1. TITLE OF CONSTITUENT BODY and NAME OF REPORTER

Subcommission on Carboniferous Stratigraphy (SCCS)

Prepared by Xiangdong Wang, Chair of SCCS

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2. OVERALL OBJECTIVES AND FIT WITHIN IUGS SCIENCE POLICY

Objective

The SCCS promotes and coordinates international cooperation among various geologic specialists for the purpose of defining standard global chronostratigraphic boundaries within the Carboniferous System and promoting regional and intercontinental stratigraphic correlation of Carboniferous. The principal SCCS goals are:

(a) to establish a standard global stratigraphic time scale and to select the best stage boundaries within the two Carboniferous subsystems.

(b) to redefine the Carboniferous-Devonian boundary.

(c) to facilitate global correlation within the system.

Fit within IUGS Science Policy

The current objectives of SCCS relate to main aspects of IUGS policy:

(a) Establishment of a standard global stratigraphic time scale, defined by Global Stratotype Sections and Points (GSSPs).

(b) Development of an internationally acknowledged chronostratigraphic units/or boundary.

(c) Promotion of international cooperation in geological research.

3. ORGANISATION - interface with other international projects/groups

3a. SCCS Officers for 2016-2020:

Chair: Xiangdong Wang (China)
Vice-Chair: Svetlana Nikolaeva (UK)
Secretary: Wenkun Qie (China)

3b. Voting members (VM) and corresponding members (CM):

The Carboniferous subcommision of ICS together have 19 voting members (including 3 officers) representing 10 countries: Belgium (2), Cezch Republic (1), China (4), France (1), German (1), Japan (1), Russia (4), Spain (1), UK (1), USA (3). A full list of current voting members (with address, telephones and emails) is at the end of this annual report as appendix. There are approximately 280 corresponding members at present, please check the latest issue of Newsletter on Carboniferous Stratigraphy for contact information.

3c. SCCS maintain an official website, and the URL is as following:

www.stratigraphy/org/carboniferous

3d. Interface with other international projects / groups

The SCCS works closely with the subcommissions on Devonian (SDS) and Permian Stratigraphy (SPS) to establish the common boundaries with the Carboniferous. The SCCS expects to cooperate with the NSF-sponsored Chronos initiative, which has a website at www.chronos.org, and with the NSF-sponsored PaleoStrat community digital information system for sedimentary, paleontologic, stratigraphic, geochemical, geochronologic, and related data, hosted at Boise State University, and with a website at www.paleostrat.org. It also has established a more close relationship with the Geobiodiversity Database (GBDB, a large compilation of data about sections and fossil occurrences) hosted at Nanjing Institute of Geology and Palaeontology, CAS.

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

5. CHIEF ACCOMPLISHMENTS IN 2017 (including any publications arising from ICS working groups)

5.1. The base of the Carboniferous:

The last formal meeting of the task group for the redefinition of the base of the Carboniferous was the workshop in Montpellier in September 2016. Since then, members of the task group have continued the work on boundary sections and started to test the application of the criteria voted in Montpellier. It must be underlined that those criteria are actual being tested for their potential if there are suitable for the definition of the boundary. Hence, these criteria are currently only for the informal use within the work group, and in no circumstances to be used for a formal work on the boundary. The task group is also currently preparing a volume with a series of contributions giving an overview on the DCB in different regions around the globe. Contributions are expected for following regions: France (Montagne Noire, Pyrenees), German (Rheinisches Schiefergebirge, Thuringia), Austria/Italy (Carnic Alps, Graz Palaeozoic, Sardinia), Czech Republic, Belgium, British Islands, Balkan, Poland, Russia, China, USA, Canada, Greenland, South America, South East Asia, Morocco, Iran, CAOB (Kazakhstan, Uzbekistan, etc), Australia and Turkey. This volume will be published as a regular volume in *Palaeobiodiversity and Palaeoenvironments (http://www.springer.com/palaeo)* in 2020. The next formal meeting of the task group will be organised in July 2018 in Paris (International Palaeontological Congress).

5.2. The Visean-Serpukhovian Boundary:

A potential index for the Viséan-Serpukhovian Boundary definition, the first evolutionary occurrence of the conodont *Lochriea ziegleri* Nemirovskaya, Perret & Meischner, 1994 in the lineage *Lochriea nodosa* (Bischoff, 1957) –*Lochriea ziegleri*, has been selected, but not voted on by the task group and SCCS for final approval. Work is well advanced at two prime GSSP candidate sections: the Naqing (Nashui) section in southern Guizhou, China and the Verkhnyaya Kardailovka in the southern Ural Mountains of Russia.

In south China, the boundary index – the FAD of *L. ziegleri* has been precisely located in the Naqing section (Qi *et al*., 2013; Chen *et al*., 2016). A manuscript titled "Conodonts of the genus *Lochriea* near the Viséan-Serpukhovian boundary (Mississippian) at the Naqing section, Guizhou Province, South China" by Yuping Qi, Tamara Nemyrovska, Qiulai Wang, and Keyi Hu is nearing completion. Their study enables confirmation and refinement of known lineages

within the genus, and two lineages are proposed: 1) noded *Lochriea* species, such as *L. mononodosa–L. nodosa–L. ziegleri, L. senckenbergica* and *L. multinodosa*, and 2) ridged *Lochriea* species such as *L. monocostata–L. costata–L. cruciformis*. In addition, the foraminifera *Janishewskina delicata* (Malakhova, 1956), an auxiliary index to the base of the Serpukhovian, has also been found by Dr. Qingyi Sheng (Ph.D. dissertation) at 2.15 m above the FAD of *L. ziegleri* in the Naqing section. In the Verkhnyaya Kardailovka section, the task group completed sedimentologic, paleontologic, and stable isotope studies across the boundary level and presented their work in a comprehensive work (Richards *et al.*, in press). The publication confirmed results by the task-group members in previous reports Nikolaeva *et al.* (2014, 2009) and demonstrated the boundary level, defined by the FAD of *L. ziegleri*, lies in stylonodular, deep-water, pelagic carbonate lithofacies between 19.53 and 19.63 m (midpoint 19.58 m) above base of the Kardailovka section. The report by Richards *et al.* (in press) included preliminary $\delta^{13}C_{carb,}$ $\delta^{18}O_{carb,}$ and $\delta^{18}O_{apatite}$ studies across the boundary.

In the Cantabrian Mountains of northwest Spain, work continued on the Millaró and Vegas de Sotres sections, two other potential candidate sections for the GSSP. A detailed description of the Vegas de Sotres section was provided by Cózar et al. (2016), and the location of the Viséan/Serpukhovian boundary and correlations with the Venevian to the Protvian are based mainly on foraminifer occurrences. In the Millaró section, the precise first occurrence of conodont *Lochriea ziegleri* just above *L. nodosa* has been located by Drs. Javier Sanz-López and Silvia Blanco-Ferrera. Furthermore, some faunas of ostracodes from the Alba Formation at the Triollo section were recently described (Sánhez de Posada et al., 2016).

5.3. The Bashkirian-Moscovian boundary:

The best potential indexes for defining the Bashkirian-Moscovian boundary include First Appearance Datum (FAD) of conodonts *Declinognathodus donetzianus* Nemirovskaya, 1990 or *Diplognathodus ellesmerensis* Bender, 1980, although the official criterion has not been selected and voted on. In the Basu River section, group members have done substantial works on the conodont and foraminifer fauna, and recognized an evolutionary lineage of *Declinognathodus marginonodosus-D. donetzianus* and the first appearance of the fusulinid *Profusulinella prisca* a few meters below that of *D. donetzianus*. It might be a good candidate for a GSSP, but is now fully covered. Russian colleagues are currently looking for a new suitable section in adjacent area. In the Naqing (Nashui) section, the *D. donetzianus* is absent, and the first appearance of conodont *D. ellesmerensis*, which has a broader global distribution, has been considered as the marker event for this boundary. The ancestral species is being intensively studied and its evolutionary first occurrence would provide an ideal GSSP to define the boundary.

5.4. The Kasimovian-Gzhelian boundary:

Task group members of establishing the Kasimovian-Gzhelian boundary agreed to use the FAD of the conodont *Idiognathodus simulator* s.s. (Ellison, 1941) as the definition of the base of the Gzhelian since 2008, however, its ancestral species is still not well known. Sino-US colleagues (Profs. Yuping Qi and James Barrick) are currently working on large conodont collections, recovered from the continuously deposited and fully exposed deep-water Carboniferous successions at Naqing (Nashui), to gain a better understanding of the evolutionary lineage of conodont fauna around this boundary. In 2013 and 2014, sedimentologic and stable-isotope geochemical researches at Naqing were initiated by Dr. Jitao Chen and Isabel Montanez.

5.5. International conference:

"Uppermost Devonian and Carboniferous carbonate buildups and boundary stratotypes" and field trip to visit the upper Devonian-Carboniferous reef buildups of the Bolshoi Karatau Mountains in South Kasakhstan were co-organized by K.I. Satpayev Institute of Geological Sciences and SCCS during August 15-22, 2017. Approximate 40 participants, including 4 current voting members and former SCCS chair Dr. Barry Richard, attend the meeting and visit the pre-reef, reef and post-reef Upper Devonian (Famennian) and Carboniferous deposits in the north-western part of the Bolshoi Karatau Mountains. These successions also expose boundaries of the Carboniferous stages. For detailed information on the abstracts and fieldtrip guidebook, please check our official website under the subsection 'Publications - Conference Abs&Guide'.

5.6. The Kazan Golovkinsky Stratigraphic Meeting:

During September 19-23, 2017, the Kazan Golovkinsky Stratigraphic Meeting joint with Fourth All-Russian Conference "Upper Palaeozoic of Russia" was held in Kazan, Russia, covering all aspects of Carboniferous and Permian stratigraphy, bioevents, taxonomy, nonmarine-marine correlation, the evolution of sedimentary basins and their resources etc. The aims of the meeting were to provide a platform for discussion of research fields and for international exchange of ideas between research groups working on the Carboniferous and Permian periods. The meeting included three days of oral and poster presentations and several days of field trips to the Carboniferous and Permian outcrops of Volga Region. Many SCCS members attended this meeting and presented their latest research results, e.g. the problems of the Bashkirian/Moscovian boundary (Alexander S. Alekseev), the fusulinids data from Bashkirian/Moscovian boundary interval of Basu section (Elena I. Kulagina) and the updated Carboniferous chronostratigraphic scheme of China (Xiangdong Wang). Their abstracts were published in the conference abstract volume (Nurgaliev et al., eds., 2017).

5.7. Mississippian Stratigraphy and International Cooperation:

From Oct. 26th to Nov. 6th, guided by Dr. Paul Brenckle, SCCS chair Dr. Xiangdong Wang and his Nanjing colleagues Drs. Yuping Qi, Qingyi Sheng and Le Yao had a field trip of the Mississippian Subsystem in its type region in North America, the Mississippi River Valley of Illinois, Missouri, and Iowa. Twenty-seven classic exposures along the Mississippi River from north of Burlington, Iowa, to southern Illinois contain all formations of the Kinderhookian, Osagean, Meramecian, and Chesterian stages, in ascending order. This field trip familiarizes Chinese group in general with the important lithostratigraphic and biostratigraphic information on the Mississippian stratotype, and will help them develop further research on global correlation and Carboniferous GSSPs.

Publications related to the Carboniferous stratigraphy:

Corranidi, C., Spalletta, C., Mossoni, A., Matyja, H., Over, D. J., 2016. Conodonts across the Devonian/Carboniferous boundary: a review and implication for the redefinition of the boundary and a proposal for a updated conodont zonation. Geological Magazine, Doi: 10.1017/S001675681600039X

Cozap, P., Somerville, I.D., Sanz-Lopez, J., Blanco-Ferrera, S. (2016). Foraminiferal biostratigraphy across the Visean/Serpukhovian boundary in the Vegas de Sotres section (Cantabrian Mountains, Spain). Journal of Foraminiferal Research 46, 171–192

Hu Keyi, Qi Yuping. 2017. The Moscovian (Pennsylvanian) conodont genus *Swadelina* from Luodian, southern Guizhou, South China. Stratigraphy 14 (1-4): 197-215.

Nurgaliev, D., Silantiev, V. & V. Zharinova (eds.) (2017): Kazan Golovkinsky Stratigraphic Meeting -2017 and Fourth All-Russian Conference "Upper Palaeozoic of Russia", Upper Palaeozoic Earth systems high-precision biostratigraphy, geochronology and petroleum resources. – Abstract Volume, Kazan University Press, Kazan, 232 p.s

Sanchez De Posada, L.C., Blanco-Ferrera, S., Sanz-Lopez, J. (2016). On some bythocytherid (Ostracoda) from the Viséan of Triollo (N Palencia, Cantabrian Mountains, Spain). Spanish Journal of Palaeontology 31, 221–230

Spalletta, C., Perri, M.C., Over, D.J., Corradini, C., 2017. Famennian (Upper Devonian) conodont zonation: revised global standard. Bulletin of Geosciences 92, 31-57.

Wang Qiulai, Wang Yue, Qi Yuping, Wang Xiangdong, Choh Suk-Joo, Lee Dong-Chan & Lee Dong-Jin. 2017. Revised conodont and fusuline biostratigraphy of the Bamchi Formation (Pyongan Supergroup) at the Bamchi section, Yeongwol and the Carboniferous–Permian boundary in South Korea. Alcheringa. Doi. 10.1080/03115518.2017.1395077

6. SUMMARY OF INCOME IN 2017

Prepared by Prof. Xiangdong Wang, Chair of SCCS (Accounts maintained in U.S dollar)

Funds carried forward from 2016	$1,732
ICS Grant	**$800**
TOTAL INCOME	$2,532

7. SUMMARY OF EXPENDITURE IN 2017:

Prepared by Prof. Xiangdong Wang, Chair of SCCS (Accounts maintained in U.S dollar)

Travel and conference registration support for SCCS Vice-Chair	$500
Support for the International conference "Uppermost Devonian and Carboniferous carbonate buildups and boundary stratotypes" in Almaty and Turkestan, Kazhakstan (August 15-22, 2017)	$1,232
SCCS Newsletter 2017 editing, printing, and mailing	$450
TOTAL EXPENDITURE	$2,182

8. BUDGET FROM ICS IN 2018

PROJECTED EXPENSES	
Support for voting members, executive, and students to participate in 5th IPC, in Paris, France	$3,000
SCCS Newsletter 2018 editing, printing, and mailing	$450
TOTAL PROJECTED EXPENSES	$3,450
INCOME	
Carryover (from CREDIT balance of 2017 fiscal year)	$350
Estimated donations	$00.00
TOTAL PROJECTED INCOME	$350
BALANCE	
Estimated (deficit) /credit from above	-$3,100

BUDGET REQUEST FROM ICS for 2018	$3,100

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

- A final report in Episodes needs to be published for the chosen GSSP of the Tournaisian-Viséan boundary in the Pengchong section, southern China, following its approval by the SCCS in late 2007 and its ratification by the ICS and IUGS.
- An index for the Viséan-Serpukhovian boundary needs to be voted on by the task group and SCCS in the next year.
- In 2017, many VMs and CMs will meet in Paris at the 5th IPC in June, we will have a Carboniferous session.

10. OBJECTIVES AND WORK PLAN FOR NEXT 4 YEARS (2016-2020)

- 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 GSSPs ratified in the next four years.
- 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 organize at least one academic activity each year, either a workshop (maybe combined with conferences) or joint workshop/field excursion.
- To establish working groups on dividing the Tournaisian and Viséan stages because both of them represent too much time.
- 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 Paleobiology Database (a large compilation of data about fossils) at the University of Wisconsin-Madison, and other major databases, to facilitate the studies on Carboniferous biota and stratigraphy.

APPENDIX (Names and Addresses of Current Officers and Voting Members)

In addition to the three executive voting members, the SCCS has sixteen rank-and-file voting members.

Officers:

Chair: Dr. **Xiangdong Wang**

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Vice-Chair: Dr. **Svetlana Nikolaeva**

1) Department of Earth Sciences, the Natural History Museum, London, SW7 5BD UK;
2) UK & Paleontological Institute Russian Academy of Sciences Profsoyuznaya ul., 123, Moscow, 117997 Russia; E-mail: s.nikolaeva@nhm.ac.uk

Secretary: Dr. Wenkun Qie

Key Laboratory of Economic Stratigraphy and Palaeogeography,Nanjing Institute of Geology and Palaeontology, CAS, 39 East Beijing Rd. Nanjing, Jiangsu 210008, China; Tel: 086-025-83284308; E-mail: wkqie@nigpas.ac.cn

List of Regular Voting Members:

Dr. Alexander Alekseev, Geology Faculty, Lomonosov Moscow State University, 119991 Moscow GSP-1 Russia; E-mail: aaleks@geol.msu.ru

Dr. Markus Aretz, Université de Toulouse (UPS), GET (OMP), 14, avenue Edouard Belin31400 Toulouse, France; Tel: +33 5 61 33 26 74; E-mail: markus.aretz@get.omp.eu

Dr. Ondrej Bábek, Department of Geological Sciences, Masaryk University of Brno, Kotlarska 2, 61137 Brno, Czech Republic; E-mail: babek@sci.muni.cz

Dr. Zhong-Qiang Chen, State Key Laboratory of Biology and Environmental Geology, China University of Geosciences (Wuhan), 388 Lumo Road, Wuhan 430074, China; E-mail: zhong.qiang.chen@cug.edu.cn

Dr. Natalva V. Goreva, Geological Institute, Russian Academy of Sciences, Pyzhevsky per. 7109017 Moscow, Russia; E-mail: goreva@ginras.ru

Dr. Hans-Georg Herbig, Universität Köln, Institut für Geologie und Mineralogie, Zülpicher Strasse 49a, D-50674 Köln, Germany; Tel: +49 221 470-2533; E-mail: herbig.paleont@uni-koeln.de

Dr. Tatiana Isakova, Geological Institute, Russian Academy of Sciences, Pyzhevsky per. 7 109017 Moscow, Russia; E-mail: isakova@ginras.ru

Dr. Vera A. Konovalova, Russian Academy of Sciences, Profsoyuznaya 123 117997 Moscow, Russia; E-mail: konovalovavera@mail.ru

Dr. Lance L. Lambert, Department of Geological Sciences, University of Texas at San AntonioSan Antonio, TX 78249; Tel: +1(210) 458-5447; E-mail: lance.lambert@utsa.edu

Dr. Spencer G. Lucas, New Mexico Museum of Natural History and Science, 1801 Mountain Road N. W., Albuquerque, New Mexico 87104-1375 USA; Tel: 505-841-2873; Fax: 505-841-2808; E-mail: spencer.lucas@state.nm.us

Dr. Bernard Mottequin, Royal Belgian Institute of Natural Sciences, O.D. Earth and History of Life, rue Vautier 29, B 1000 Brussels, Belgium; E-mail: bmottequin@naturalsciences.be

Dr. Edouard Poty, Service de Paléontologie animale, Universitè de Liège, Bât. B18, Sart Tilman, B-4000 Liège, Belgium; E-mail: e.poty@ulg.ac.be

Dr. Yuping Qi, Nanjing Institute of Geology and Paleontology, No. 39 East Beijing Rd. Nanjing, Jiangsu 210008, China; E-mail: ypqi@nigpas.ac.cn

Dr. Javier Sanz-López, Department of Geology, University of Oviedo, Arias de Velasco s/n 33005 Oviedo, Spain; E-mail: jasanz@geol.uniovi.es

Dr. Katsumi Ueno, Department of Earth System Science, Fukuoka University, Fukuoka 814-0180 JAPAN; E-mail: katsumi@fukuoka-u.ac.jp

Dr. David M. Work, Maine State Museum, 83 State House Station, Augusta, ME 04333-0083; Tel: (207) 287–6635; Fax: (207) 287–6633; E-mail: david.work@maine.gov

Working group leaders and corresponding members

The SCCS has six current task groups and two exploratory project groups:

a. The joint Devonian-Carboniferous Boundary GSSP Reappraisal Task Group

Chair: Markus Aretz, Université de Toulouse (UPS), GET (OMP), 14, avenue Edouard Belin 31400 Toulouse, France; Tel: +33 5 61 33 26 74; Email: markus.aretz@get.omp.eu

Vice-Chair: Carlo Corradini,Dipartimento di Scienze Chimiche e Geologiche, Università di Cagliari, via Trentino 51, I-09127 Cagliari, Italy; E-mail: corradin@unica.it

b. Task Group to establish the Tournaisian-Viséan Boundary

Chair: George Sevastopulo, Department of Geology, Trinity College Dublin, Dublin, Ireland; E-mail: gsvstpul@tcd.ie

c. Task Group to establish the Viséan-Serpukhovian Boundary

Chair: Barry Richards, Geological Survey of Canada-Calgary, 3303-33rd St. N.W. Calgary, Alberta, Canada T2L 2A7, Tel: 1 (403) 292-7153; Fax: 1 (403) 292-4961; E-mail: barry.richards@canada.ca

d. Task Group to establish the Bashkirian-Moscovian Boundary

Chair: Alexander Alekseev, Geology Faculty, Lomonosov Moscow State University, 119991 Moscow GSP-1 Russia; E-mail: aaleks@geol.msu.ru

e. Task Group to establish the Moscovian-Kasimovian Boundary

Chair: Katsumi Ueno, Department of Earth System Science, Fukuoka University, Fukuoka 814-0180 JAPAN; E-mail: katsumi@fukuoka-u.ac.jp

f. Task Group to establish the Kasimovian-Gzhelian Boundary

Chair: Katsumi Ueno, Department of Earth System Science, Fukuoka University, Fukuoka 814-0180 JAPAN; E-mail: katsumi@fukuoka-u.ac.jp

g. Project Group on Carboniferous magnetostratigraphy

Chair: Mark W. Hounslow, Department: Lancaster Environment Centre, Lancaster University, Lancaster, United Kingdom LA1 4YQ; Tel: +44 (0)1524 510238; E-mail: m.hounslow@lancaster.ac.uk

h. Project Group on Carboniferous and Permian Nonmarine and Marine Correlations

Chair: Jörg W. Schneider, TU Bergakademie Freiberg, Geologisches Institut, Bereich Paläontologie/Stratigraphie, Bernhard-von-Cotta-Strasse 2, 09599 Freiberg, Germany;Tel.: +49 (0)3731-39-2856; E-mail: Joerg.Schneider@geo.tu-freiberg.de