceed. They were on the subjects of "Application of New Stratigraphic Tools to Precambrian and Igneous Rocks: Challenges and Solutions" and "Problems in Hydrostratigraphy and the Usage of Its Nomenclature".

A half-day topical session on *Coastal Plain Stratigraphy & Paleontology*, co-sponsored by NACSN, the Paleontological Society, and SEPM, was co-organized by Commissioner Edwards for the 2012 Geological Society of America Annual Meeting (<https://gsa.confex.com/gsa/2012AM/webprogram/Session30761.html> last accessed September 23, 2014).

Two related half-day topical sessions were held at the 2013 Geological Society of America Annual Meeting. The first on "Earth Deep Time Revolution by Global Chronostratigraphic Correlation" was organized by Commissioners Finney, Edwards and Scott <https://gsa.confex.com/gsa/2013AM/webprogram/Session33003.html>

last accessed September 23, 2014), with the other on “*Impact of GSSPs on The Evolution of North American Chronostratigraphy*” organized by Commissioners Finney, Pratt and Fluegeman (<https://gsa.confex.com/gsa/2013AM/webprogram/Session33038.html> last accessed September 23, 2014).

### Position Papers on Stratigraphic Matters

Walsh (2001) published a paper on geochronologic and chronostratigraphic units. On behalf of the NACSN, Commissioners Easton, Edwards, and Wardlaw published a response to Walsh’s paper to clarify the position of NACSN on the subject (Easton et al., 2003).

In 2004, an article by Zalasiewicz et al. (2004) of the Stratigraphic Commission of the Geological Society of London appeared in *Geology*. In the discussion that ensued at the 2004 NACSN annual meeting, six points of contention were raised.

The practice of chronostratigraphy today defines the time framework of geochronology as intervals of geologic time are precisely defined within rock successions by GSSPs (golden spikes).

The effect is that chronostratigraphy and geochronology should become one and the same discipline, as Harland et al. (1990) realized. For this discipline they propose to keep the name “chronostratigraphy” that is the definition and application of a hierarchy of eons, eras, periods, epochs, and ages.

The terms “eonothem,” “erathem,” “system,” “series,” and “stage” thus become formally redundant, but may be used informally. Time units defined by chronostratigraphy may be qualified by “early,” “middle,” and “late,” but not by “lower,” and “upper.” The qualifiers “lower,” “middle,” and “upper” are applicable to rock bodies of lithostratigraphy.

Time units defined by chronostratigraphy are founded within strata, but encompass all rocks on Earth.

The term “geochronology” reverts to referring to dating and ordering geological events, particularly using numerical estimates of time, e.g., radiometric dating.

Chairman Orndorff stated that the article showed the passion of science that resulted in change and evolution of stratigraphic practice. When asked what the stand of the Commission was, he replied that the Commission had none. He reminded the Commission that last year Walsh (2001) had suggested a number of amendments for the Code. As there is a specific procedure for amending the Code, Walsh, Zalasiewicz, and anyone else were welcome to submit proposals to amend the code using the procedures for amendment to the Code.

Commissioner Jordan lamented that the Geological Society of America had published the article without consulting with the Commission as their publication of it gave the appearance that the NACSN endorsed the concept, especially as the Geological Society of America had embraced and endorsed the Code. He felt we should not dignify the article with a response. Chairman Orndorff stated that from his interactions with members of the stratigraphic community, including Maria Bianca Cita, Chairman of the ISSC, a response by the Commission was expected. Commissioner Manger proposed and Commissioner Easton seconded a motion “that we formulate a response and publish it.”

After discussion, the motion passed on a vote of 13 yeas, 1 nay, 1 abstaining. After further discussion, Vice Chairman Lasca proposed and Commissioner Mancini seconded a motion “that our response should state the position of the Commission and the procedures for amending the Code.”

After discussion, the motion passed on a vote of 14 yeas, 0 nay, 1 abstaining. A committee consisting of Commissioners Easton and Ferrusquía-Villafranca, Orndorff and Owen was appointed to craft the response for publication in *Geology*. It was subsequently learned from *Geology* that a reply article was not possible, because reply articles must be published within six months from the publication date of the original paper. Consequently, a stand-alone paper was prepared and published in the special issue of *Stratigraphy* dedicated to the NACSN (Ferrusquía-Villafranca et al., 2009).

### NACSN relations with Latin America

At the 2004 meeting, Vice Chairman Lasca asked the Commissioners whether this might be the time to consider expanding the Commission to include Latin America? He noted that the Commission originally was called the *American Commission* and when Canada and Mexico joined, the name was changed to *North American Commission*. Commissioner Ferrusquía-Villafranca felt it would be a very good move to explore a relationship with the Latin American stratigraphic community. Commissioners Donovan and Jordan felt we should encourage them to develop a parallel stratigraphic organization, but thought the idea worth considering. Commissioners Edwards and Pratt felt the idea worth exploring and suggested that a sub-committee be appointed to look into the idea. Commissioners Ferrusquía-Villafranca and Pratt agreed to serve on the sub-committee and report back to the Chairman.

In 2005, Commissioners Ferrusquía-Villafranca and Pratt reported on correspondence with various geological societies in Brazil, Peru, and Argentina. They reported that the Latin American Geological Congress is exposed to the ideas of the NACSN, and that the responses they received were sympathetic but non-committal. Commissioners Ferrusquía-Villafranca and Pratt were directed to pursue this issue for another year.

At the 2006 meeting, Commissioner Ferrusquía-Villafranca reported on the large and vibrant geological communities of Latin America, particularly in Brazil, Argentina and Mexico. An umbrella organization, Asociación de Servicios de Geología y Minería Iberoamericanos (ASGMI) publishes newsletters and maintains a website. Commissioner Ferrusquía-Villafranca recommended that the Commission approach ASGMI, with a long-term view toward a Pan-American Code. A motion was approved to set up a Sub-Committee consisting of Commissioners Ferrusquía-Villafranca, Pratt and Orndorff to look further into this possibility.

At the 2007 meeting, Commissioner Ferrusquía-Villafranca reported contacting the recently appointed ASGMI President, Dr. A.S. Lucas Dantas, regarding the interest of the Commission in establishing formal relationships with ASGMI. Resulting correspondence from ASGMI indicates that they were in favor of this proposal. Commissioner Ferrusquía-Villafranca submitted a written report to the Commission that outlined the process in more detail.

Limited progress on this file took place between 2007 and 2010. At the 2010 meeting, Commissioner Ferrusquía-Villafranca

noted that the upcoming 14<sup>th</sup> Latin American Conference on Geology had little representation of stratigraphy, but that it would be a good opportunity to strengthen the awareness of the Commission among Latin American organizations. Commissioner Scott spoke of the desirability of ties to Colombia and Cuba. Commissioner Scott then proposed and Barragan seconded a motion “that Commissioner Ferrusquía-Villafranca pursue means to improve collaboration with Latin American national commissions.”

The motion was carried unanimously.

Commissioner Ferrusquía-Villafranca reported at the 2012 meeting that he had contacted heads of geological surveys in South America who had shown modest interest in co-operation, but it was clear that a higher level official, such as someone like the new director of the Servicio Geológico Mexicano, would be in a better position to expand co-operation between the different societies. NASCN could approach the new director and also offer help. Commissioner Ferrusquía-Villafranca will approach new director who is to be appointed by end of 2012. Two areas where the Commission could assist would be with the development of the geologic charts of South America being developed as part of the *Geological Map of the World*, as well as working toward developing a stratigraphic Code that would apply to both North and South America (“Stratigraphic Code of the Americas”). Commissioner Ferrusquía-Villafranca noted that an international guide or a code would have more authority than the geologic charts, and would provide common ground for conducting stratigraphic work. Much discussion ensued. Guest E. Landing suggested presenting an “American Code”. Should this topic of a session at the Geological Society of America annual meeting in 2013? Commissioner Lasca noted that this idea was discussed in the past. Commissioner Pratt noted that the Argentinian and Brazilian Stratigraphic Codes are modeled after the *North American Stratigraphic Code*. It was also noted that the Caribbean should be included. There was also discussion about implications for the existing *North American Stratigraphic Code* (e.g., possible amendment) depending on the eventual outcome of these discussions. Commissioner Van Couvering proposed and Commissioner Lasca seconded a motion “to adopt as a working title, that the next version of code be re-named as ‘Stratigraphic Code of the Americas’, to be developed in consultation with other responsible geological bodies in the hemisphere.

The motion was approved.

Apparently some Latin American geoscientists object to the Mexican translation of the *North American Stratigraphic Code*; so the translation needs to be modified to be in accord with other Latin American groups. Commissioner Finney proposed, and Commissioner Harper seconded a motion “that NACSN coordinate with The Commission for the Geologic Map of the World to achieve consistent terminology”.

The motion was approved.

In 2013, Commissioner Ferrusquía-Villafranca noted that the director of the Servicio Geológico Mexicano had been changed. He stated he would make one more attempt to pursue the subject with the new director. Commissioner Finney noted that there was plenty of variation between countries and terminology, as well as dialect issues, and that perhaps utilizing the ICS was the best approach. Commissioner Orndorff reminded all present that this is a process, and that it is not going to happen within only a few years.

## Commission Business

### Journal of Record for the NACSN – Stratigraphy

At the 2005 meeting, John van Couvering proposed that *Stratigraphy* be considered as the journal of record for the NACSN. It was noted that, at that time, the NACSN did not have an official journal, although, with few exceptions (i.e., a report and a note published in the *Geological Society of America Bulletin*), everything that the NACSN had published appeared in the *AAPG Bulletin*. Although *Stratigraphy* has a relatively low circulation number compared to the *AAPG Bulletin*, the ability to both advertise and make select NACSN publications available through the NACSN web-site more than made up for this difference in circulation. A subsequent motion by Commissioners Edwards and Manger to make *Stratigraphy* the journal of record for the NACSN was carried with no objections. Since then, *Stratigraphy* has been the official journal of the NACSN.

### Changes in Commission Membership

At the 2006 meeting, the Society of Sedimentary Geology (SEPM) made an application to join the NACSN. Commissioner Catuneanu introduced the application, commenting that SEPM, as a long-standing supporter of stratigraphy, would be an appropriate addition, and proposed a motion to include them. The motion was approved, and SEPM was invited to join, being represented by two members on 3-year, staggered, terms.

At the 2005 meeting, Commissioner Ferrusquía-Villafranca suggested that the newly reorganized and renamed Geological Service of Mexico [Servicio Geológico Mexicano] should be invited to join the NACSN. At the 2006 meeting, a motion was introduced, seconded and passed inviting the Servicio Geológico de Mexico to join the NACSN with one member with a standard 3-year term. The 2009 version of the NACSN Bylaws (Owen et al., 2009) formalize both of these additions to the membership of the Commission.

### Changes in Commission By-Laws

At the 2009 meeting a change to Article IV, Part 4, of the Commission By-Laws elaborating the duties of the Vice-Chairman was moved, seconded and passed unanimously. Article IV, Part 4 of the By-Laws now states (the second sentence is new): “The Vice Chairman shall perform functions of a secretary and treasurer in addition to other duties. Secretarial duties shall include the responsibility for keeping an official, up-to-date record of the meeting, its Commissioners and Alternates, as well as ensuring its publication in an appropriate medium.”

Although this change is now in effect, it was made after publication of Report 11—Revised articles of organization and procedure of the North American Commission on Stratigraphic Nomenclature in *Stratigraphy* (Owen et al., 2009). The amended text will appear in the next published version of the By-Laws.

## Memorials

The commission wishes to pay its respects and gratitude to former NACSN Chairmen and Commissioners Donald L. Baars who passed away in 2008 (served 1988-1995, Chairman in 1995), and Jared R. Morrow, who passed away in 2010 (served 2003-2009, Chairman in 2008). Commissioner Joshua J. Tracy, Jr. (served 1982-1988) passed away in 2004.

In addition, the commission pays its respects to the following stratigraphers: Amos Salvador and Stephen L. Walsh, who both

passed away in 2008, and Gerald M. Friedman who passed away in 2011.

#### Officers and Commissioners 2003-2013

Officers of NACSN from 2003 to 2013 were as follows: Chairman: Brian R. Pratt (2002-2003), Randall C. Orndorff (2003-2004), Norman P. Lasca (2004-2005); Octavian Catuneanu (2005-2006); A.P. (Tony) Hamblin (2006-2007); Jared R. Morrow (2007-2008); Berry H (Nick) Tew (2008-2009); Art D. Donovan (2009-2010); Peter Sadler (2010-2011); R. Michael Easton (2011-2012); Robert W. Scott (2012-2013), Richard H. Fluegeman (2013-2014). Vice-Chairman-secretary: Randall C. Orndorff (2002-2003), Norman P. Lasca (2003-2004); Octavian Catuneanu (2004-2005); A.P. (Tony) Hamblin (2005-2006); Jared R. Morrow (2006-2007); Berry H (Nick) Tew (2007-2008); Art D. Donovan (2008-2009); Peter Sadler (2009-2010); R. Michael Easton (2010-2011), Robert W. Scott (2011-2012), Richard H. Fluegeman (2012-2013), Howard Harper (2013-2014).

Commissioners who served during this period were:

American Association of Petroleum Geologists (AAPG): Art D. Donovan (2005-2011); Robert R. Jordan (2003-2009); Donald E. Owen (2003-2012); Susan A. Longacre (2003-2005); Robert W. Scott (2012-2013)

Association of American State Geologists (AASG): John P. Bluemle (2003); Robert H. Fakundiny (2003-2007); Ernest A. Mancini (2003-2011); John Steinmetz (2012-2013); Berry H (Nick) Tew (2004-2012); David Wunsch (2009-2012)

Geological Society of America (GSA): Marie-Pierre J. Aubry (2007-2010); E. Arthur Bettis (2008-2011); Frank R. Etensohn (2012-2013); Stanley C. Finney (2009-2012); Richard H. Fluegeman (2010-2013); H. Richard Lane (2003-2004); Ed Landing (2005-2008); Walter L. Manger (2003); Christopher G. Maples (2003-2004), Brett McLauren (2006-2009); Jared R. Morrow (2003-2006); Matthew R. Saltzman (2004-2007); Bridget Wade (2011-2013)

U.S. Geological Survey (USGS): Lucy E. Edwards (2003-2013); David S. Fullerton (2005-2013); Randall C. Orndorff (2003-2013); Bruce R. Wardlaw (2003-2005)

Geological Survey of Canada (GSC): R.G. Anderson (2004-2010); A.P. (Tony) Hamblin (2003-2013); Robert Rainbird (2003-2013) Canadian Society of Petroleum Geologists (CSPG): Brian R. Pratt (2003-2013), Octavian Catuneanu (2003-2013)

Geological Association of Canada (GAC): Robert Michael Easton (2003-2013); Frank Brunton (2005-2013)

Society of Sedimentary Geology (SEPM) : Vitor Abreu (2006-2009); Marie-Pierre J. Aubry (2012-2013); Howard Harper (2009-2013); Peter Sadler (2008-2011)

Instituto de Geología de la Universidad Nacional Autónoma de México: Ricardo Barragán Manzo (2007-2010); Ismael Ferrusquía-Villafranca (2003-2006); Elizabeth Solliero Rebolledo (2010-2013)

Asociación Mexicana de Geólogos Petroleros: vacant (2003-2013)

Sociedad Geológica de Mexicano: M.C. Emiliano Campos

Madrigal (2008-2011)

Servicio Geológica Mexicano: Edgar Juárez Arriaga (2008-2011); Rosario Isabel López Palomino (2008-2011)

Commissioners-at-large: Ashton F. Embry (2005-2011); Ismael Ferrusquía-Villafranca (2006-2013); Stanley C. Finney (2012-

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58 <sup>th</sup>	Seattle, Washington	November 2, 2003
59 <sup>th</sup>	Denver, Colorado	November 7, 2004
60 <sup>th</sup>	Salt Lake City, Utah	October 17, 2005
61 <sup>st</sup>	Philadelphia, Pennsylvania	October 23, 2006
62 <sup>nd</sup>	Denver, Colorado	October 29, 2007
63 <sup>rd</sup>	Houston, Texas	October 6, 2008
64 <sup>th</sup>	Portland, Oregon	October 19, 2009
65 <sup>th</sup>	Denver, Colorado	November 1, 2010
66 <sup>th</sup>	Minneapolis, Minnesota	October 10, 2011
67 <sup>th</sup>	Charlotte, North Carolina	November 5, 2012
68 <sup>th</sup>	Denver, Colorado	October 28, 2013

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2013); Norman P. Lasca (2003-2013); Walter L. Manger (2005-2009); Jared R. Morrow (2006-2009); John Van Couvering (2005-2013)

The NACSN holds its annual meeting in conjunction with the Annual Meeting of the Geological Society of America. Annual meeting locations and dates covered by this note were as follows:

#### REFERENCES

##### See Finney; Orndorf; van kanendonk

- BARRAGÁN, R., CAMPOS-MADRIGAL, E., FERRUSQUÍA-VILLAFRANCA, I., LÓPEZ-PALOMINO, I., and TOLSON, G., 2010. *Código estratigráfico norteamericano por la Comisión Norteamericana de Nomenclatura Estratigráfica*. Mexico, DF: Instituto de Geología, Universidad Nacional Autónoma de México. Boletín 117, 48 pp.
- BLEEKER, W. 2004. Towards a “natural” time scale for the Precambrian – A proposal. *Lethaia*, 37: 219–222.
- CATUNEANU, O., GALLOWAY, W. E., KENDALL, C. C. ST. C., MIALL, A. D., POSAMENTIER, H. W., STRASSER, A., and TUCKER, M. E., 2011. Sequence stratigraphy: Methodology and nomenclature. *Newsletters on Stratigraphy*, 44: 173–245.
- CHRISTIE-BLICK, N., 2009. *Conventions and symbols for geological time: Forum for discussion of GSA time unit conventions*. Boulder: Geological Society of America. <http://www.geosociety.org/TimeUnits/> (last accessed 27 Sept. 2011).
- , 2012. Geological time conventions and symbols. *GSA Today*, 22: 28–29.
- COWIE, J. W., and BASSETT, M. G., 1989. *Global stratigraphic chart of the International Union of Geological Sciences*. Included with *Episodes*, v. 12.
- EASTON, R. M., EDWARDS, L. E., and WARDLAW, B. R. 2003. Discussion and reply: Notes on geochronologic and chronostratigraphic units. *Geological Society of America Bulletin*, 115: 1016–1017.
- EASTON, R. M., JONES, J. O., LENZ, A. C., FERRUSQUÍA-VILLAFRANCA, I., MANCINI, E. A., WARDLAW, B. R., EDWARDS, L. E., and PRATT, B. R., 2005. Note 65: Records of Stratigraphic Commission, 1995–2002. *American Association of Petroleum Geologists, Bulletin*, 89: 1459–1464.

- FERRUSQUÍA-VILLAFRANCA, I., EASTON, R. M., EDWARDS, L. E., FAKUNDINY, R. H., and JONES, J. O., 2001. Note 63: Application for amendment of the North American Stratigraphic Code concerning consistency and updating regarding electronic publishing. *American Association of Petroleum Geologists Bulletin*, 85: 366–375.
- FERRUSQUÍA-VILLAFRANCA, I., EASTON, R. M., and OWEN, D. E., 2009. Do GSSPs render dual time-rock/time classification and nomenclature redundant? *Stratigraphy*, 6:135–169.
- FINNEY, S. C., 2010. Formal definition of the Quaternary System/Period and redefinition of the Pleistocene Series/Epoch. *Episodes*, 33: 159–163.
- FINNEY, S. C., 2013. The ‘Anthropocene’ as a ratified unit in the ICS International Chronostratigraphic Chart: fundamental issues that must be addressed by the Task Group. In: [EDITORS??], Eds., [TITLE, PAGES??] London: The Geological Society. Special Paper 395.
- , 2014. Dedicating America’s GSSPs ¼ International geostandards. *GSA Today*, 24: 20–21.
- GIBBARD, P. L., and HEAD, M. J., 2010. The newly ratified definition of the Quaternary System/Period and redefinition of the Pleistocene Series/Epoch, and comparison of proposals advanced prior to formal ratification. *Episodes*, 33: 152–158.
- GILLESPIE, D., STEPHENSON, D. and MILLWARD, D. 2008. *BGS classification of lithodemic units: proposals for classifying units of intrusive rock*. Keyworth: British Geological Survey. Research Report RR/08/05, 31pp.
- GRADSTEIN, F. M., OGG, J. G., SMITH, A. G., BLEEKER, W., and LAURENS, L. J., 2004. A new Geologic Time Scale, with special reference to Precambrian and Neogene. *Episodes*, 27: 83–100.
- HANSEN, W. R., Ed., 1991. *Suggestions to authors of the reports of the United States Geological Survey, seventh edition*. Reston, VA: U. S. Geological Survey, 289p.
- HARLAND, W. B., ARMSTRONG, R. L., COX, A. V., CRAIG, L. E., SMITH, A. G., and SMITH, D. G. 1990. *A geological time scale, 1989*. Cambridge: Cambridge University Press, 131 pp.
- HOLDEN, N. E., BONARDI, M. L., DE BIÈVRE, P., RENNE, P. R., and VILLA, I. M., 2011a. IUPAC–IUGS common definition and convention on the use of the year as a derived unit of time (IUPAC Recommendations 2011). *Pure and Applied Chemistry*, 83: 1159–1162.
- , 2011b. IUPAC–IUGS common definition and convention on the use of the year as a derived unit of time (IUPAC–IUGS Recommendations 2011). *Episodes*, 34: 39–40.
- JORDAN, R. R., 2009. Layer by Layer: An account of the North American Commission on Stratigraphic Nomenclature. *Stratigraphy*, 6: 170–182.
- LENZ, A. C., EDWARDS, L. E., and PRATT, B. R., 2001. Note 64: Application for revision of articles 48–54, biostratigraphic units, of the North American Stratigraphic Code. *American Association of Petroleum Geologists, Bulletin*, 85: 372–375.
- MERQ, 1986. *Code stratigraphique Nord-Américain*. Montreal: Ministère de l’Énergie et des Ressources du Québec. DV 86–02, 58 p.
- MIALL, A. D., and MIALL, C. E., 2004. Empiricism and model–building in stratigraphy: Around the hermeneutic circle in the pursuit of stratigraphic correlation. *Stratigraphy*, 1: 27–46.
- MIALL, A. D., and MIALL, C. E., 2001. Sequence stratigraphy as a scientific enterprise: the evolution and persistence of conflicting paradigms. *Earth-Science Reviews*, 54: 321–348.
- NACSN (NORTH AMERICAN COMMISSION ON STRATIGRAPHIC NOMENCLATURE). 1983. North American Stratigraphic Code, 1983. *American Association of Petroleum Geologists, Bulletin*, 67: 841–875.
- , 2005. North American Stratigraphic Code, 2005. *American Association of Petroleum Geologists, Bulletin*, 89:1547–1591.
- ORNDORFF, R. C., EDWARDS, L. E., JORDAN, R. R., MANCINI, E. A., EASTON, R. M., CATENEANU, O., MANGER, W., MORROW, J., FERRUSQUÍA-VILLAFRANCA, I., and LASCA, N. P. 2004A. Allostratigraphy and unconformity-bounded units: Toward a unified nomenclature. In: Eds., *32nd International Geological Congress, Abstracts, Part 2*, 1501. Florence, Italy. Organizing Committee, 32nd International Geological Congress.
- ORNDORFF, R. C., EDWARDS, L. E., EASTON, R. M., PRATT, B. R., and FERRUSQUÍA-VILLAFRANCA, I., 2004b. Regional Stratigraphic Commissions: Testing Grounds for New Avenues in Stratigraphic Concepts. In: Eds., *32nd International Geological Congress, Abstracts, Part 2*, 1525. Florence, Italy Publisher: Organizing Committee, 32nd International Geological Congress.
- OWEN, D. E., LASCA, N. P. and EDWARDS, L. E., 2009. Report 11 — Revised articles of organization and procedure of the North American Commission on Stratigraphic Nomenclature. *Stratigraphy*, 6: 183–184.
- RÄSÄNEN, M. E., AURI, J., and VIRTASALO, J. J., 2012. “Stratigraphic guide for Quaternary glaciated terrain deposits in Finland.” Unpubl. draft report, 74p.
- RENNE, P. R., and VILLA, I. M., 2009. *The case for abandonment of dual units for ages and durations of time: Forum for discussion of GSA time unit conventions*. Boulder: Geological Society of America, <http://www.geosociety.org/TimeUnits/> (last accessed 27 Sept. 2011)
- SALVADOR, A., Editor, 1994. *International Stratigraphic Guide, 2nd edition*. Geneva: International Union of Geological Sciences; Boulder: Geological Society of America, 214 p.
- SNEDDEN, J. W., and LIU, C. 2011. Recommendations for a uniform chronostratigraphic designation system for Phanerozoic depositional settings. *American Association of Petroleum Geologists, Bulletin*, 95: 1095–1122.
- U. S. GEOLOGICAL SURVEY GEOLOGIC NAMES COMMITTEE, 2009. Divisions of geologic time – major chronostratigraphic and geochronologic units. *Stratigraphy*, 6: 90–92.
- VAN KANENDONK, M. J. 2012. A chronostratigraphic division of the Precambrian: Possibilities and challenges. In: Gradstein, F.M., Ogg, J.G., Schmitz, M.D., and Ogg, G. *The geologic time scale 2012, volume 1*, 299–392. Amsterdam: Elsevier.
- WALSH, S. L., 2001. Notes on geochronologic and chronostratigraphic units. *Geological Society of America, Bulletin*, 113: 704–713.
- WATERS, C. N., ZALASIEWICZ, J. A., WILLIAMS, M, ELLIS, M. A., and SNELLING, A. M., 2014. A stratigraphical basis for the Anthropocene. In: Eds. Waters, C.N., Zalasiewicz, J.A., Williams, M., Ellis, M.A. and Snelling, A.M. 321 pages. Eds, London: The Geological Society, Special Publication 395: 1-21.
- ZALASIEWICZ, J., SMITH, A., BRENCHLEY, P., EVANS, J., KNOX, R., RILEY, N., GALE, A., GREGORY, J. F., RUSHTON, A., GIBBARD, P., HESSELBO, S., MARSHALL, J., OATES, M., RAWSON, P., and TREWIN, N., 2004. Simplifying the stratigraphy of time. *Geology*, 32: 1–4.
- R. Michael Easton, Octavian Catuneanu, Art D. Donovan; Richard H. Fluegeman; A.P. (Tony) Hamblin, Howard Harper, Norman P. Lasca, Jared R. Morrow, Randall C. Orndorff, Peter Sadler, Robert W. Scott; Berry H (Nick) Tew  
Vice Chairmen-Secretaries 2003-2013

## APPENDIX 1

### RESOLUTION OF THE NORTH AMERICAN COMMISSION ON STRATIGRAPHIC NOMENCLATURE

Approved by Unanimous Vote of the Commission, October 8, 2009

WHEREAS, the purposes of the North American Commission on Stratigraphic Nomenclature (NACSN) are to develop statements of stratigraphic principles, to recommend procedures applicable to classification and nomenclature of stratigraphic and related units, to review problems in classifying and naming stratigraphic and related units, and to formulate expressions of judgment thereon; and,

WHEREAS, the promotion of unambiguous communication in stratigraphy and geoscience is an explicit goal of NACSN; and,

WHEREAS, NACSN includes representation from the American Association of Petroleum Geologists (AAPG), the Association of American State Geologists (AASG), the Geological Society of America (GSA), the United States Geological Survey (USGS), the Geological Survey of Canada (GSC), the Canadian Society of Petroleum Geologists (CSPG), the Geological Association of Canada, the Instituto de Geología de la Universidad Nacional Autónoma de México, the Society for Sedimentary Geology (SEPM), the Asociación Mexicana de Geólogos Petroleros, the Sociedad Geológica de México, and the Servicio Geológico Mexicano, as well as Commissioners-at-Large representing various sectors of the geological and stratigraphic community; and,

WHEREAS, Article 13(c) of the North American Stratigraphic Code (Code) (1983, 2005) states that:

“The age of a stratigraphic unit or the time of a geologic event, as commonly determined by numerical dating or by reference to a calibrated time-scale, may be expressed in years before the present. The unit of time is the modern year as presently recognized worldwide. Recommended (but not mandatory) abbreviations for such ages are SI (International System of Units) multipliers coupled with “a” for annum: ka, Ma, and Ga for kilo-annum (10<sup>3</sup> years), Mega-annum (10<sup>6</sup> years), and Giga-annum (10<sup>9</sup> years), respectively. Use of these terms after the age value follows the convention established in the field of C-14 dating. The “present” refers to 1950 AD, and such qualifiers as “ago” or “before the present” are omitted after the value because measurement of the duration from the present to the past is implicit in the designation. In contrast, the duration of a remote interval of geologic time, as a number of years, should not be expressed by the same symbols. Abbreviations for numbers of years, without reference to the present, are informal (e.g., y or yr for years; my, m.y., or m.yr. for millions of years; and so forth, as preference dictates). For example, boundaries of the Late Cretaceous Epoch currently are calibrated at 63 Ma and 96 Ma, but the interval of time represented by this epoch is 33 m.y.”; and,

WHEREAS, the concept of a specific point in time (datum) is distinct from the concept of duration; and the use of the abbreviations ka, Ma, and Ga for specific points in time before the present has been advocated not only by the Code, but also by the International Stratigraphic Guide (1994) and the Glossary of Geology (1987, 1997, 2005); and,

WHEREAS, the terms year, annum, or annus are not part of the

International System of Units (SI); and,

WHEREAS, no petition has come to NACSN since the 1983 publication of the Code suggesting changes to Article 13(c) regarding the above stated usage of abbreviations for dates and durations; and,

WHEREAS, the recent papers of Aubry (2009) and Aubry et al. (2009) (papers attached) have comprehensively reviewed the issues associated with dates and durations in geoscience and have made appropriate recommendations consistent with the Code, Guide, and Glossary; and,

WHEREAS, it is the position of NACSN that the use of Ga, Ma, ka for points in time before the present, together with suitable abbreviations (e.g., Gyr, Myr, kyr, yr as recommended by Aubry et al. (2009)) for durations is appropriate and should be allowed

NOW, THEREFORE, BE IT RESOLVED, that NACSN advocates that the abbreviations Ga, Ma, and ka should be used exclusively to express the age of stratigraphic units or points in time before the present (i.e., years ago); that durations be designated by appropriate abbreviations (e.g., Gyr, Myr, kyr, yr as recommended by Aubry et al. (2009)); that the editorial policies of geoscience journals and publications allow for this usage; and that the recommendations of Aubry et al. (2009) in these matters should be given due consideration for more formal adoption in appropriate venues.

#### References Cited

- AUBRY, M.-P., 2009. Thinking of deep time: *Stratigraphy*, v. 6, No. 2, p. 93–99.
- AUBRY, M.-P., VAN COUVERING, J.A., CHRISTIE-BLICK, N., LANDING, E., PRATT, B.R., OWEN, D.E., and FERRUSQUÍA-VILLAFRANCA, I., 2009. Terminology of geological time: Establishment of a community standard: *Stratigraphy*, 6: 100–105.
- BATES, R.L. and JACKSON, J.A., Editors, 1987. *Glossary of Geology, 3rd Edition*. Falls Church, VA: American Geological Institute, 788 p.
- JACKSON, J.A., Editor, 1997. *Glossary of Geology, 4th Edition*. Alexandria, VA: American Geological Institute, 769 p.
- NEUENDORF, K.K.E., MEHL, JR., J.P., and JACKSON, J.A., Editors, 2005. *Glossary of Geology, 5th Edition*, Alexandria, VA: American Geological Institute, 779 p.
- NORTH AMERICAN COMMISSION ON STRATIGRAPHIC NOMENCLATURE, 1983. North American Stratigraphic Code: American Association of Petroleum Geologists Bulletin, 67: 841–875.
- NORTH AMERICAN COMMISSION ON STRATIGRAPHIC NOMENCLATURE, 2005. North American Stratigraphic Code: American Association of Petroleum Geologists Bulletin, 89: 1547–1591.
- SALVADOR, A., Editor, 1994. *International Stratigraphic Guide: A Guide to Stratigraphic Classification, Terminology and Procedure, 2nd Edition*. Trondheim, Norway, and Boulder, CO: International Union of Geological Sciences, and Geological Society of America. 214 p.

**APPENDIX 2  
RESOLUTION OF THE NORTH AMERICAN  
COMMISSION ON STRATIGRAPHIC NOMENCLATURE**

**Approved by Unanimous Vote of the Commission, October 8,  
2009**

WHEREAS, Dr. Robert R. Jordan has faithfully served the North American Commission on Stratigraphic Nomenclature (NACSN) since 1978, a span of 31 years; and

WHEREAS, during this time, Dr. Jordan has served two terms as Chairman of NACSN; and

WHEREAS, Dr. Jordan served as Vice-Chairman (Secretary) for the duration of the production of the 1983 Code; and

WHEREAS, Dr. Jordan has recently completed a true labor of love in preparing a history of NACSN, which has recently been published as "Layer by Layer: An account of the North

American Commission on Stratigraphic Nomenclature," in *Stratigraphy*; and

WHEREAS, Dr. Jordan has made significant contributions not only to NACSN, but to the wider geoscience community, the science of geology, and society as a whole; and

WHEREAS, Dr. Jordan enjoys great respect and admiration among his NACSN colleagues, who value his wise counsel and understanding of the history, procedures, and protocols of NACSN.

NOW, THEREFORE, BE IT RESOLVED, that NACSN expresses deep gratitude to Dr. Robert R. Jordan for his many years of service and contribution; commends him on his outstanding scientific career; and wishes him well in all future endeavors. Further, NACSN desires to convey to Dr. Jordan that his fellowship, wise counsel, keen wit, and dedication to the mission and mandate of NACSN will be greatly missed by his fellow Commissioners.