



International Commission on Stratigraphy

ANNUAL REPORT 2020

1. TITLE OF CONSTITUENT BODY

The International Commission on Stratigraphy (ICS)

Summary and compilation of subcommission reports submitted jointly by:

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2. OVERALL OBJECTIVES AND FIT WITHIN IUGS SCIENCE POLICY

Objectives

The International Commission on Stratigraphy (ICS) is a body of expert stratigraphers founded for the purpose of promoting and coordinating long-term international cooperation and establishing standards in stratigraphy. Its principal objectives are:

- (a) Establishment and publication of a standard global stratigraphic time scale and the preparation and publication of global correlation charts, with explanatory notes.
- (b) Compilation and maintenance of a stratigraphic database centre for the global earth sciences.
- (c) Unification of regional chronostratigraphic nomenclature by organizing and documenting stratigraphic units on a global database.
- (d) Promotion of education in stratigraphic methods, and the dissemination of stratigraphic knowledge.
- (e) Evaluation of new stratigraphic methods and their integration into a multidisciplinary stratigraphy.
- (f) Definition of principles of stratigraphic classification, terminology and procedure and their publication in guides and glossaries.

Fit within IUGS Science Policy

The objectives satisfy the IUGS mandates of:

- Fostering international agreement on nomenclature and classification in stratigraphy.
- Facilitating international co-operation in geological research.

- Improving publication, dissemination, and use of geological information internationally.
- Encouraging new relationships between and among disciplines of science that relate to geology worldwide.
- Attracting competent students and research workers to the discipline.
- Fostering an increased awareness among individual scientists worldwide of what related programmes are being undertaken.

In particular, the current objectives of ICS relate to three main aspects of IUGS policy:

- (a) Development of an internationally agreed scale of chronostratigraphic units, fully defined by Global Stratotype Sections and Points (GSSPs) where appropriate and related to a hierarchy of units to maximize resolution throughout geological time.
- (b) Promotion of international consensus on stratigraphic classification and terminology, which is essential for advancement of earth-science research and education.
- (c) Establishment of frameworks and systems to encourage international collaboration in understanding the evolution of the Earth.

3. ORGANISATION

ICS is organised in two types of constituent bodies: Subcommissions for longer-term study, and Executive Task Groups (working groups) for more limited, shorter-term tasks. ICS is managed by the Executive Committee, which consists of elected and appointed officers. The current structure of ICS consists of the Executive Committee of three voting and three non-voting members, and 17 Subcommissions that deal with the major chronostratigraphic units and aspects of stratigraphic classification. The ICS Executive has initiated a new Executive ex-officio position of Treasurer and appointed a new webmaster. The webmaster is revising the ICS website and transferring the webpages of the subcommissions to the main ICS site. International Subcommission on Timescale Calibration (ISTC) is now in operation under the leadership of Dr Brad Cramer.

Subcommissions:

Quaternary
 Neogene
 Paleogene
 Cretaceous
 Jurassic
 Triassic
 Permian
 Carboniferous
 Devonian
 Silurian
 Ordovician
 Cambrian
 Ediacaran
 Cryogenian
 Pre-Cryogenian
 Stratigraphic Classification
 Timescale Calibration

- (a) Establishment and publication of a standard global stratigraphic time scale and the preparation and publication of global correlation charts, with explanatory notes.
- (b) Compilation and maintenance of a stratigraphic database centre for the global earth sciences.
- (c) Unification of regional chronostratigraphic nomenclature by organizing and documenting stratigraphic units on a global database.
- (d) Promotion of education in stratigraphic methods, and the dissemination of stratigraphic knowledge.

INTERNATIONAL UNION OF GEOLOGICAL SCIENCES

The reports of each Subcommittee are appended to this ICS summary compilation. The ICS subcommittees together include approximately 350 titular members. When the corresponding members of Subcommittees are added, several thousand stratigraphers worldwide participate in the activities of ICS, and several thousand more over the 60-year history of ICS. In addition, ICS maintains contacts with many national stratigraphic committees. The members of the Full Commission (i.e. the 3 voting members and 3 non-voting members of the Executive, and the chairs of the 17 Subcommittees) represent 12 countries: United Kingdom (5 members), Canada (1), Italy (2), USA (2), China (4), Sweden (2), France (1), Netherlands (1), Spain (1), Austria (1), Australia (1) and Czechia (2). Among all subcommittee officers and the ICS executive, 18 countries are represented: United Kingdom (7 members), Canada (3), USA (7), China (11), Italy (7), Australia (1), Spain (3), Poland (2), Russia (1), Czech Republic (2), France (3), Belgium (1), Germany (3), Brazil (3), Sweden (2), Austria (2) and Norway (1). The voting members of ICS, i.e. all voting members of all subcommittees who replied to our request to report include officers, represent over 42 countries: USA (69), China (38), United Kingdom (25), Ireland (1), Russia (29), Canada (15), Germany (24), Italy (25), Australia (12), Spain (8), France (11), Japan (9), New Zealand (4), Argentina (3), Belgium (8), Netherlands (7), Brazil (10), Poland (10), Czech Republic (5), Denmark (3), Sweden (8), Switzerland (5), United Arab Emirates (1), Hungary (2), India (4), South Africa (3), Austria (4), Slovenia (1), Tunisia (1), Swaziland (1), Estonia (2), Finland (3), Iran (2), Jordan (1), Korea (1), Mexico (1), Croatia (1), Algeria (1), Namibia (1), Greece (1), Turkey (1) and Columbia (1). The ICS is proud of its gender equality across all the subcommittees. ICS and its subcommittees maintain their own websites; the URLs of the websites are as follows (currently subject to revision*):

Websites:

ICS main site:	www.stratigraphy.org
Quaternary:	www.quaternary.stratigraphy.org
Neogene:	www.geo.uu.nl/SNS
Paleogene:	wzar.unizar.es/isps/
Cretaceous:	www.univ-brest.fr/geoscience/?ISCS/
Jurassic:	www.jurassic.stratigraphy.org
Triassic:	paleo.cortland.edu/sts/
Permian (newsletter):	www.permian.stratigraphy.org
Carboniferous	www.stratigraphy.org/carboniferous/
Devonian:	www.unica.it/sds/
Silurian:	www.silurian.stratigraphy.org

Ordovician:	www.ordovician.stratigraphy.org
Cambrian:	www.palaeontology.geo.uu.se/ISCS/ISCS_home.html
Ediacaran:	www.paleo.geos.vt.edu/Ediacaran/
Cryogenian:	being established
Precambrian:	www.precambrian.stratigraphy.org
Stratigraphic Classification:	issc.uni-graz.at/
Timescale calibration	being established

*As noted above these sites are in the process of being incorporated into the main ICS website. It is hoped that this will be completed by next year.

3a. ICS Executive Officers for 2020-2024:

Chair: David Harper (Durham, England)

Vice-Chair: Shuzhong Shen (Nanjing, China)

Secretary General: Philip Gibbard (Cambridge, England)

Non-voting officers:

Information Officer: Nicholas Car (Brisbane, Australia)

Graphics Officer: Kim Cohen (Utrecht, Netherlands)

Treasurer: Stuart Jones (Durham, England)

ICS Subcommission officers:

A full listing of current officers (with addresses) is at the end of this main ICS report. The individual subcommission reports include a listing of all voting members (typically *c.* 20 in each subcommission).

4. EXTENT OF NATIONAL/REGIONAL/GLOBAL SUPPORT FROM SOURCES OTHER THAN IUGS

Few of the subcommissions have formal financial contributions from external sources other than IUGS (through ICS), and they are very limited and listed in the individual reports. Some activities that are associated with ICS goals, such as distributing charts of the Geological Time Scale and placing this information onto public websites, have received some minimal support from private companies and professional organisations. Informally, every officer and member of ICS donates their own time, office space, institutional facilities, and other components to the activities of the organization. No officer nor executive receives any salary compensation from IUGS or other ICS funds. Indeed, most officers personally contribute towards their own travel and operational expenses.

5. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

Active and highly fruitful interfaces with many international organisations and geo-projects are a standard feature of ICS activities. ICS maintains a strong link with the International Quaternary Association (INQUA) Commission on Stratigraphy regarding the stratigraphy of the Quaternary, and with the Commission for the Geological Map of the World (CGMW) in Paris regarding standardisation of

chronostratigraphy and its colour scheme on charts, as well as producing the ICS International Chronostratigraphic Chart. In addition, ICS is collaborating with the IUGS Commission on Geoscience Information (CGI) as it develops GeoSciML as an interchange format for geoscience data. ICS subcommissions are traditionally affiliated with a considerable number of IUGS and IGCP activities. For example, ICS members lead or participate or have participated in numerous, active IGCP projects and others serve on IGCP national committees and the scientific board. ICS members maintains active links with international research groups, including The Micropalaeontology Society (TMS), the North American Micropaleontology Society (NAMS), International Nannoplankton Association (INA) and the Association of American Stratigraphic Palynologists (AASP), and international palaeontological research groups on Graptolites, Conodonts, Ammonites, Radiolarians (Interrad), Nannofossils, Foraminifers, etc., and many ICS members serve on national stratigraphic commissions and as editors of journals. There are close links between many ICS stratigraphers and the International Ocean Drilling Project (IODP). ODP cores routinely test the global correlation potential of a great number of bio-events since the Jurassic, and this record is vital to develop integrated timescales at several scales of resolution, and global palaeo-climate models. The designation of GSSPs necessitates close interaction with local and international groups concerned with conservation, such as UNESCO (Geoparks Programme), IUGS (Geosites Programme) and ProGEO (Geosites and Geoparks initiatives).

6. CHRONOSTRATIGRAPHIC STAGE AND SERIES NAMES AND DEFINITIONS ESTABLISHED IN ICS

Quaternary:

- Base Meghalayan Stage (=Base Upper Holocene Subseries)
- Base Northgrippian Stage (=Base Middle Holocene Subseries)
- Base Greenlandian Stage (=Base Lower Holocene Subseries)
- Base Holocene Series
- Base of Lower and Upper Pleistocene Subseries
- Base Chibanian Stage (= base Middle Pleistocene Subseries)
- Base Calabrian Stage
- Base Gelasian Stage (= Base Pleistocene Series and Base Quaternary System)

Neogene:

- Base Piacenzian Stage
- Base Zanclean Stage (= Base Pliocene Series)
- Base Messinian Stage
- Base Tortonian Stage
- Base Serravallian Stage
- Base Aquitanian Stage (= Base Miocene Series and Base Neogene System)

Paleogene:

- Base Chattian Stage
- Base Rupelian Stage (= Base Oligocene Series)
- Base Priabonian Stage
- Base Lutetian Stage
- Base Ypresian Stage (= Base Eocene Series)
- Base Thanetian Stage
- Base Selandian Stage
- Base Danian Stage (= Base Paleocene Series and Base Paleogene System)

Cretaceous:

Base Maastrichtian Stage
 Base Santonian Stage
 Base Turonian Stage
 Base Cenomanian Stage (=Base Upper Cretaceous Series and Base Cretaceous System)
 Base Hauterivian Stage

Jurassic:
 Base Kimmeridgian Stage*
 Base Bathonian Stage
 Base Bajocian Stage
 Base Aalenian Stage (= Base of Middle Jurassic Series)
 Base Toarcian Stage
 Base Pliensbachian Stage
 Base Sinemurian Stage
 Base Hettangian Stage (= Base Lower Jurassic System and Base Jurassic Series)

Triassic:
 Base Carnian Stage (= Base Upper Triassic System)
 Base Ladinian Stage
 Base Induan Stage (= Base Triassic System)

Permian:
 Base Changhsingian Stage
 Base Wuchiapingian Stage (= Base Lopingian Series)
 Base Capitanian Stage
 Base Wordian Stage
 Base Roadian Stage (= Base Guadalupian Series)
 Base Sakmarian Stage
 Base Asselian Stage (= Base Cisuralian Series and Base Permian System)

Carboniferous:
 Base of Bashkirian Stage (= Base Lower Pennsylvanian Series and Base Pennsylvanian Subsystem)
 Base Viséan Stage
 Base Tournaisian Stage (= Base Lower Mississippian Series and Base Mississippian Subsystem and Base Carboniferous System)

Devonian:
 Base Famennian Stage
 Base Frasnian Stage (= Base Upper Devonian Series)
 Base Givetian Stage
 Base Eifelian Stage (= Base Middle Devonian Series)
 Base Emsian Stage
 Base Pragian Stage
 Base Lochkovian Stage (= Base Lower Devonian Series and Base Devonian System)

Silurian:
 Base Pridoli Series
 Base Ludfordian Stage
 Base Gorstian Stage (= Base Ludlow Series)
 Base Homerian Stage
 Base Sheinwoodian Stage (= Base Wenlock Series)
 Base Telychian Stage
 Base Aeronian Stage
 Base Rhuddanian Stage (= Base Llandovery Series and Base Silurian System)

Ordovician:
 Base Hirnantian Stage

Base Katian Stage
Base Sandbian Stage (= Base Upper Ordovician Series)
Base Darriwilian Stage
Base Dapingian Stage (= Base Middle Ordovician Series)
Base Floian Stage
Base Tremadocian Stage (= Base Lower Ordovician Series and Base Ordovician System)

Cambrian:

Base Jiangshanian Stage
Base Paibian Stage (= Base Furongian Series)
Base Guzhangian Stage
Base Drumian Stage
Base Wuliuan Stage (= Base Miaolingian Series)
Name Terreneuvian Series
Base Fortunian Stage (= Base Terreneuvian Series and Base Cambrian System)

Neoproterozoic:

Base Ediacaran System

* in process of ratification at time of writing.

7. CHIEF ACCOMPLISHMENTS IN 2020

Full commission

- The 2020 version of ICS Chronostratigraphic Chart, which includes revised numerical ages, was posted on the ICS website (there were about 3 versions of the chart in 2020). A special version was prepared for circulation to all participants at the IGC in Delhi. In addition a new interactive chart was added to the website and the iPhone timescale app was updated.
- Several authors, university teachers and other educators and professional societies were granted permission to use and reproduce the ICS International Chronostratigraphic Chart in their productions.
- The GSSP for the base of the Pleistocene Chibanian Stage and the Lower, Middle and Upper Pleistocene substages, the Cretaceous Hauterivian Stage and the Eocene Priabonian Stage, were ratified by IUGS. They are the process of publication.
- A change in the status of the term Precambrian has been agreed last year by the ICS resulted in the Precambrian Subcommittee being named the Precryogenian Subcommittee in order to clarify the responsibilities of the subcommissions.
- The GSSPs for the base of the Jurassic Kimmeridgian Stage is currently being evaluated.

Quaternary Subcommittee.

- Approval and ratification of the Chibanian Stage and Middle Pleistocene Subseries by GSSP at the Chiba section, Japan. It is now in press in *Episodes*.
- Ratification of the Lower/Early Pleistocene Subseries/Subepoch, comprising the Gelasian Stage/Age and the superjacent Calabrian Stage/Age, with a GSSP corresponding to that of the Gelasian Stage, the Pleistocene Series, and the Quaternary System; the Middle Pleistocene Subseries (see above); and the

Upper/Late Pleistocene, at the rank of subseries/subepoch, with a base currently undefined but provisionally dated at ~129 ka. This is now in press in *Episodes*, and a report on the latest developments has been submitted to the *INQUA Newsletter* (Zalasiewicz et al. *The Quaternary in the Geological Time Scale: An update*).

- Work on the Anthropocene continues. An article was published this year by Syvitski, J. *et al.* on the ‘Extraordinary human energy consumption and resultant geological impacts beginning around 1950 CE initiated the proposed Anthropocene Epoch’, in *Communications Earth & Environment* 1, 32, (doi.org/10.1038/s43247-020-00029-y).

Neogene Subcommission

- The ongoing discussion within the Langhian and Burdigalian GSSP Working Group (chair: Frits Hilgen) about the Langhian GSSP finally succeeded in finding a consensus on a proposal. The two possible GSSP sections considered were La Vedova section (Italy) and St. Peter’s Pool section (Malta), and the WG decided to have the Langhian GSSP defined at the top of C5Cn in the La Vedova section in Italy (Turco et al., 2017). Constructive discussions occurred during the last STRATI 2019 meeting in Italy (July 2019). Uncertainty related to the choice of calcareous plankton events associated with the top of C5Cn, and useful for the recognition of the Langhian base at low-latitudes, is still matter of debate. As an example, the taxonomic issues related to the *Praeorbulina* datum (the historical criterium for recognising Base of Langhian) are overt, as well as the low reliability for global correlation of the LCO *Helicosphaera ampliaperta*, an event proposed for the best one approximating the top of C5Cn in the Mediterranean. This problem led to the suggestion of an auxiliary boundary stratotype in a Pacific (I)ODP core, at the equivalent stratigraphic level, providing direct correlation to the open ocean benthic isotope record and low-latitude calcareous plankton events. The proposal for the Langhian GSSP is in preparation and will be submitted soon with the purpose of reaching a final decision within the SNS.
- The discussion on the definition Burdigalian GSSP is still open since till now no good candidate section (astronomically tuned deep marine section, possibly in the Mediterranean, that would guarantee the stratigraphic contiguity with the other GSSP sections) is available. The search for suitable sections for defining the Burdigalian GSSP will continue and the suggestion has been made by some members of the WG to consider the Contessa Section (Central Italy) as a possible candidate and this will be fully considered. However, recent reports from this section are not promising (Kashohm *et al.*, 2020, GSA Abstract). In the absence of suitable Mediterranean (or extra-Mediterranean) sections for defining the Burdigalian GSSP, the option to formally define this boundary in an IODP core will be seriously considered by SNS. This discussion will be the first major action item of the newly reconstituted SNS.

Paleogene Subcommission

- The proposal for the base of the Priabonian Stage (Agnini et al., 2020) was approved by ICS and ratified by IUGS. The primary marker for the GSSP coincides with the base of a prominent crystal tuff layer, the Tiziano bed, at 63.57 metre of the Alano section (NE Italy).

- In order to define the only remaining GSSP of the Paleogene, the ISPS has focused on studies dealing with the base of the Bartonian, including multidisciplinary analyses in Alum Bay section (Barton area in the UK) by Cotton *et al.* (2020), studies around the Lutetian-Bartonian transition in ocean drilling cores (Rivero-Cuesta *et al.*, 2019, 2020), and ongoing studies on the Italian Torrente Caravello (by Dinarés-Turell and colleagues) and Bottaccione sections (Coccioni *et al.*).
- Numerous studies have been carried out on the Paleogene successions of the Caucasus, the Baltic, East and West Russia pointing out the importance of this area for interregional correlation.

Cretaceous Subcommission

- Campanian GSSP. The Campanian Working group (WG) is moving rapidly towards submission of a recommended GSSP. The search for an appropriate GSSP has been greatly helped by publication of two detailed studies on the Bottaccione (Gubbio, Italy) locality, by members of the WG, which provide high-resolution data on which the proposal will be based (Miniati *et al.* 2020; Maron and Muttoni 2020). In addition, restudy of a previously proposed GSSP at Waxahachie in Texas, demonstrates for the first time the presence of a major hiatus in the succession (Gale *et al.* in press, 2020). This renders the locality inappropriate as a candidate GSSP. The WG has also worked on the provision of auxiliary sections to the GSSP, and recommends Seaford Head, Sussex, UK (Thibault *et al.* 2016); excellent isotope stratigraphy, micro- and macrofossil biostratigraphy, orbital tuning.
- Coniacian GSSP The WG submitted the GSSP proposal to SCS in September 2020 for discussion. The WG is currently (November 2020) revising the proposal according to the comments and suggestions received by the voting members. The Salzgitter-Salder (Germany) is the proposed candidate stratotype section. Primary criterion is the appearance of the inoceramid *Cremnoceramus deformis erectus*. Secondary criteria include a negative excursion in the $\delta^{13}\text{C}$ values (Navigation Event), and bivalve, planktic foraminiferal and peridinioid dinocyst datums. Three auxiliary sections are indicated: Słupia Nadbrzeżna (central Poland); the Střeleč railway cut, adjacent to the Střeleč Quarry (Bohemia, Czech Republic); and El Rosario, Sierra del Carmen National Park (Coahuila, Mexico).
- Albian GSSP. Finalisation of the official steps with the local authorities for the protection and easy accessibility of the GSSP site at Col de Pre-Guittard in the Commune of Arnayon (Department of Drôme).
- Aptian GSSP. The research activities that were agreed during STRATI 2019 included analyses of stratigraphic sections and evaluation of all available data across the Barremian/Aptian boundary. The year 2020 was marked by significant delay in receiving additional information on magnetostratigraphy from French ammonite-dated sections. C. Frau and colleagues from Poland (J. Grabowski), Czech Republic (A. Svoboda, P. Schnabl) and France (A. Tendil) sampled sections in S. France: Fontblanche (near La Bedoule) and Mont Ventoux (southern margin of Vocontian Basin). The team plans to combine chemostratigraphy with magnetostratigraphy. First results are expected in 2021.
- Barremian GSSP. The Río Argos section (Caravaca, Murcia, SE Spain) is the candidate stratotype for the Hauterivian/Barremian boundary. The primary

marker discussed and approved by the working group is the first appearance of the ammonite *Taveraidiscus hugii*. During the last years, the WG has carried on studies on the stratigraphic distribution of various fossil groups (ammonites, calcareous nannofossils, planktonic and benthic foraminifera), as well as chemostratigraphic and cyclo-stratigraphic analyses in the Argos section. Unfortunately, a secondary remagnetisation precludes any magnetostratigraphic dating, although indirect correlation using ammonite and isotope stratigraphy is possible with the Gorgo a Cerbara section (central Italy). In 2020, complementary analysis of ammonite and calcareous nannofossils in the candidate section have been performed. In addition, an integrated astrochronological study of the entire Barremian Stage performed on two other sections of the Subbetic Domain has been completed and published.

- Hauterivian GSSP. The GSSP for the base of the Hauterivian Stage at the FO of the ammonite genus *Acanthodiscus* at La Charce (SE France) was ratified by IUGS in December 2019. The protection of the GSSP section at La Charce is ensured by an Espace Naturel Sensible (ENS). The department and the municipality of La Charce established an exceptional and world-renowned geological interpretation circuit for the public. The formal publication of the GSSP are in press in *Episodes*.
- Valanginian GSSP. The WG approved the first appearance of the calpionellid *Calpionellites darderi* as the primary marker for the base of the Valanginian. Two sections are considered as possible candidates for the GSSP: Cañada Luenga (Cehegín, SE Spain) and Vergol (Montbrun-les-Bains, SE France). Integrated analyses of the Cañada Luenga section with biostratigraphic (ammonites, calpionellids and calcareous nannofossils) and magnetostratigraphic data are published. During the last year the WG have expanded the biostratigraphic analyses to the lower part of the section (upper Berriasian). Preliminary data on the distribution of ammonites and calpionellids were published for the Vergol section. A complete cyclostratigraphic analysis is also available. During the last year, an integrated study of the distribution of ammonites and calcareous nannofossils in this section has been completed and recently submitted for publication. Calpionellids are currently being studied.
- Berriasian (J/K boundary) GSSP. The GSSP proposal for the base of the Berriasian Stage in the Tre Maroua section (Vocontian Basin, SE France) at the base of the calpionellid *Calpionella alpina* Subzone was voted in October 2020 by the 81.8% of SCS voting members. The proposal received the 44.5% of “yes” votes and thus was not approved.
- KILIAN Group. The WG was inactive in 2020.

Jurassic Subcommittee

- Finalisation and Submission of the Kimmeridgian GSSP Proposal to ICS: under the leadership of Andrzej Wierzbowski, with strong support from Angela Coe the ISJS Secretary (now chair), the proposal for the base of the Kimmeridgian has been finalized and submitted to ICS.
- New executive and voting members: an election was held amongst the voting members for a new chair administered by Jozsef Palfy. Two candidates stood, Angela Coe was elected. A new secretary was appointed and fifteen new voting members. In appointing the new executive and voting members particular attention was paid to addressing inequalities in gender, ethnicity and

career stage in addition maintaining a broad spread of countries and subject specialisms. We also ensured that in particular we had Upper Jurassic expertise to facilitate definition of the remaining stage GSSPs.

- Outstanding GSSPs and base Cretaceous: Work on the remaining three stage GSSPs is being revitalised. Members of ISJS have also taken part in the debate about the possible position of the Jurassic-Cretaceous boundary (for further information see Wimbledon *et al.* 2020 and Granier *et al.* 2020, *Volumina Jurassica*, 18 (parts 1 and 2) and liaised with the Cretaceous Subcommission over their appointment of a new working group responsible for putting together a new proposal for the Berrasian GSSP.

Triassic Subcommission

A total of 75 papers that are closely related to integrated stratigraphy and extreme events within the Triassic have been published by STS members in 2020. The issue of *Albertiana* (#43) was published, and it is available for download from STS websites.

- Global Triassic Time Scale: Ogg *et al.* (2020) established the updated, integrated chronostratigraphic framework of the Triassic based on global correlations of biostratigraphy (conodonts, ammonoids, palynology, and other biozones), magneto-, chemo-, and cyclo-stratigraphy for seven stages and three series throughout the Triassic. In addition, sea-level changes, seawater temperature changing curves, various excursions of carbon, sulfur, and oxygen isotopes as well as major environmental, climatic and biotic events within the Triassic worldwide.
- New achievements in I-O and O-A boundaries: After updating biostratigraphy (ammonoids, conodonts), cyclostratigraphy and radiometric dating, and documenting new carbon isotope stratigraphy, magnetostratigraphy, and sequence stratigraphy, Chen *et al.* (2020) formally proposed the Wantou section of Guangxi, South China as the GSSP for the Olenekian-Anisian boundary. Correlations of OAB beds between Wantou and another GSSP candidate section (Kcira section of Albania) have also been made. Advantages and disadvantages of these two candidate sections have been hotly debated among OAB working group members. Currently, selection of GSSP for OAB still opens for debate. Considerable progress on GSSP for I-O boundary. Lyu *et al.* (2020) evaluated evolutionary lineage of conodont *Eurygnathodus costatus* and its role in defining the I-O boundary, and recommended this conodont species to serve as an auxiliary marker for the IOB. The Chaohu section is also recommended for the potential GSSP for the IOB. Another GSSP candidate Mud section of Spiti has also been re-studied. Integrated biostratigraphy (conodonts and ammonoids) and carbon isotope stratigraphy and elemental geochemistry have been studied. The IOB beds show similar succession to that of Chaohu section, but the first occurrences of conodonts *Novispathodus waggeni waggeni* and *Eu. costatus* are slightly different in these two GSSP candidate sections. Further discussions and correlations are needed to decide the selection of GSSP for IOB. Field excursions to the Chaohu section of Anhui and the Wantou section of Guangxi, South China

were carried out by Chinese members of STS, together with postgraduate students (totally 35 people) during 26-30 November, 2020.

- Terrestrial Permian-Triassic boundary and biotic extinction: Great progress on defining the terrestrial PTB and correlating PTB and mass extinction horizons with those defined in marine sections. New results (Gastaldo *et al.*, 2020; Chu *et al.*, 2020; Wu *et al.*, 2020) reveal that biotic extinction in terrestrial ecosystems clearly predated the same event happened in marine ecosystems.

Permian Subcommission

- General proposals for the bases of the Artinskian and Kungurian stages have been prepared and published in the SPS Newsletters *Permophiles* 69 by Chernykh (2020).
- A multidisciplinary study of the Mechetlino Quarry section (Southern Urals, Russia), the GSSP candidate for the base of the Kungurian Stage has been published by Chernykh *et al.* (2020, *Palaeoworld* 29).
- The Sakmarian-base GSSP by Chernykh *et al.* was accepted for publication in *Episodes* in April 2020.
- Two issues of *Permophiles* have been published (SPS Newsletters *Permophiles* 68 and 69)
- The Guadalupian timescale has been refined based by Wu *et al.* (2020, *Palaeogeography, Palaeoclimatology, Palaeoecology*, 548). A comprehensive paper on the three GSSPs and their correlation of the the Guadalupian Series has been published (Shen *et al.*, 2020, *Earth-Science Reviews*, 211)
- A comprehensive review of the terrestrial Permian stratigraphy has been provided by Schneider *et al.* (2020, *Palaeoworld*, 29).
- A voting members webinar has been organised on 22 October 2020.
- A corresponding members webinar has been organised on 13 November 2020.

Carboniferous Subcommission

- The newest Geological Timescale 2020, as the successor of GTS 2012, was recently published by Elsevier, and presents the time scale for c. 4 billion years of Earth history. Chapter 23, ‘*The Carboniferous Period*’ was provided by three SCCS members, Aretz Markus, Hans-Georg Herbig, and Xiangdong Wang, recording intense developments of integrated stratigraphy framework of the global and regional Carboniferous successions.
- A working group business meeting on the redefinition of the Devonian-Carboniferous Boundary was held at the University of Cologne, within the 19th ICCP in 2019, and three possible levels for the new DCB were discussed and voted on: 1) the base of the conodont kuehni Zone/the basal sulcata Zone & coastal plant extinction; 2) the base of the conodont kockeli Zone, beginning of radiation & top of major regression (top of HSS) and end of mass extinction; and 3) mass extinction level (‘big six mass extinction’) & base of the Hangenberg Black Shale. In the end, the second one won the majority, but some concerns have been shown by other working group members. The next step is to provide a detailed global correlation chart with regional subdivisions for different sedimentary facies. This correlation chart should be established by the end of 2020 and then be published in a joint

paper by all members of the working group in a journal like “Newsletter on Stratigraphy”. And a special issue about the global Devonian-Carboniferous boundary review is close to be complete and will be published in the last issue of *Palaeobiodiversity and Palaeoenvironment* at the end of 2020.

Devonian Subcommission

- Following failure of the joint SDS/Uzbekistan/RAS field expedition to Zinzilban Gorge, Uzbekistan to find the nominated conodont taxon named informally *Polygnathus excavatus* 114, SDS reluctantly came to the conclusion that the base Emsian cannot be defined at this level in Zinzilban. The SDS decided that the GSSP can be moved to other place, but still may remain in Uzbekistan if better section is available. The joint work on alternative section within the Kitab State Reserve is being carried out by Russian and Uzbek colleagues. During 2017-18 SDS informally considered how to progress with redefinition of the GSSP. We continued these discussions at the IPC in Paris with two presentations on new GSSP sections from Spain and the Czech Republic. SDS met again at STRATI 19 in Milan and had hoped to receive formal proposals for the base Emsian GSSP. During the ‘Covid year’ we could not meet in the planned SDS meeting in Geneseo, New York State. Therefore several Devonian subprojects have been launched to speed the accumulation of data in the Eifel Mountains, the Rhenish Mountains and the Prague Synform. We have applied for special ICS project for Pyrenees. In time of limited international travelling work has been concentrated intensively in the ‘home areas’ in order to finish the formal proposals for the GSSP. It is planned to vote on these and move on forwards for formal consideration by the ICS.

Silurian Subcommission

- *Silurian Times* No 27 was edited by the secretary, Renbin Zhan, and distributed in April, 2020, posted on the web site for the ISSS, and circulated as an email attachment to all titular, corresponding and interested members of the Subcommission. It contained the reports on previous meetings, announcements of upcoming meetings and publications, the latest news and recent publications on Silurian research.
- The restudy of the Rheidol Gorge section experienced some delays due to the Covid lockdown. Full paper by Melchin *et al.* (in prep) presenting the proposal of Rheidol Gorge as a candidate section for the base of the Aeronian Stage will be submitted for publication by early 2021. Chitinozoan biostratigraphy and faunas have been already published by De Weirtd *et al.* (2020).

Ordovician Subcommission

- As a result of the Covid-19 pandemics, the initial plans for activities in 2020 could not be respected. The 36th International Geological Congress, with the official meeting of the ICS and the take-over of the new subcommission and its officers, was cancelled in the last minute.
- In accordance with ICS Rules, about 2/3 of the current Voting Members of SOS were going to retire in March 2020, at the moment of the IGC. Replacement candidates were proposed to the Voting Membership, which voted to select a new Executive and Voting Members for the term 2020-2024.

The Voting Membership was increased to 20.

- The Subcommittee changed, according to the new rules of the ICS and the IUGS, with a strong replacement of the titular/voting members. Seven former Voting Members remain in the new subcommittee (2020-2024) and a total of 13 new Voting Members stepped in. The gender balance improved, with now seven female Voting Members.
- The official inauguration of the second Auxiliary Boundary Stratigraphic Section and Point (ASSP) for the base of the Ordovician System in the Dayangcha section (Northern China), scheduled for May 2020, was cancelled and is provisionally postponed to May 2021.
- The closing meeting of the International Geoscience Programme (IGCP) 653 ‘The onset of the Great Ordovician Biodiversification Event,’ cancelled in May 2020, took finally place as a successful videoconference congress, September 7th-10th, with over 200 participants, and a strong involvement of members of the Ordovician subcommittee, including the Voting Members.
- *Ordovician News* 37 (for 2019) was published in March 2020 and is available from the ISOS webpage.

Cambrian Subcommittee

- The Cambrian chapter (‘*The Cambrian Period*’ by Peng, S.C., Babcock, L.E. & Ahlberg, P.) for the book *Geologic Time Scale 2020* was completed and the entire volume was published by Elsevier in November 2020. The chapter has been updated, contains a wealth of new information, and will form a basis for discussions on how to define the remaining undefined series and stages.
- In November 2020, the Working Group on Cambrian Stage 10 provided its recommendation on which stratigraphic horizon to be used to mark the stage. Two options were considered: at the FAD of *Lotagnostus americanus* and at the FAD *Eoconodontus notchpeakensis*. The WG overwhelmingly recommended that the base of provisional Stage 10 should be at the FAD of *Lotagnostus americanus* (*sensu* Peng *et al.* 2015), and the FAD of *Eoconodontus notchpeakensis* should be used for subdividing Stage 10 into two substages.
- Landing *et al.* (2020) and Officers of the Subcommittee (Zhu *et al.* 2020) attempted to clarify the carbon isotope stratigraphy in the uppermost Cambrian and the concept of the TOCE and HERB excursions in two separate papers published in *Geological Magazine*, albeit with different views (<https://doi.org/10.1017/S0016756820000382> and <https://doi.org/10.1017/S0016756820001120>).

Ediacaran Subcommittee

The impact of the COVID19 Pandemic has meant that many of our expected accomplishments were postponed to 2021. Our leadership transition took longer than expected.

- The Subcommittee had to cancel plans to have a field workshop to examine Ediacaran successions in Brazil and Argentina in July 2020. Despite the cancellation, all logistical work was accomplished.
- New website. As part of the Executive transition, we wished to transfer the website to new ownership. We also solicited our colleague Dr. Tara Selly to act as web-developer.

- New voting members: Over the summer of 2020, the Executive recruited six new voting members. This was done in order to include a greater diversity of experts, both in terms of genders and geographic area of representation.

Cryogenian Subcommission

- Green paper for future subdivision of pre-Cambrian time and strata. A key issue for the immediate future will be to assist plans to remove all pre-Cryogenian GSSAs to be replaced by GSSP concepts as was done for the Cryogenian. This issue has become urgent since the base of the Cryogenian Period was moved from precisely 850 Ma to c.720 Ma (Shields-Zhou *et al.*, 2016). Although expertise within the Cryogenian Subcommission was originally envisaged to cover the interval between 850-720 Ma, it seems likely that the definition of the now vastly extended Tonian Period/System will change in future as will most pre-Cryogenian subdivisions. Following wide-ranging discussions, subcommission members and others, including co-authors of all Precambrian chapters of the new *Geologic Timescale 2020* book, produced a ‘Green Paper’: a template for pre-Ediacaran subdivision of time and strata, a recent version of which is now online as a pre-print (<https://doi.org/10.31223/X5FW25>).
- Symposia and Virtual Geological Field Trip. (1) A voting member zoom meeting was held on 6 November, 2020. As a face-to-face meeting is currently not possible, to discuss the action plan (virtual or in person field meetings) and the key objectives and work plan for 2021 and the whole period of 2020-2024, a meeting has been held online. Fourteen voting members (Leigh Anne Riedmann, Karl-Heinz (Charlie) Hoffmann, Konstantin Nagovitsin, Galen Halverson, Maoyan Zhu, Marc Laflamme, Tony Prave, Carol Dehler, Bing Shen, Graham Shields, Susannah Porter, Ian Fairchild, Shihong Zhan, Nicholas Swanson-Hysell, Ying Zhou, Chuanming Zhou, Anton Kuznetsov) and one representative from the Ediacaran Subcommission (Dima Grazhdankin) participated in the meeting. The discussion has been recorded and results incorporated into this report. (2) A Virtual Geological Field Trip to North Islay was held on 21 May, 2020 (published by David Webster on the Geological Society of Glasgow website and Youtube). Organisers include the subcommission voting member Ian Fairchild. The virtual field trip looked at the Bonahaven Dolomite Formation, which lies just above the Port Askaig diamictite. Links to the virtual field trip is on: www.Islaygeology.org and <https://youtu.be/5kwBpTUj0iU>. The subcommission is exploring the possibility of having more virtual field trips in the future, which will contribute to further discussions for a Cryogenian GSSP in Scotland or other GSSP candidates.
- Greater internet visibility and community building. A Cryogenian twitter account @cryogenian has been set up to promote new publications of the Cryogenian/Tonian research community. The twitter account is managed by Ying Zhou; A Cryogenian Facebook Group for Cryogenian research community was also set up to enable researchers communicate, and reach out to interested general public.

Precryogenian Subcommission

- Two proposals for votes were finalised:
- The Subcommission received a proposal for a green paper by a member of the scientific community not affiliated with our Subcommission. The proposed

green paper suggested a novel division of the entire Precambrian. The Subcommittee considered the proposal carefully, but found it scientifically flawed and lacking rigour. The Subcommittee voted unanimously against the proposal.

- The Subcommittee worked on potential candidates to Hadean/Archean boundary, of which a document summarising all notes and extensive discussion was produced. This document will serve to support the final proposal on this boundary, to be voted in early 2021.
- The Subcommittee has re-organized into strategic working groups that specifically deal with the following boundaries: Archean/Paleoproterozoic, Paleoproterozoic/Mesoproterozoic and Mesoproterozoic/Neoproterozoic.
- The Subcommittee changed its name from Precambrian to Precryogenian to avoid formal overlap with the separate Subcommittee on Cryogenian Stratigraphy.

Stratigraphic Classification Subcommittee

- Project: New developments in stratigraphic classification: The goal of ISSC is to update, upgrade and implement the *International Stratigraphic Guide* (ISG)(Hedberg, 1976 [1st edition]; Salvador, 1994 [2nd edition]; Murphy & Salvador, 1999 [abridged edition]). The ISG is a most important official document with a large distribution, which requires revisiting because of the fundamental advances of stratigraphy in the last 30 years. A project was developed by ISSC under the Chairmanship of Maria Bianca Cita following a workshop organised during the 32nd IGC in Florence, entitled “Post-Hedberg Developments in Stratigraphic Classification”. Background and motivation of this ambitious project “New Developments on Stratigraphic Classification” are clearly expressed in the introductory article (Cita, 2007) printed in *Newsletters on Stratigraphy* where the various review articles are being published. After all the various review articles in the co-ordinated series are published, the reprinting of the various articles in a textbook is foreseen, after passing the prescribed check points for approval in order to obtain the permission to use the ICS and IUGS logos.
- Lithostratigraphy: Leader: Brian Pratt, Canada, brian.pratt@usask.ca, participants: Stan Finney, USA, scfinney@csulb.edu, Mike Easton, Canada, mike.easton@ndm.gov.on.ca, Werner E. Piller, Austria, werner.piller@uni-graz.at. The working group is making good progress. It is expected, that the manuscript will be submitted in summer 2021.
- Biostratigraphy: Currently, possible new working group members have been approached, including a new group leader. As the concepts and approaches of biostratigraphy vary between fossil groups and stratigraphic systems, this turns out be rather difficult. After a team of authors will be established (December 2020), a video-conference is planned to define a thematic skeleton of the manuscript. The manuscript, however, will not be finalised before end of 2021.
- Chronostratigraphy: A new working group has been established (core: Marie-Pierre Aubry, Martin Head, Werner Piller). The manuscript should be finalised spring 2021.
- ISSC Business Meeting: A business meeting was planned to be held during the 36th IGC in New Delhi. Due to the COVID 19 pandemic no meeting took place.

- North American Commission on Stratigraphic Nomenclature (NACSN): The chair of ISSC, Werner Piller, was again invited and attended the 75th annual meeting of the NACSN on 22 October 2020 which has been a digital meeting. The major topics of this meeting were a proposal on formalising subseries in the North American Stratigraphic Code. This proposal received a majority and ‘Subseries’ will be a formal unit in the North American Code, a proposal on formalising chemostratigraphy. This proposal was (again) lengthily discussed, however, it is still in a very immature state. It is still unclear how formal chemostratigraphic units could be defined.
- The ISSC co-organised a technical session (online) ‘Integrated Stratigraphy - Recent advances in stratigraphic systems and geochronology’ at EGU 2020 in Vienna.

Timescale Calibration

- The creation of the full voting membership and completion of the subcommission personnel was the chief accomplishment. In addition we held on virtual session at a meeting and supported the next stage of the Cyclostratigraphy Intercomparison Project (CIP). Due to the inability to travel due to Covid, our subcommission put out a call for proposals among the membership for novel application of available funds. This was highly successful and the finances were used to support the creation of teaching materials.
- Completion of full voting membership to organize a fully functional subcommission. In total, 33 voting members (17 male/16 female) from 10 countries including 3 developing/BRICs nations
- Hosted our first science session at the virtual Geological Society of America meeting
- Used our 2020 funds to support the Cyclostratigraphy Intercomparison Project (CIP) in their creation of online learning resources and tools for researchers and teacher of cyclostratigraphy.

8. SUMMARY OF EXPENDITURE IN 2020:

The IUGS Executive Committee awarded ICS a budget of \$40,000 for 2018 (a reduction on previous years, limiting significantly the requests of the 16 subcommissions and the ICS Executive. Thus, \$40,000 was available for ICS activities in 2018. Expenditure is detailed in the appended financial spreadsheet (Expenditure_Budgets).

9. SUMMARY OF INCOME IN 2020:

The IUGS Executive Committee awarded ICS a budget of \$40,000 for 2020, reducing significantly the requests of the subcommissions and the ICS Executive. No additional income to the ICS is declared.

10. BUDGET PROPOSALS FROM ICS IN 2020

These have been itemised in detail in the attached spreadsheet ((Expenditure_Budgets)).

10. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR:

Quaternary Subcommission

- The priority for SQS is the selection of a GSSP for the Upper Pleistocene Subseries and its corresponding stage. Two potential candidates have already been identified (Fronte Section, Taranto, Italy; and an ice core in Antarctica). The aim is to have proposals developed for these potential candidates during the coming year. The Upper Pleistocene Working Group is being reformed under the co-convenership of Martin Head.
- A field workshop on the Neogene–Quaternary boundary and Gelasian GSSP, originally meant to be held in Palermo in June, 2020. This workshop will inaugurate a multidisciplinary multi-year research programme to re-investigate the Gelasian type section.
- The SQS website is being updated under the direction of Martin Head as Vice-Chair with explicit responsibility for this task.

Neogene Subcommission

- The major plan is to present to ICS the official proposal for the Langhian GSSP, that is on a reliable/reproducible guiding criterium, complemented by additional criteria useful for correlation, and reach a decision on the GSSP section and auxiliary deep-sea core.

Paleogene Subcommission

- Given the current uncertainties related to the Covid-19 global pandemic, a realistic working plan will not necessarily depend on long-distance travelling. The planned fieldtrips by those members of ISPS who are based near the outcrops and/or in the same country/region.
- Full support will be given to studies related to the last GSSP pending definition, i.e. for the Bartonian Stage and its working group. Fieldwork is planned in several Italian and Spanish sections, and on-going studies of the Bartonian WG will likely lead to the submission of a formal proposal in 2021.
- In order to revise and find auxiliary sections better to characterise the Paleocene/Eocene boundary (P/E), which is the most problematic GSSP of the Paleogene, the ISPS Board will propose a selection of auxiliary sections from different palaeogeographical areas and depositional settings and a publication will be submitted to *Episodes*.
- Contribute to a new edition of the international meeting on ‘*Climatic and Biotic Events of the Paleogene*’ (CBEP 2021), which will be held in Bremen (Germany). This is the main meeting event for the Paleogene community, and is convened every 4 years.

Cretaceous Subcommission

- Campanian GSSP. The WG will write a proposal for the Campanian GSSP, based largely upon new data provided in the 2020 papers (see above). This proposal will consist of two parts: a longer document, submitted to the

Subcommission, and a shorter publication, summarising the data and rationale, submitted to *Cretaceous Research*. As the supporting data is now largely published, this task is relatively straightforward. A draft document of the proposal and accompanying article will be sent to all WG members for feedback by spring 2021 and both documents will be submitted to the SCS and *Cretaceous Research*, respectively, in the summer or early autumn of 2021. Providing the Campanian GSSP is approved and ratified, the WG will produce a short article for *Episodes* in 2022, detailing the GSSP locality, and including essential data.

- Coniacian GSSP. A revised version of the GSSP proposal is planned to be submitted to SCS for voting in December 2020. If approved, it will be submitted to ICS in early 2021.
- Aptian GSSP. The WG is waiting for magnetostratigraphy combined with chemostratigraphy from two French locations. As soon as the results are available the discussion on the selection of the marker criterion and on the stratotype section will start. The WG will also produce a synthesis of available data for complete sections from various localities. Currently there are two favourite options: GSSP defined by (1) biostratigraphy, magnetostratigraphy and chemostratigraphy in a pelagic limestone succession (Gorgo a Cerbara, Italy), or by (2) ammonite stratigraphy and, hopefully, chemo- and magnetostratigraphy (historical stratotype for Bedoulian, Cassis-La Bedoule, and, possibly, a new location in the Vocontian Trough). Problems in defining the Aptian GSSP are related to the proposed base of M0 that has been re-dated with ammonites as Barremian in age in a pelagic succession. If this new age assignment of M0 turns out to be correct, a new biological or physical set of markers needs to be identified for the definition of the GSSP. However, a tentative new GSSP (e.g. negative spike in the Aptian C-isotope record) would fall into the Bedoulian which would then be in conflict with the current definition of the Bedoulian as “lower Aptian”. A synopsis is in progress (by the WG chairs) to be distributed for WG discussion.
- Barremian GSSP The WG is planning to complete the formal proposal of the Argos section as GSSP of the Barremian in the first half of 2021 and send it to the WG members for discussion and voting. If approved, the proposal will be submitted to SCS for the discussion phase by the voting members.
- Valanginian GSSP. The WG has still to finalise the study of calpionellids from Cañada Luenga and Vergol sections and complete the analysis of the stable isotope record in the Cañada Luenga on samples already collected. All pending studies in both candidate sections will be likely completed by the end of 2021. Circulation of the proposal among WG members is planned by mid-2022.
- Berriasian (J/K boundary) GSSP. Following rejection of the GSSP proposal and according to previous practice in ICS, the Berriasian WG was disbanded in October 2020. The new WG will be appointed and will be active by end November 2020. Jacek Grabowski from the Polish Geological Institute-National Research Institute (PGI-NRI) in Warsaw (Poland) has accepted to lead the new Berriasian WG. Jacek Grabowski is a paleomagnetist, very active in research and aware of the science issues around the J/K boundary, and has all the required skills for this position. He was member of the previous Berriasian working group and is currently voting member of the International Subcommission on Jurassic Stratigraphy. The selection of the members of the

WG is currently in progress.

- Kilian Group. The upper Aptian, lower-middle Albian zonal schemes will be in focus at the forthcoming Kilian meeting. The Kilian meetings are usually held every 3 years (2002; 2005; 2008; 2010; 2013; 2017). The next meeting will be associated with the next Cretaceous Symposium (Poland, 2022). The local organisation will be made by Izabela Ploch.

Jurassic Subcommission

- Kimmeridgian GSSP. Steer the proposal through ICS and deal with any matters and further publications arising. In partnership with Scottish Natural Heritage (<https://www.nature.scot/>) and other local bodies promote the GSSP to the scientific community and general public.
- Oxfordian, Tithonian and Callovian GSSPs. Through a workshop (online if required) renew focus on the Oxfordian GSSP building on the work to date with the aim of presenting the voting members with at least one but more likely two proposals (Dorset, UK and Subalpine Basin, SE France). Through the new voting members, rejuvenate the Tithonian and Callovian task groups and expand the search for possible candidate GSSPs by considering promising sections out of Europe.
- Webpages. Approve and revitalise the webpages on the new ICS site, promote the work of ISJS particular to career young researchers internationally. Arrange a permanent and secure online home for the often referenced ISJS *Newsletters in stratigraphy* (1978-2010).

Triassic Subcommission

Organising the International Symposium on Triassic Integrated Stratigraphy and Bio-Environmental Events in Wuhan on 18-21 June, 2021, in which STS business meeting is held, progresses on GSSPs for Olenekian, Anisian, Norian are reported, and global biotic and environmental events are also reported.

- Norian GSSP: The plan is to move forward towards a vote on the boundary marker and GSSP section. This will be achieved by: 1) the preparation of document detailing the correlation potential of suitable markers, and details on the candidate sections by the WG member for in early 2021. 2) Face-to-face discussions will then take place at Wuhan meeting in late June, 2021. Following this the plan is to move towards a vote in late 2021.
- Anisian and Olenekian GSSPs: Both move towards preparing a discussion document among the working group members at the Wuhan meeting in late June, 2021, as a prelude to moving towards a vote on the candidate markers and sections.

Potential funding sources external to IUGS: Research grants of STS members from various funding agencies. Sponsorship of STS conference is obtained from China University of Geosciences, China (organising institution). A new IGCP project will be proposed and will cover some expenses of STS activities.

Permian Subcommission

- It is hoped to ratify the GSSP of the base of Artinskian and start to work on that of the base of Kungurian.
- It is planned to produce a video to advertise SPS.

Carboniferous Subcommission

- A special volume entitled ‘*The Carboniferous Timescale*’ will be officially published in Geological Society, London, Special Publication in 2021.
- Due to the COVID-19 pandemic, many events have been deleted or postponed to new dates. In 2021, the SCCS executive committee plan to organise several online workshops about the progresses of the Carboniferous studies around the world.
- Task group leaders for the establishments of four Boundaries will be re-appointed and related works will be carried out to facilitate the definitions of the bases of the Serpukhovian, Moscovian, Kasimovian and Gzhelian.
- A detailed proposal for the GSSP defining the base of the Moscovian and Gzhelian stages needs to be prepared and voted by the task groups and SCCS in the next year, and the result should be submitted to the ICS.

Devonian Subcommission

- Formal proposals or progress reports submitted for the revision of the basal Emsian GSSP from several areas.
- Continuation of Devonian subprojects aimed at GSSP redefinition.
- Revision of the D/C boundary with the D/C Boundary Task Group (Chairman: M. Aretz) in close collaboration with the Carboniferous Subcommission. Progress towards selection of candidate stratotypes at STRATI 2019.
- Meet in New York State for fieldwork/conference in Geneseo with 3 days fieldwork before the meeting, 5 days after and 1 day during the 3 day conference.

Silurian Subcommission

- Two ISSS groups working on restudy of the base of the Aeronian GSSP and base of the Telychian GSSP will complete their work by submission of the formal proposals of the candidate sections (Štorch *et al.*, Hlasna Treban, Czech Republic and Melchin *et al.*, Rheidol Gorge, UK for Aeronian GSSP and David Loydell *et al.*, El Pintado Reservoir, Spain, for Telychian GSSP).
- ISSS online discussion and formal voting on the Aeronian and Telychian GSSP replacement candidate sections is anticipated for 2021.
- Further update of the website for Silurian Subcommission by new webmaster Huang Bing. We gratefully acknowledge this work and the support provided by the Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences.

Ordovician Subcommission

- Support of the Annual Meeting (absolutely final meeting) of IGCP653 to be held in Lille, France (September 10th-20th 2021), including a pre-conference excursion to the Ordovician of Belgium and a post-conference excursion to the Ordovician of Wales and the Welsh Borderland, UK. The meeting will also serve as a mid-term meeting between the ISOS meetings in Novosibirsk (2019) and Tallinn (2023). In addition, it would be the opening meeting of the new IGCP project, if accepted by the UNESCO.
- Support of the Seminar on Regional Stratigraphic Classification Standard in China in Baishan, Jilin Province, May 2021 (organised by the Chinese Commission on Stratigraphy), to include an inspection and unveiling

ceremony for the Xiaoyangqiao ASSP section (originally planned to be organized in May 2020).

- Further work is needed to compile an updated summary on Ordovician regional stratigraphy and geology: A Global Synthesis of the Ordovician System. A meeting of editors and contributors is planned (possibly in Nanjing, late 2021).
- Data will be gathered for *Ordovician News* 38 (to be published in March 2021).

Cambrian Subcommittee

- In 2021 the Cambrian Subcommittee will continue work toward defining GSSPs for its remaining provisional stages.
- Arrival at a decision on how to define Stage 10 in 2021 (two options: at the FAD of the agnostoid *Lotagnostus americanus* or at the FAD of the conodont *Eoconodontus notchpeakensis*); then to arrive at decisions on stages 2, 3, and 4 in subsequent years.
- Continue examining issues surrounding definition of the Cambrian GSSP.

Ediacaran Subcommittee

Field workshop to examine Ediacaran successions in Brazil and Argentina. This trip will hopefully be run in the summer of 2021. Focus will be on the Corumba and Bambui groups in Brazil, and the La Providencia Group in Argentina. The Corumba and Bambui groups contain *Cloudina* and other tubular fossils that are being considered as key biostratigraphic criteria to define the terminal Ediacaran stage (TES), and thus they are highly relevant to the missions of the Subcommittee. The field workshop will be organised and led by Subcommittee Secretary Lucas Warren and his colleagues in Brazil and Argentina.

Developing and managing a special issue (most likely in *Episodes*) that brings our membership up to speed on the progress made over the past 5 years (since Xiao et al., 2016. Towards an Ediacaran time scale: problems, protocols, and prospects. *Episodes*, 39, pp.540-555). This special issue will also summarise regional Ediacaran stratigraphy and potential criteria for the definition of the terminal Ediacaran stage (TES). Each manuscript will be formatted identically and designed as a facts-only short format where all proposed defining characters of the Series and Stages are identified and compared across sections. Importantly, recent recalibration and dating of the global Shuram negative excursion (Rooney et al., 2020, Calibrating the coevolution of Ediacaran life and environment. *Proceedings of the National Academy of Sciences*. 2020 Jul 21;117(29):16824-30) may finally provide a strong correlative character for the base of the Series and Stage. We believe we are close to a final vote and wish to have all the facts in one place before voting. With the change in leadership, we also require a change in our subcommittees. These committees will be tasked with setting realistic boundaries within both proposed Series.

Improved Subcommittee Exposure and Branding: In order to reach out to our members and to breathe new life into the subcommittee, we are rebranding with a new logo and new website. We also hope to purchase and distribute “swag” (such as coffee mugs, USB sticks, lapel pins) amongst voting and corresponding members, and distribute at conferences. We (Schiffbauer and

Laflamme) have used similar approaches with other committees (Geobiology and Geomicrobiology division of the Geological Society of America), and have seen a direct increase in attendance and participation (especially by junior/student members) at international meetings.

Cryogenian Subcommission

- Cryogenian Webinar Series. Online seminar/webinar series has been agreed during the voting members' zoom meeting this November. The webinar series will be organised by Ying Zhou. Three talks are planned till early Spring 2021 and will be open to a wider audience.
- Voting for criteria to define the base of the Cryogenian System during course of 2021.
- Field Trips. Two field trips will be organized if the pandemic situation permits, including (1) Utavi, Namibia field trip, mid-July, 2021 (organised by Karl-Henz Hoffman and Galen Halverson); and (2) Scotland field trip (virtual and in planning, organised by Ian Fairchild), May 2021.

Precryogenian Subcommission

- Assuming that the Subcommission's proposal on the Hadean-Archean boundary is accepted by ICS, the subsequent focus of the activities of the Subcommission will primarily be to explore various suggested ways of subdividing the Archean, namely the Palaeoarchean lower and upper boundaries.
- The Subcommission has established collaboration with Dr. Brian Zimmer, Appalachian State University, USA, to develop a digitalised learning tool on the oldest fossils in the rock record. This digital learning tool will contribute to the education of geoscience students in the future. The Subcommission is actively preparing a proposal to be submitted to the National Science Foundation (USA) to develop this learning tool. In this context, the former chair (Dr. Noffke) plans a workshop to take place in summer 2021 (postponed from 2020 due to Covid19) with local members to visit key outcrops in South Africa. The goal will be to evaluate outcrops in the almost 3.5 Ga Barberton Greenstone Belt with respect to fossil content and suitability for a holotype-rock section.
- An Old Dominion University student engaged by former chair, Dr. Noffke, will continue to help the Subcommission assembling information on Precambrian stratigraphic sections into a preliminary digital catalogue.
- Expansion of the Subcommission membership to include currently unrepresented areas, especially east and south Asia.
- Produce Education and Public Outreach material aiming to disseminate information on the main events and characteristics of the ancient Earth up to its modernization (from Hadean throughout early Neoproterozoic). The material is intended to be digital (website), mainly visual (large use of figures and animations), show nonspecialist language and be translated to several idioms.

Stratigraphic classification

- For the chapters Biostratigraphy and Chronostratigraphy in the new stratigraphical guide, new members of the workgroups will be invited. A video conference will be organized early in 2021.

- The session SSP2.3 “Integrated Stratigraphy - Recent advances in stratigraphic systems and geochronology” will be held at the EGU General Assembly 2021 (EGU 2021), 19-30 April 2021, Vienna, Austria.
- The Subcommittee does not envisage being able, as an organisation, to obtain significant funding from outside IUGS/ICS sources. Some financial support could be obtained by individual members from their host institutions and/or their personal research funds. There is, however, a considerable amount of in-kind funds supporting the activities of all ISSC members.

Timescale Calibration

- Second session of the ISTC to be organised at either AGU, EGU, or GSA.
- Planning and organisation for the first ISTC subcommittee meeting to be held in 2022. Acquisition of funding at the national/international level to support community building globally for the ISTC.

11. OBJECTIVES AND WORK PLAN FOR NEXT 4 YEARS (2020-2024)

The following is a summary of objectives of the ICS Executive Commission and a selection of key goals noted in the detailed reports of each subcommittee.

ICS Executive

- Define a substantial number of GSSPs, particularly for stages in the Carboniferous, Triassic, Jurassic, Cretaceous, and Cambrian systems; re-evaluate GSSPs for the several Silurian stages and the Devonian-Carboniferous boundary, and of the Cambrian System (Paleozoic Erathem, Phanerozoic Eonothem), and select GSSP-defined subdivisions of the Precambrian.
- Maintain website (and the ICS App) and its formal, permanent archive of the global geostandards - GSSPs and the ICS International Chronostratigraphic Chart.
- Continue coordinating websites and the information they contain among all subcommittees and the Commission in order that they become the primary global web-based entry point to information on the activities and accomplishments of the subcommittees and ICS.
- Encourage subcommittees to re-assess regularly GSSPs and to develop new initiatives and projects that utilise the refined International Stratigraphic Chart.
- Encourage the recruitment by subcommittees of members from under-represented countries/regions and of those at early career stages.
- Promote the preservation of GSSPs by local communities and national stratigraphic commissions and dedication ceremonies, including the placement of permanent markers, at all ratified GSSPs.
- Produce a new edition of the *International Stratigraphic Guide* with its joint publication by IUGS and the Geological Society of America
- Continue development of a strong link between ICS and the Geobiodiversity DataBase (GBDB) at the Nanjing Institute of Geology & Palaeontology
- Maintain close collaboration with all national stratigraphic commissions.
- Cooperate with One-Geology and the Commission on the Geologic Map of the World to ensure that these projects continually incorporate the latest revisions

- to the International Stratigraphic Chart.
- Serve as the primary international body setting global standards and illustrating best practices in stratigraphy.
- To continue to integrate fully the new Subcommittee on Timescale Calibration (ISTC) under the leadership of Dr Brad Cramer (cf. below) into the ICS structure.

Quaternary Subcommittee

- Develop and submit a GSSP proposal for definition of the Upper/ Late Pleistocene and its respective Stage/Age.
- Analyse candidate GSSPs for the Anthropocene, and submit a proposal for formalisation to the SQS
- Re-investigate the GSSP for the Gelasian Stage (and Lower Pleistocene Subseries, Pleistocene Series, Quaternary System) at Monte San Nicola, Sicily.
- Explore the possibility of a second stage for the Middle Pleistocene, based around the increasingly well-recognised Mid-Brunhes Transition.
- Continue to examine the fine-scale subdivision of the Quaternary.
- Continue to develop/update detailed correlation charts for the Quaternary (Cohen & Gibbard, 2019, *Quaternary International*, is the latest version).

Neogene Subcommittee

- The incoming Chair Ken Miller, Vice-chair Elena Turco, and Secretary Marie-Pierre Aubry reviewed the members of the Subcommittee considering the time mandate and to discuss additional action items. They thanked all members serving more than 8 years for their service, with the exceptions of Fritz Hilgen (past Chair) and Elena Turco (current Vice Chair) and Marie-Pierre Aubry (secretary). They reduced to 20 the number of voting members and some former members agreed to become Corresponding Members.
- We will hold a virtual meeting with new members in January 2021 and a tentative field trip to La Vedova section Conero Riviera, Italy after Sept. 2021. As noted above, we have two action items to: 1) strongly encourage the final proposal for La Vedova as the Langhian boundary stratotype and to subsequently vet and vote on the proposal; 2) evaluate possible boundary stratotypes and criteria for the definition of the base of the Burdigalian Stage.

Paleogene Subcommittee

- To advance the definition criteria for identifying the base of Bartonian Stage, choose a type section and submit a GSSP proposal to the Paleogene Subcommittee voting members.
- To prepare the report on the Bartonian GSSP proposal to be submitted to the ICS and the IUGS.
- To celebrate the official ceremony to place the Golden Spike at the GSSP for the base of the Priabonian in Alano di Piave section, Italy.
- To produce an updated version of an integrated Paleogene Time Scale.
- Preparation of standardised regional correlation charts and paleogeographic maps by the regional Committees.
- To support studies for the completion of the Paleogene astronomical time scale. This will contribute to filling the so-called “middle Eocene astronomical

timescale gap” and will help to connect existing floating calibrations with the astronomically tuned standard Neogene time scale.

- Update the status of Paleogene working groups, creating new working groups as necessary and closing those which have completed their task and/or are inactive.
- Revisit existing GSSPs and, if necessary, define new GSSPs and/or ASSPs in order to characterise better the following boundaries:
 - Thanetian/Ypresian (P/E) boundary (i.e., Alamedilla, Caravaca and Zumaia sections in Spain; Forada and Contessa Highway sections in Italy; Polecat Bench in Wyoming);
 - Danian/Selandian boundary: Contessa and Bottaccione sections in Italy; Caravaca and Sopelana sections in Spain;
 - Selandian/Thanetian boundary: Contessa, Italy
 - Base of the Rupelian (E/O boundary): Monte Cagnero and Monte Vaccaro sections in Italy.

Cretaceous Subcommittee

- December 2020: GSSP proposal for the base of the Coniacian submitted to SCS for voting. Autumn 2021: official ceremonies for the inauguration and placement of the golden spikes of the Albian and Hauterivian GSSPs.
- 2021: Finalise the GSSP proposals for the base Barremian and base Campanian and vote within the WG.
- 2022: Finalise the GSSP proposals for the base Valanginian and base Aptian and vote within the WG.
- 2021–2024: Research activities toward the preparation of the GSSP proposal for the base of the Berriasian Stage by the new Berriasian WG.
- 2021-2022: Continue preparation of proposals for the definition of substages for discussions at the forthcoming meeting: 11th International Symposium on the Cretaceous (Poland, 2022).
- 2022-2023. Vote by the SCS of the Barremian and Campanian GSSPs.
- 2023-2024. Finalise the GSSP proposal for the base Berriasian and vote within the WG.
- 2023-2024. Vote by the SCS of the Valanginian and Aptian GSSPs.

Jurassic Subcommittee

- Achieve ratification of the Kimmeridgian GSSP.
- Complete or significantly advance the defining of the remaining Jurassic GSSPs (Callovian, Oxfordian, and Tithonian) through revitalizing the working groups and facilitating progress by encouraging constructive collaboration and raising funds.
- Increase diversity and facilitate research aspirations at all career stages by championing representation through the new official positions, providing a diversity of opportunities, role models and subject specialist champions.
- Facilitate communication on the Jurassic for both specialist and non-specialist audiences. including promoting the Jurassic GSSPs. This will be achieved

through meetings, workshops, *Volumenta Jurassica*, outreach activities and maintaining an up-to-date and informative subcommission website.

- Facilitate a successful and inclusive Jurassic congress in Budapest, Hungary in 2022.
- Improve resolution and correlation of the integrated stratigraphy for the Jurassic.
- Further our understanding of the Earth system during the Jurassic especially palaeoclimate change.
- Provide support to IGCP 655 (Toarcian) and future IGCP projects related to the Jurassic.
- Work with the Cretaceous Subcommission to help them define the base of the Berriasian and the Jurassic/Cretaceous boundary.
- Work with national and international bodies to protect Jurassic geological sites, assess and promote their natural capital.

Triassic Subcommission

A total of 3 international symposia or field workshops, 2-3 STS sessions, 2 thematic issues, significant progresses on 4 GSSPs (2 of them can be ratified) are anticipated to be achieved:

- Organise the International Symposium on Triassic Integrated Stratigraphy and Bio-Environmental Events in Wuhan, China on 18-21 June, 2021, in which STS business meeting is held, progresses on GSSPs for Olenekian, Anisian, Norian are reported, and global biotic and environmental events are also reported
- Organise the International Symposium and Field Workshop on Triassic Stratigraphy and Bioevents in Albuquerque, New Mexico, USA in July-August, 2022.
- Organise the International Symposium and Field Workshop on Triassic Stratigraphy and Bioevents in Armenia in July-August, 2024.
- Organise the STS sessions in major conferences, i.e. GSA Annual Meetings, 36th and 37th International Geological Congress, 3rd International Congress of Stratigraphy etc.
- Organise the thematic issues on the Triassic Integrated Stratigraphy and Extreme Events in an international journal in 2022.
- Organise the thematic issues on the Global Triassic Stratigraphic Correlations from Marine to Terrestrial Successions in international journals or book series of an international publisher in 2023, and preparing the Triassic Period chapter for the Geologic Time Scale 2024.
- Norian GSSP: This GSSP is anticipated to move towards a vote in late 2021.
- Olenekian GSSP: The goal of the WG chair is to have a GSSP proposal to submit to STS for ratification in early 2022. Establishment of physical, cyclostratigraphic, magneto- and chemo-stratigraphic scales.
- Anisian GSSP: The proposal of GSSP candidate for the OAB from the western US is anticipated to be submitted in 2021-2022, and the GSSP of OAB is to be voted in 2023-2024.
- Rhaetian GSSP: A long-time stasis in this group has seen no significant prospects of change. If this continues into early 2021, a new chair of this working group will be sought to move forward at a faster pace.

Permian Subcommission

- Establish the Artinskian and Kungurian GSSPs.
- Revise the Permian timescale where it needs to be improved (Guadalupian stages, replacement GSSP section of the base-Lopingian).
- Establish a robust palaeogeographic frameworks for the Permian and focus on N-S correlations.
- Propose DDE-sponsored informatics support for biostratigraphic data management and palaeogeographic reconstructions.
- Organise webinars to increase the size, diversity and international coverage of the Permian Community
- Publish at least two *Permophiles* issues each year

Carboniferous Subcommission

- Within the next 4 years, it will be possible to select the defining events for all of the stage boundaries and progress toward selecting candidate sections for the GSSPs. We intend to use high-resolution biostratigraphy and combine it with a multi-discipline approach (use of sedimentology, geochemistry, and geological events) to establish as many of the remaining GSSPs as possible. The realistic objective is to have two remaining GSSPs ratified in the next four years and redefine the Devonian-Carboniferous boundary.
- We will encourage and pay more attention to finding volcanic ash beds for radiometric dating, in order to establish a more precise Carboniferous time scale and facilitate the correlation of important Carboniferous events at global scale.
- Using multi-discipline methods including palynological studies, U-Pb dating and stable isotope studies, we will further promote marine and non-marine correlation.
- We are going to organise at least one academic activity each year, either a workshop (maybe combined with conferences) or joint workshop/field excursion. However, this plan might be delayed or cancelled due to the COVID-19 situation, and we will probably have more video meetings and try to make progresses through internet.
- To establish working groups on dividing the Tournaisian and Viséan stages because both of them represent too long time interval.
- To strengthen and to vivify the SCCS website, with membership lists revised, tasks and newsletters updated in time, making it a genuine platform to bring Carboniferous specialists together for collaboration and exchange of new ideas and results.
- Integrate the Carboniferous databases from the entire world, combining the Geobiodiversity Database (GBDB, a large compilation of data about sections) at Nanjing Institute of Geology and Palaeontology, the Palaeobiology Database (a large compilation of data about fossils) at the University of Wisconsin-Madison, DDE (Deep Time Digital Earth) and other major databases, to facilitate the studies on Carboniferous biota and stratigraphy.

Devonian Subcommission

- Redefine the base of the Emsian Stage.
- Redefinition of the Devonian/Carboniferous Boundary with the joint Task Group.

- Annual meetings.

Silurian Subcommittee

- Principal work will be devoted to GSSP-related research activities – restudy of some previously ratified but currently inadequate basal stratotypes. Delayed formal proposals of the Aeronian and Telychian GSSP replacement candidates will be completed in 2021 and new stratotypes will be chosen. We aimed to vote on these candidate sections in 2019 in Milano, but the deadline had to be postponed due to delayed work on some of the candidate sections and subsequent Covid-related restrictions.
- Homeric working group will be established and restudy of the Homeric GSSP will join the programme, together with never ending search for potential sections suitable for new GSSP of the Wenlock Series.
- Application of astronomically tuned cyclostratigraphy integrated with radiometric data and high-resolution biostratigraphy in conjunction with IGCP no 652 “Reading geological time in Palaeozoic sedimentary rocks”.
- We will take part in further development of databases that would bring together and make available information from all sources associated with the Silurian researchers. One such database, operated by the Nanjing Institute of Geology and Palaeontology (Geobiodiversity Database, GBDB) is the official database of the ICS.
- ISSS bi-annual field-meeting and business meeting organised in Sofia, Bulgaria in August 2021 in collaboration with Geological Institute of Bulgarian Academy of Sciences may be postponed until the end of international travel restrictions, most likely until 2022.

Ordovician Subcommittee

- For further advancement and increased precision in correlation we need to focus on regional stratigraphy, regional scales and regional chronostratigraphic schemes. We recognise that many biotic, chemical and physical changes are not always synchronous, and that local and regional signals may vary from trends evident in global compilations. This is especially true for the Ordovician, where strong provincialism can mask biostratigraphic-based correlation. Ordovician regional stratigraphy and geology will therefore be the main goal for the period 2020-2024.
- To compile and publish an updated summary on Ordovician regional stratigraphy and geology: A Global Synthesis of the Ordovician System. Special attention is going to be paid to precise correlation of the Ordovician depositional sequences and sea level curves as well as stable isotope and regional biodiversity curves. Though work has been proceeding on this aim, regrettably it is at a glacial pace.
- To better correlate Ordovician depositional sequences throughout the World.
- To design and execute a program of radiogenic dating of key Ordovician horizons (using Pb-Pb isotopes and CA-IDTIMS dating of zircons).
- The Ordovician website will be updated including development of a database for GSSPs and ASSPs.

Cambrian Subcommittee

- The principal objective of the Subcommittee is to narrow possibilities for horizons and GSSP stratotypes for the remaining undefined stages, which are provisionally identified as stages 2, 3, 4, and 10. The ISCS has developed a prioritised plan for formalising definition of the remaining undefined GSSPs. The plan is:
- Provisional Stage 10 is expected to be defined next, and a decision on a GSSP will likely be made in 2021.
- Following a decision on Stage 10, provisional stages 2, 3, and 4, are expected to be defined in rapid succession. A decision on the preferred GSSP horizon of any one of the three stages will restrict choices for the remaining two stages, so the ISCS is approaching work toward definition of the three stages as closely linked.
- A more long-term objective is re-examination of the Cambrian GSSP (Terreneuvian Series, Fortunian Stage). Imprecision in correlating the lower boundary of the Cambrian System has been encountered on all palaeocontinents, and the ISCS is now engaged in seeking a practical solution to remedy the problem (Babcock, L.E. *et al.* 2014: Proposed reassessment of the Cambrian GSSP. *J. of African Earth Sci.* 98, 3–10). A decision on how to proceed with the Cambrian GSSP is expected to be made following ratification of GSSPs for stages 2, 3, and 4.

Ediacaran Subcommittee

- Subcommittee annual newsletter will be distributed in December 2020. Secretary Dr. Lucas Warren will be leading the effort to compile and edit the newsletter.
- Building on several previous trips in Brazil sponsored by members of the Ediacaran Subcommittee, the Subcommittee will sponsor an extended field trip to examine Ediacaran successions in Brazil and Argentina. The field trip will be led by TES-WG voting member Dr. Lucas Warren and his colleagues, and it is tentatively scheduled on July 05–29, 2020.
- A field workshop is being planned to visit and examine Ediacaran successions in Siberia.
- A vote will be called to decide what criterion or criteria will be the most useful in dividing the Ediacaran System into series and stages (particularly the second and terminal stages of the Ediacaran System). Our goal is to finalise the discussion on TES by 2021 (previously 2020).

Cryogenian Subcommittee

- Voting for criteria to define the base of the Cryogenian System (2021)
- Call for proposals for basal Cryogenian GSSP candidates (2022).
- Voting and ratification of basal Cryogenian GSSP (2023).
- Establishment of working groups on Cryogenian subdivision (2022)
- Voting and ratification of Cryogenian series (2023-2024).
- Interface with other international projects / groups.
- Field trips planned: (1) Utavi, Namibia field trip, mid-July, 2021 (organised by Karl-Henz Hoffman and Galen Halverson); Scotland field trip, May 2021 (virtual and already in planning, organised by Ian Fairchild and Tony Spencer); Tonian Urals field trip, 2022 (organised by Anton Kuznetsov); South China field trip, 2023 (organised by Maoyan Zhu).

Precryogenian Subcommittee

- The Subcommittee continues to assemble suitable rock successions that cover the entire Precambrian time span. As mentioned above, it is planned to request funding for a VIRTUAL data base that allows ‘visiting’ key locations for the Precambrian stratigraphy. The commission hopes to receive funds from NSF in course of 2021.
- Also, the Subcommittee aims to start a new initiative, focused on scientific education (Education and Public Outreach – EPO – material). Our intention is to produce audiovisual material, including texts, figures, audios and animations about events and characteristics of the ancient Earth and in all its spheres, from Hadean to early Neoproterozoic, to be made available at the subcommission website for pre-Tertiary students and teachers.
- The original Precambrian Subcommittee’s task suite is now revised and published on the ICS web page. The rock record of the Precryogenian Precambrian is highly incomplete and criteria that can be employed for the Phanerozoic may not be suitable for this time period. Many events are not recorded but can be only inferred from subsequent rock successions. Many techniques for age determination will not work for older rocks. The continuous aim of the Subcommittee is to discuss methods of how to resolve such issues and to align the Precambrian-specific approach with the procedures of the Phanerozoic.

Stratigraphic Classification

- All the remaining review papers on the various branches of Stratigraphy will be published in 2021.
- The series of papers may form the core of a textbook. Publication details, including arrangements with Nägele & Obermiller, Stuttgart (the publishers of *Newsletters on Stratigraphy*) remain to be worked out.
- The subcommission will take the initiative to encourage special sessions and symposia at conferences that advance stratigraphic principles, in collaboration with other ICS subcommissions.
- The subcommission will continue to participate in GSSP discussions with ICS subcommissions.
- The subcommission continues to interface with national stratigraphic commissions although only in an advisory capacity.
- The ultimate goal is the publication of a new, multi-authored, really multinational International Stratigraphic Guide - a guide not a code, simple, clear, concise, user-friendly, for worldwide distribution and acceptance (post-2021).

Timescale Calibration

- Create the full subcommission with both voting members and corresponding members. We have completed the list of voting members and are now in the process of filling out the list of corresponding members.
- Organising the first subcommission meeting to physically bring the ISTC together for the first time
- Organising a major position volume to be focused on current best practices in timescale calibration as well as where we see the future of timescale

calibration. This is to be a printed volume following on from the first subcommission meeting.

- Integrate the ISTC with other international as well as national and regional organizations. For example EARTHTIME, EARTHTIME EU, EARTHTIME China, Geochronology Division of the GSA, SEPM, The Palaeontological Association, The Paleontological Society, etc.

APPENDIX 1: ICS DIRECTORY OF OFFICERS 2020-2024

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SUBCOMMISSION ON PRECRYOGENIAN STRATIGRAPHY

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Vice Chair: Mark D. Schmitz, Department of Geosciences, Boise State University, Boise, Idaho 83725, USA. markschmitz@boisestate.edu

Secretary: Anne-Christine DaSilva, Department of Geology, Université de Liège, B-4000 Liège, Belgium. ac.dasilva@uliege.be

PL Gibbard
Cambridge University
30.11.20

DAT Harper
Durham University
1.12.20

APPENDICES: REPORTS OF INDIVIDUAL SUBCOMMISSIONS

These were edited by the respective officers of the named subcommissions and are presented here as submitted.