

# North American Commission on Stratigraphic Nomenclature Note 70: Records of the Stratigraphic Commission 2014-2017

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## INTRODUCTION

NACSN (North American Commission on Stratigraphic Nomenclature) Note 70 is a summary of the activities of the Commission from October 2014–October 2017. This note is condensed from the minutes of the 69<sup>th</sup> through the 72<sup>nd</sup> meetings of the NACSN held in conjunction with the Annual Meetings of the Geological Society of America. The 69<sup>th</sup> meeting of the NACSN was held October 20, 2014, in Vancouver, British Columbia; the 70<sup>th</sup> meeting on November 2, 2015, in Baltimore, Maryland; the 71<sup>st</sup> meeting on September 26, 2016, in Denver, Colorado; and the 72<sup>nd</sup> meeting on October 23, 2017, in Seattle, Washington. Members of the NACSN who served as officers during the period 2014-2017 serve as co-authors of this note and are listed with their roles in Appendix A.

The mission of the NACSN is to develop statements of stratigraphic principles, recommend procedures applicable to the classification of nomenclature of stratigraphic units, review problems in classifying and naming stratigraphic and related units, and formulate expressions of judgement on these matters. Commissioners of the NACSN represent various geoscience professional organizations from Canada, Mexico, and the United States who have an interest in maintaining a stable stratigraphic nomenclature. Commissioners and their constituencies for 2014-2017 are listed in Appendix B.

NACSN Note 70 follows the format established in NACSN Note 66 (Easton et al. 2014). The activities of the NACSN are 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.

5. Commission Business.

Each of these categories forms a separate section of this report. Commission activities within each of the categories are summarized within each section.

## REVISIONS AND AMENDMENTS TO THE NORTH AMERICAN STRATIGRAPHIC CODE (NACSN, 2017)

### Introduction

A primary function of the NACSN is to ensure that the *North American Stratigraphic Code* (NACSN 2005), hereafter referred to as the Code, meets the current and emerging needs of the geoscience community. The Code is periodically revised in its entirety but this is a lengthy process spanning many years and is not adequate to deal with changing demands from new fields of stratigraphy. The Code may be amended as described in Article 21 (<https://ngmdb.usgs.gov/Info/NACSN/Code2/code2.html#Article21>). The NACSN undertakes the discussion of proposed amendments with the intent to approve those considered useful to the geoscience community. Not all issues raised will move toward approval as formal amendments but this note serves as a formal record of their discussion by the NACSN and their status. Items included in this section advanced past the initial discussion stage and are being studied by working groups or ad hoc committees. Other items in the initial stages of discussion are treated elsewhere in this note.

Below is a summary of the issues discussed during the 2014-2017 proceedings of the NACSN.

### **Revision of the North American Stratigraphic Code, Lithodemic Units, Article 37**

Discussion of the proposed revision of Article 37 of the Code to extend the term “complex” to include masses of intrusive rock consisting of multiple intrusive plutons, stocks, lopoliths, and dikes began in 2004 (Easton et al. 2014). In the intervening period between 2004 and 2016, the revision process moved forward including the formation of an ad hoc committee to study the feasibility and desirability of amending article 37 of the Code (Easton et al. 2014). During the 2014-2016 proceedings of the NACSN, the amendment process was completed. At the 2014 NACSN annual meeting in Vancouver, the ad hoc committee (Robert M. Easton, Lucy E. Edwards, Randall C. Orndorff, Manuel Duguet, and Ismael Ferrusquía-Villafranca) distributed a draft of the manuscript containing the proposed amendment to the Code. The NACSN authorized the ad hoc committee to submit the final version of the manuscript to *Stratigraphy* for publication as an NACSN Note for consideration and comment by the geoscience community. French and Spanish translations were prepared and published as a part of the note. The NACSN recommended that all commission organizations send out a notice with a link to the draft to ensure wide circulation.

The proposed amendment was published in *Stratigraphy* volume 12, pages 39-45 as NACSN Note 67 (Easton et al. 2015). The paper was distributed to the commissioners at the NACSN annual meeting in Baltimore. Comments were invited from the NACSN and the geoscience community at large. NACSN Note 67 was published “open-access” to ensure the widest possible distribution. Commissioner Easton distributed print copies of NACSN Note 67 at Strati 2015, the 2<sup>nd</sup> International Congress on Stratigraphy held in Graz, Austria, July 2015. An item about the proposed revision to the Code was also submitted to the *GSA Forum* for general comments by the broader geoscience community. One comment was received.

At the 2016 NACSN annual meeting in Denver, the NACSN discussed the proposed amendment and voted unanimously to approve the amendment to the North American Stratigraphic Code Lithodemic Units Article 37 as outlined in NACSN Note 67 (Easton et al. 2015). The amendment was published as NACSN Report 12 in *Stratigraphy* (Easton et al. 2016).

### **Proposed Standardization/Codification of Sequence Stratigraphic Units**

At the 2014 annual meeting in Vancouver, a discussion was held on the desirability and feasibility of standardizing the units of sequence stratigraphy in the Code. The Commission noted that there is a varied, sometimes conflicting nomenclature regarding surfaces and systems tracts in sequence stratigraphic studies. Numerous sequence stratigraphic units exist in the stratigraphic literature but all of them remain informal. Although the Commission agreed that any formal sequence stratigraphic units defined by the Code would be material stratigraphic units (NACSN 2005), what the fundamental units would be or what hierarchy of units could be established is not clear. The commissioners concluded that the standardization/codification of sequence stratigraphic units was premature. A working group was not established although this may be revisited in the future. Geoscientists seeking guidance on the concepts, nomenclature, and applications of sequence stratigraphy are referred to Catuneanu et al. (2011).

### **Proposed Formalization of “Subseries” as Chronostratigraphic Units in the North American Stratigraphic Code**

A discussion was begun at the 70<sup>th</sup> annual meeting of the NACSN in Baltimore about the need and desirability of formalizing the rank of “subseries” in the Code. This discussion followed on an open forum at the 2<sup>nd</sup> International Congress on Stratigraphy (Strati 2015) held in Graz, Austria regarding whether subseries should be formalized in the International Stratigraphic Guide (Salvador 1994). The NACSN concurred that not all users of chronostratigraphic units are stratigraphers and formalization would provide guidance to geoscientists and editors of journals. The NACSN also concurred that the use of subseries would be optional and that individual subcommissions could decide as to whether or not the term was useful for their systems. A working group to study the formalization of subseries was established. Commissioners Edwards, Aubry, Brett, and Landing agreed to serve.

At the 71<sup>st</sup> annual meeting of NACSN, Commissioner Aubry reported on the working group studying the formalization of subseries. She reported that a subset of the International Stratigraphic Commission (ICS) had conducted a vote on the formalization of subseries. This vote required a supermajority in favor (60%) to pass. The vote received 59.5% in favor and accordingly did not pass. She noted that Quaternary and Neogene stratigraphers were in favor of using formal subseries while Paleogene stratigraphers were not. Commissioner Edwards stated that the question becomes whether the NACSN should begin the procedure to formally amend the Code with regard to subseries. Commissioner Brett added that substage formalization could also be a part of the discussion. An ad hoc committee of Commissioners Aubry, Fluegeman, and Brett was appointed to form a proposal to circulate two months in advance of next year’s meeting.

At the 72<sup>nd</sup> annual meeting discussion continued on the inclusion of subseries within the Code. The NACSN decided to table further discussion until the 73<sup>rd</sup> meeting. A proposal to make subseries formal stratigraphic units was published as NACSN Note 69 (Aubry et al. 2018).

### **Formalization/Standardization of Chemostratigraphic Units**

During open discussion on future directions of NACSN held at the 69<sup>th</sup> annual meeting in Vancouver, the NACSN concurred that chemostratigraphy is missing from the Code. Chemostratigraphy is a relatively new discipline of stratigraphy and much of the literature focuses on methods and the correlation of phenomena with global events. While some local and regional correlations have been made, there is no standardization in the use of nomenclature. The NACSN agreed to put this item on the agenda for 2015.

At the 70<sup>th</sup> annual meeting in Baltimore, a discussion on chemostratigraphy was held. The NACSN agreed that more information was needed from chemostratigraphers. Commissioner Brett agreed to reach out to chemostratigraphers and report back to the NACSN at the following year’s meeting.

Commissioner Brett reported to the NACSN at the 71<sup>st</sup> annual meeting in Denver that there was a need for the establishment of a working group to study the possible formalization/standardization of chemostratigraphic units. Commissioners Brett, Fluegeman, and Pratt agreed to be on the Chemostratigraphy

Working Group. Commissioner Brett noted that Weissert et al. (2008) was a good overview of chemostratigraphy. The commissioners concurred that an NACSN sponsored topical session be proposed for the 2017 GSA Annual Meeting in Seattle, Washington. Commissioners Fluegeman, Brett, and Pratt agreed to be co-organizers of the session. In addition to sponsorship by the NACSN, SEPM sponsorship would be sought. This session was proposed and accepted as a poster session.

At the 72<sup>nd</sup> Annual Meeting of the NACSN held in Seattle, discussion of chemostratigraphic units continued from the previous meeting. The poster session “Chemostratigraphy: Environments, Correlation, and Time” demonstrated to the conveners that there is a great deal of interest in chemostratigraphy. This session attracted 17 poster presentations dealing with some aspect of chemostratigraphy. Although the poster session captured a wide interest among stratigraphers in chemostratigraphy, the topic remains a diverse discipline with little consistency in nomenclature. Terms such as “excursion” and “spike” are widely applied to the rock record but may represent physical units to some workers and temporal events to others. Commissioners Scott and Finney remarked on the emphasis on chemostratigraphy among Cretaceous stratigraphers but indicated the use of terms was inconsistent. Commissioner Fluegeman noted the lack of consistency in the literature with some workers recognizing short term spikes occurring within excursions and others identifying spikes as excursions.

A discussion followed with diverse views on the formal definition of chemostratigraphic units. This discussion during the 72<sup>nd</sup> annual meeting concluded with an intent to continue the discussion at the 73<sup>rd</sup> meeting and to consider whether the NACSN should proceed toward codifying chemostratigraphic units in the North American Stratigraphic Code.

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

Easton et al. (2014) discussed a proposed revision in Articles 25, 26, and 30 of the Code to create a new rank of lithostratigraphic unit: the Submember. This process was initiated in 2005 but by 2013, the period of NACSN proceedings covered by NACSN Note 66 (Easton et al. 2014) no proposal had been made.

Renewed interest in this proposed revision was evident at the 71<sup>st</sup> annual meeting of the NACSN in Denver. Commissioner Brett stated that submembers are needed, because at present, only beds are listed below members in the lithostratigraphic hierarchy. In his experience, there are named beds that would be placed within formal submembers if allowed. An ad hoc committee consisting of Commissioners Brett, Landing, and Pratt was appointed to report to the NACSN at the 72<sup>nd</sup> annual meeting in Seattle, October 23<sup>rd</sup>, 2017. The ad hoc committee could investigate the feasibility of subgroups if so desired.

A proposal for the formalization of submembers was developed by the ad hoc committee and was introduced for a vote at the 72<sup>nd</sup> annual meeting of NACSN in Seattle. The discussion among the commissioners was supportive and the proposal was unanimously approved. Details of the proposal were presented by Brett et al. (2018) and comments solicited by the NACSN from the geoscience community.

### **Proposed Revision to Biostratigraphic Units Article 54, Remark (c)**

At the 72<sup>nd</sup> meeting, a proposal by Commissioner Landing (presented by Commissioner Brett) was considered. It sought the change of one word in Article 54c of the Code: “If the concept of a particular biozone or subbiozone is substantially modified, a new unique designation is **desirable**.” to: “If the concept of a particular biozone or subbiozone is substantially modified, a new unique designation is **required**.”

Chair Edwards pointed out that the 1983 version of the Code originally stated “required” but when the Code was revised, the NACSN decided that this issue needed some flexibility. After brief comments from various Commissioners, a formal motion was made. As there was no second to this motion, the motion died and no vote was taken. Fellow commissioners expressed their appreciation for Commissioner Landing’s attention to the subject in detail.

## **INTERACTION WITH OTHER ORGANIZATIONS**

### **American Geosciences Institute**

The NACSN is a member society of the American Geosciences Institute (AGI). Commissioners regularly attend AGI member society meetings and report back to the NACSN. Details of the AGI proceedings can be found at the AGI website: <https://americangeosciences.org>.

At the 71<sup>st</sup> meeting of the NACSN, Commissioner Lasca reported that the AGI had spent a significant amount of time discussing harassment in the workplace. A survey sponsored by the AGI reported that more than 40% of women reported harassment in the office, in the field, and at meetings. The AGI determined that an explicit code of conduct regarding harassment is needed. As a member society of AGI, any policy statements will be brought forward to the NACSN. At the 72<sup>nd</sup> meeting of the NACSN, Commissioner Lasca noted that the Code of Conduct was nearly complete and that it would be circulated to members of the NACSN for comments.

The AGI also discussed the issues of Geo-ethics and open access publication, which are of concern to the NACSN. The Commission will monitor these issues for future developments.

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

Commissioners of the NACSN have served on the International Commission on Stratigraphy (ICS) during the 2014-2017 period. Commissioner Finney served as Chair of the ICS through 2017. Also during the 2014-2017 period, Commissioner Brett served as the vice-chair of the Devonian subcommission, a Titular Member of the Silurian subcommission, and a corresponding member of the Ordovician subcommission. The 2<sup>nd</sup> International Congress on Stratigraphy, Strati 2015 was held in Graz, Austria. Several NACSN commissioners (Aubry, Edwards, Finney, Fluegeman, and Harper) were participants. The third congress (Strati 2019) was held in Milano, Italy, in July 2019.

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

The International Subcommission on Stratigraphic Classification (ISSC) is the international counterpart of the NACSN. During the 2014-2017 period, Commissioner Pratt served as Chair through August 2016, and is currently serving as Vice-Chair along with Commissioner Fluegeman. The ISSC has sponsored a series of

review papers in the journal *International Newsletters on Stratigraphy*, and NACSN commissioners have been involved in this project. These papers provide insight into the various subdisciplines of stratigraphy and are designed to be accessible to students. Commissioner Catuneanu was the lead author on the paper on sequence stratigraphy (Catuneanu et al. 2011). Commissioner Pratt is taking the lead on the paper on lithostratigraphy and Commissioner Fluegeman is organizing the paper on biostratigraphy.

The ISSC will eventually be engaged with the development of a revised *International Stratigraphic Guide* but this is something for the future. The completion of review papers for chronostratigraphy, lithostratigraphy, and biostratigraphy will move this effort forward. Members of the ISSC have been invited to attend NACSN meetings as guests; Werner Piller, Chair of the ISSC, has been a regular attendee.

#### **DISCUSSION OF ISSUES RELATED TO STRATIGRAPHY, CHRONOSTRATIGRAPHY, AND GEOLOGIC TIME SCALES – The Anthropocene**

During the 2014-2017 period, the topic of the “Anthropocene epoch” was extensively discussed by the NACSN. Most of the discussions concerned the potential recognition of the Anthropocene as a chronostratigraphic unit. The formation in 2009 of an Anthropocene Working Group of the International Commission on Stratigraphy raised concerns among the commissioners of the NACSN.

Commissioner Edwards co-authored a note in *Nature* (Edwards et al. 2017) responding to a call by Ellis et al. (2016) for social scientist involvement in defining the Anthropocene, specifically the statement “Earth sciences long ago moved away from defining precise stratigraphic boundaries to developing records of continuous change” (*Nature* 540, 192-193, 2016). Edwards et al. (2017) strongly disagreed with that statement and the NACSN expressed support for this position as well at the 2017 meeting.

No action was taken regarding the Anthropocene as the matter is considered beyond the jurisdiction of the NACSN. Future discussions are anticipated as actions taken by the Anthropocene Working Group may ultimately affect the Code.

#### **OUTREACH ACTIVITIES RELATED TO THE DISCUSSION AND PROMOTION OF THE SCIENCE OF STRATIGRAPHY AND THE APPLICATION OF THE NORTH AMERICAN STRATIGRAPHIC CODE**

##### **Outreach to Latin American Geoscience Societies**

The NACSN began an exploratory effort (November 2015) to determine whether the development of a unified Stratigraphic Code would be applicable throughout North and South America. These efforts were led by Commissioner Ferrusquía-Villafranca and included direct contacts and a letter from the Chair of the NACSN to the President of the Association of Ibero-American Geological and Mining Surveys expressing the interest of the NACSN in working together on such a project. As of December 2019, no response has been received.

The NACSN expressed an interest in Cuban representation on the NACSN. Commissioner Fluegeman made initial contact (with Manuel Iturralde-Vinent of the Museo Nacional de Historia Natural) in 2016 and there was interest. Logistical difficulties with travel between the United States and Cuba after

2017 have made Cuban participation unlikely for the near future.

#### **Sponsorship of Sessions at Meetings of Partner Organizations**

In order to further the science of stratigraphy, the NACSN regularly sponsors and co-sponsors technical sessions at national and international meetings. These sessions provide visibility for the NACSN but also provide information of current topics of action and discussion within the commission. During 2014-2017, NACSN was the primary sponsor of the following technical session:

Geological Society of America Annual Meeting 2017 in Seattle:

*Chemostratigraphy: Environments, Correlation, and Time (Posters)*

Additionally, the NACSN proposed at its 2017 meeting to sponsor a technical session on Integrated Biostratigraphy at the 2018 Geological Society of America Annual Meeting in Indianapolis.

#### **COMMISSION BUSINESS**

Records of the North American Commission of Stratigraphic Nomenclature

The website of the NACSN contains records of past meetings, links to publications, a current roster of commissioners, and a link to the most current edition of the North American Stratigraphic Code. The website can be found at:

<http://nacs.n.americangeosciences.org>

The website also provides access to NACSN archives.

#### **ACKNOWLEDGMENTS**

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## APPENDIX A

List of Officers of the North American Commission of Stratigraphic Nomenclature 2014–2017

2014

Chair: Richard H. Fluegeman  
Vice-Chair: Howard Harper

2015

Chair: Richard H. Fluegeman  
Vice-Chair: Frank Brunton

2016

Chair: Frank Brunton  
Vice-Chair: Lucy E. Edwards

2017

Chair: Lucy E. Edwards  
Vice-Chair: Carlton E. Brett

## APPENDIX B

### List of Commissioners of the North American Commission of Stratigraphic Nomenclature

2014–2017 with their constituencies and terms served

#### *American Association of Petroleum Geologists*

Art Donovan (2011–2014)  
Donald E. Owen (2012–2015)  
Robert W. Scott (2012–2015; 2015–2018)

#### *Association of American State Geologists*

John Steinmetz (2012–2015)  
Berry H. (Nick) Tew (2012–2015)  
David Wunsch (2011–2014)  
Matt Joeckel (2017–2020)

#### *Geological Society of America*

Frank R. Ettensohn (2012–2015)  
Bridget S. Wade (2011–2014)  
Carlton E. Brett (2014–2017)  
Shanan Peters (2015–2018)  
William A. Berggren (2016–2019)  
Marieke Dechesne (2017–2020)

#### *U.S. Geological Survey*

Lucy E. Edwards (2013–2016; 2016–2019)  
David S. Fullerton (2011–2014)  
Randall C. Orndorff (2012–2015; 2015–2018)  
Julie A. Herrick (2017–2020)

#### *Geological Survey of Canada*

Robert G. Anderson (2013–2016)  
A.P. (Tony) Hamblin (2012–2015)  
Robert MacNaughton (2016–2019)  
Jim Haggart (2015–2018)  
Rob Rainbird (2011–2014)  
Rod Smith (2015–2018)

#### *Canadian Society of Petroleum Geologists*

Octavian Catuneanu (2011–2015)  
Brian R. Pratt (2012–2015; 2015–2018)

#### *Geological Association of Canada*

Robert M. Easton (2011–2014; 2014–2017)  
Frank Brunton (2013–2016)  
John Johnston (2017–2020)

#### *Instituto de Geología de la Universidad Nacional Autónoma de México*

Elizabeth Solliero Rebolledo (2013–2016)  
Ricardo Barragán Manzo (2017–2020)

#### *SEPM Society for Sedimentary Geology*

Marie-Pierre J. Aubry (2012–2015; 2015–2018)  
Howard Harper (2013–2016; 2016–2019)

#### *Asociación Mexicana de Geólogos Petroleros*

Hilarión Sánchez Hernández (2017–2020)

#### *Sociedad Geológica de México*

M. C. Emiliano Campos Madrigal (2013–2016)  
René Alejandro Téllez Flores (2016–2019)

***Servicio Geológica Mexicano***

Natalia Amezcua Torres (2013–2016)  
Rosario Isabel López-Palomino (2012–2015; 2017–2020)

***Commissioners-at-Large***

John A. Van Couvering (2013–2016)  
Norman P. Lasca (2012–2015; 2015–2019)  
Ismael Ferrusquía-Villafranca (2013–2016; 2016–2019)  
Stanley C. Finney (2012–2015; 2015–2018)  
Richard H. Fluegeman (2013–2016; 2016–2019)  
Thomas W. Dignes (2016–2019)