1. TITLE OF CONSTITUENT BODY and NAME OF REPORTER

SUBCOMMISSION ON CARBONIFEROUS STRATIGRAPHY

ICS ANNUAL REPORT **2014,** SUBMITTED BY: Barry C. Richards, Chairman of SCCS; Geological Survey of Canada-Calgary, 3303-33rd St. N.W., Calgary, Alberta, Canada; Office Phone: 1 (403) 292-7153; Cell Phone: 1 (403) 650-3682; Fax: 1 (403) 292-6014; Email: barry.richards@canada.ca

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

The SCCS promotes and coordinates international cooperation among various geologic specialists for the purpose of defining standard global chronostratigraphic boundaries within the Carboniferous System. The GSSP for the Devonian-Carboniferous boundary is at La Serre in southern France (Paproth & Streel, 1984; Paproth *et al*., 1991), and the Carboniferous-Permian boundary GSSP at the top has been selected in northern Kazakhstan (Davydov *et al*., 1998). The Mid-Carboniferous boundary GSSP is preserved in Arrow Canyon, Nevada, U.S.A. (Lane *et al.*, 1999; Richards *et al*., 2002a), and it subdivides the Carboniferous into two subsystems, the Mississippian Subsystem below and the Pennsylvanian Subsystem above. The immediate SCCS goals are to redefine the Carboniferous-Devonian boundary and select the best stage boundaries within the two Carboniferous subsystems to facilitate global correlation within the system.

3a. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN November 1st 2013 - October 31st 2014 fiscal year

Task Group Progress Reports

The references for the task-group reports are provided after Appendix A.

The joint Devonian-Carboniferous Boundary GSSP Reappraisal Task Group [base of Carboniferous is also the base of Lower Mississippian Series and Tournaisian Stage] was established in early 2008 and is chaired by Markus Aretz (France; aretz@get.obs-mip.fr).

Introduction and general activities

The Devonian-Carboniferous (D-C) boundary task group is conducting paleontological and multi-disciplinary research on several continents. During the fiscal year, the group continued with it primary tasks (see Richards & task group, 2010; Aretz, 2011) – the search for a suitable criterion for redefinition of the D-C boundary and the hunt for a suitable section for the GSSP. Studies by Ji *et al*. (1989) and subsequent analysis (Kaiser, 2009) demonstrated severe problems exist with the D-C boundary GSSP (Paproth *et al*., 1991) at La Serre Hill, France. The boundary at La Serre is currently defined by the first occurrence of the conodont *Siphonodella sulcata* (Huddle, 1934) in the lineage *Siphonodella praesulcata* Sandberg, 1972 to *S. sulcata.*

The task group on the Devonian-Carboniferous boundary was not very active in the last fiscal year, mainly due to the important work load of the task-group members including the task-group leader. However, individual members continue to work and publish results of their research. These are important contributions, since it will help the task group to progress in the next years. The task group agreed during the workshop at Erfoud, Morocco in 2013 to compile detailed data sets for the best boundary sections throughout the world and to start to correlate these sections. This aim for 2014 was not achieved, but it remains the prime target and duty for the next year since it is the basis for any successful work in the future.

Reports from Task-Group members

Barry Richards (Calgary, Canada)

Richards & colleagues (Mark Schmitz and Vladimir Davydov at Boise State, Idaho; Jeffrey Over at SUNY-Geneseo, New York; Tim Hartel, Calgary) continued studies of the upper Famennian to lower Tournaisian (includes Exshaw and Bakken formations) in the Western Canada Sedimentary Basin (WCSB) and adjacent Montana to see if the main events in the multi-phase Hangenberg Event Interval (Kaiser *et al*., 2008), can be more precisely located in the region using a multidisciplinary approach

combining U-Pb radiometric dating (Thermal Ionization Mass Spectrometry CA-TIMS), stable carbon isotope chemostratigraphy ($\delta^{13}C$), conodont biostratigraphy, and magnetic susceptibility. Activities included continued processing of volcanic ash collected from the Exshaw and Banff during previous years for U-Pb dating and the additional sampling of the Exshaw black shale at outcrop sections in the southern Canadian Rockies for stable carbon isotope ($\delta^{13}C$) chemostratigraphic and magnetic susceptibility studies. Samples have been submitted from the three sections for stable carbon isotope studies but the analyses require completion to determine the location of the typical positive ($\delta^{13}C$) excurion at the onset of the Hangenberg Event.

Task Group to establish the Tournaisian-Viséan Boundary [which is also the base of the Middle Mississippian Series] is chaired by George Sevastopulo (Ireland; gsvstpul@tcd.ie).

Following approval of the proposed GSSP (Devuyst *et al.*, 2003) at Pengchong in southern China, by the SCCS and its ratification by the ICS and IUGS, task-group member François-Xavier Devuyst had been preparing the final report about the Tournaisian-Viséan boundary GSSP but the task-group chairman George Sevastopulo has taken over that role. Substantial progress has been made with writing the final report on the base of the Viséan and Sevastopulo plans to complete a draft during the 2015 fiscal year. The report provides a brief resume of the GSSP and then lists the successful attempts to identify the boundary in Eurasia by Jiri Kalvoda and others, and discusses the problems of identifying (and best approximation to) the boundary in North America and Gondwana. It also includes contributions by relevant paleontological experts on the up-to-date knowledge of the ranges of different fossil groups over the boundary interval, which is useful because many taxa that were considered to be of early Viséan age are actually restricted to the latest Tournaisian or first occur there.

Task Group to establish the Viséan-Serpukhovian Boundary [which is also the base of the Upper Mississippian Series] is chaired by Barry Richards (Canada; barry.richards@canada.ca).

Introduction

An index for boundary definition has been selected and work is well advanced at the two prime GSSP candidate sections: the Verkhnyaya Kardailovka in the southern Ural Mountains of Russia and the Naqing (Nashui) section in southern Guizhou Province, China. 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. For boundary definition, the group is using the first evolutionary occurrence of the conodont *Lochriea ziegleri* Nemirovskaya, Perret & Meischner, 1994 in the lineage *Lochriea nodosa* (Bischoff, 1957) –*Lochriea ziegleri. L. ziegleri* appears in the Brigantian Substage of NW Europe somewhat below the current base of the Serpukhovian as defined by its lectostratotype section in the Zaborie quarry in the Moscow Basin, Russia (Kabanov *et al*., 2009, 2012, 2013). The appearances of *Asteroarchaediscus postrugosus* (Reitlinger, 1949), *Janischewskina delicate* (Malakhova, 1956), "*Millerella*" *tortula* Zeller, 1953 and *Eolasiodiscus donbassicus* Reitlinger, 1956 are useful auxiliary indices to the base of the Serpukhovian. It is anticipated the work by Paul Brenckle using material from several new sections (including those by villages of Luokun, Narao, and Dianzishang) in addition to those at Naqing and Yashui will permit a more precise correlation based on foraminifers. During 2015 the task group plans to vote on accepting or rejecting the FAD of *L. ziegleri* for boundary definition.

Important accomplishments in 2014 were: 1) the completion of a manuscript by Nemirovska *et al*. (in progress) titled "Conodonts of the genus *Lochriea* near the Viséan/Serpukhovian boundary (Mississippian) at the Naqing section, Guizhou Province, south China". That study enables confirmation and refinement of known lineages within the genus, and two lineages are proposed: a) the noded *Lochriea* species *L. mononodosa–L. nodosa–L. ziegleri, L. senckenbergica* and *L. multinodosa*, and b) the ridged *Lochriea* species *L. monocostata–L. costata–L. cruciformis*. 2) the publication of a paper about the conodonts of the genus *Lochriea* in Ireland and recognition of the Viséan-Serpukhovian boundary (Barham *et al.*, 2014), and 3) the publication of two papers about the upper Viséan and Serpukhovian in the Moscow Basin: a) one about the sequences, disconformities and

biostratigraphy (Kabanov *et al*., 2014a) and b) a second about the geochemistry and magnetic susceptibility in the type area of the Serpukhovian Stage in the Moscow Basin, Russia (Kabanov *et al*., 2014b).

Progress in southern Guizhou province, China

A comprehensive study on the biostratigraphy, sedimentology and geochemistry of the upper Viséan to Serpukhovian succession in south China is being undertaken in order to obtain a detailed understanding about the evolutionary change of the biota and global correlations across the Viséan/Serpukhovian boundary. The studied sections include limestone-dominated, shallow-marine Yashui section and deep-water (slope) Naqing, Narao, Luokun, and Dianzishang sections. Detailed conodont and foraminiferal biostratigraphy across the Viséan/Serpukhovian boundary intervals in the Luokun and Narao sections is being done at a bed-by-bed level of detail. Foraminiferal stratigraphy across the Viséan/Serpukhovian boundary intervals in the sections is being studied intensively by Qingyi Sheng and Paul Brenckle. Preliminary stable carbon isotope work reveals a negative carbon isotope excursion shortly above the FAD of *Lochriea ziegleri* in the Naqing, Narao and Luokun sections.

An important discovery made at the Naqing, Narao and Luokun sections was the discovery of several volcanic ash beds in the upper Viséan and another in the lower Serpukhovian. Numerous zircons have been extracted from the ash samples and are being processed in the U.S.A. by Jitao Chen and Isabel Montanez with the ID-TIMS U-Pb age dating method.

Progress in Moscow Basin, Russia

The conodont record in the Upper Viséan and Serpukhovian of the Moscow Basin was revised. In the Novogurovsky quarry section near Moscow, *Lochriea* aff. *ziegleri* Nemirovskaya, Perret & Meischner, 1994 was documented from the lower Venevian Substage and *Lochriea ziegleri* was recorded in the upper Venevian (Kabanov *et al*., 2014a). These results are compatible with those of Skompski *et al*. (1995), who recorded *L. ziegleri* from a correlative stratigraphic position in the middle Brigantian (upper Viséan) in Western Europe.

Progress in South Urals, Russia

Biostratigraphic, sedimentologic and geochemical studies continued at the Verkhnyaya Kardailovka section in the southern Urals. The conodont work resulted in the placing the FAD of *Lochriea ziegleri* at 19.63 m above the base of the section, which is 7 cm lower than previously reported by Nikolaeva *et al*. (2014). Studies of conodont biofacies using a quantitative analysis of the relative abundance of *Gnathodus bilineatus* (Roundy) (a relatively deep-water species), *G. girtyi* Hass (a relatively shallow-water species), and *Vogelgnathus* (unknown ecology) suggest maximum water depths across the boundary interval were attained during deposition of the 19.00 – 19.20 m interval in the section. Sedimentologic considerations place it somewhat lower (16.45 m) at the transition from dark-grey laminated limestone to the overlying light-grey nodular limestone.

Michael Joachimski completed the preliminary phase of his stable oxygen isotope study using elements of the conodont *Gnathodus bilineatus* (Roundy) in 14 samples spanning the upper Viséan/Serpukhovian boundary interval. The $\delta^{18}O$ show a slow upward shift to heavier values through the boundary interval with a more rapid upward rate of increase at the level 19.43 – 19.53 m, close to the transition from the thin-bedded to nodular limestone. The Verkhnyaya Kardailovka section will be demonstrated during a field trip for the XVIII ICCP in 2015.

Task Group to establish the Bashkirian-Moscovian Boundary [which is also the base of the Middle Pennsylvanian Series] is chaired by Alexander Alekseev (Moscow State University, Russia; aaleks@geol.msu.ru).

During the 2014 fiscal year, continued progress was made toward the selection of a marker species and suitable section for the GSSP at the base of the Moscovian Stage. One fusulinid species *Depratina prisca* (Deprat) and two conodont species *Declinognathodus donetzianus* Nemirovskaya, 1990 and *Diplognathodus ellesmerensis* Bender, 1980 appear to have substantial potential for definition of a

boundary position close to the original base of the type Moscovian but the task group thinks the FAD of the conodont *D. ellesmerensis* has the best potential. *D. ellesmerensis* is easily recognized by conodont workers and has been recovered from China, Western and Eastern Europe (Moscow Basin and South Urals), boreal Canada, and South America. That makes it one of the most widely recovered conodont species in the Upper Carboniferous. In former years it was thought that *Diplognathodus coloradoensis* Murray & Chronic, 1965 was the immediate ancestor of *D. ellesmerensis*; however, additional work on ancestry of *D. ellesmerensis* is required. Several candidate sections for the GSSP are being studied but the Naqing section in southern Guizhou province of south China appears to have the best potential (Qi *et al*., 2010, 2013).

Moscow Basin

The recent suggestion (Goreva & Alekseev, 2012; Alekseev & Goreva, 2013) to shift the base of the Moscovian one substage higher - from the base of the Vereian regional Substage (lowermost Moscovian substage of stratotype in Moscow Basin) to the base of Kashirian regional Substage using the first appearance of the conodont *Neognathodus bothrops* Merrill, 1972 - received negligible support from the task group and will not receive further evaluation.

Guizhou Province, South China

Task-group members Qi Yuping, Tamara Nemyrovska, and Lance Lambert continued to study the Bashkirian/Moscovian interval in the deep-water (slope), limestone-dominated Naqing (Nashui) section in south China. All conodont genera known to have numerous species in the late Bashkirian to early Moscovian are recorded in the Naqing section and nearby sections. The conodont genera include *Declinognathodus, Diplognathodus, Gondolella, Idiognathodus, Idiognathoides, Mesogondolella, Neognathodus,* and *Neolochriea*. In the Naqing section, many species of these genera provide a succession of conodont chronomorphoclines throughout the B/M boundary interval. They demonstrate that deposition was remarkably continuous through the turbidite-dominated Bashkirian-Moscovian boundary interval boundary interval, which is a major criterion for selecting a GSSP. More specimens of *Diplognathodus ellesmerensis* and its ancestral forms were found from both the Naqing section and the Luokun section in Guizhou during the last fiscal year. The lineage of *D. ellesmerensis* from its ancestral species is being intensively studied and its evolutionary first occurrence would provide an almost ideal GSSP to define the base of the global Moscovian Stage. Jitao Chen is conducting integrated research on sedimentology and stable-isotope geochemistry for the Bashkirian-Moscovian boundary interval in the Naqing section, with Isabel Montanez.

Task group to establish the Moscovian–Kasimovian [which is also the base of the Upper Pennsylvanian Series], and the **Kasimovian–Gzhelian boundaries** is chaired by Katsumi Ueno (Japan; katsumi@fukuoka-u.ac.jp).

In the 2014 fiscal year, the search continued for an index within an evolutionary lineage for definition of the base of the Kasimovian. For that boundary, the use of the FAD of the conodont *Idiognathodus heckeli* Rosscoe & Barrick, 2013 shows great potential and is being tested prior to final approval. The first appearance datum (FAD) of a conodont has been formally selected for defining the base of the Gzhelian Stage (Heckel *et al*., 2008; Villa *et al*., 2009) and the search for a suitable section for the GSSP continued.

MOSCOVIAN-KASIMOVIAN BOUNDARY

As potential marker events for defining the base of the Kasimovian Stage, Villa and the task group (2008) proposed using the FADs of the conodont *Idiognathodus sagittalis* Kozitskaya, 1978 or *Idiognathodus turbatus* Rosscoe & Barrick, 2009a. Their occurrence (near base of Khamovnikian Substage, the second substage of the Kasimovian) is approximately one substage higher than the traditional base of the Kasimovian (base of Krevyakinian Substage). A new option, discussed below, is to use the first occurrence of *Idiognathodus heckeli* Rosscoe & Barrick, 2013, which is closer to the traditional base.

Progress in North America

Rosscoe & Barrick (2013) documented in detail the morphological transition from *Idiognathodus swadei* Rosscoe & Barrick, 2009a to *Idiognathodus heckeli* Rosscoe & Barrick, 2013 (the transitional form) to *I. turbatus* in the North American Midcontinent succession. The steps in this lineage occur in the offshore-marine intervals within a succession of successive cyclothems resulting from eustasy (Rosscoe & Barrick, 2009b). Rosscoe & Barrick suggested that using the FAD of *I. heckeli,* the precursor species to *I. turbatus*, would be more appropriate for boundary definition than use of *I. turbatus,* because it will bring the stage base closer to the traditional base of the Kasimovian.

Progress in South China

The morphological transition discussed above also occurs in the condensed, deep-water (comprises limestone slope turbidites) Naqing (Nashui) section of southern Guizhou province in south China. A conodont evolutionary lineage of *Idiognathodus swadei – I. heckeli – I. turbatus* was established in the Moscovian–Kasimovian boundary interval of the Naqing section, southern Guizhou province. *I. heckeli*, with a complete eccentric groove on the platform, was named by Rosscoe and Barrick (2013) based on materials from North America, and was suggested to be a suitable bio-marker for the base of the Kasimovian. The Naqing section was studied intensively during the last five years and the exact FADs of *I. turbatus* and *I. heckeli* established on bed-by-bed collections. The documentation of this lineage containing *I. heckeli* in the limestone-dominant Naqing section, which appears to lack substantial breaks resulting from either erosion or nondeposition, makes it a good potential candidate section for the GSSP at the base of the Kasimovian.

The conodont and fusulinid biostratigraphy of the nearby Narao section, deposited in somewhat shallower slope settings than the Naqing section, is being intensively studied.

Progress in Russia

During 2014, Alekseev and Goreva continued their studies of the *Idiognathodus turbatus* and *I. sagittalis* as a possible markers for the base of the Kasimovian Stage. Their lineages are diverse, but mainly evolving in relatively deep water settings, as in the Stsherbatovka section in Oka–Tsna Swell (Ryazan Region, Russia). Alekseev and Goreva started describing conodonts from the Afanasievo section and Perkhurovo and Ilinsky Pogost bore-holes, which cover the lower half of the Kasimovian in its type area in the Moscow Basin. They plan to show the Afanasievo section as the Kasomovian Neostratotype during a field trip of the August 2015 XVIII ICCP in Kazan. At this moment, they considered that the mid-Khamonvnikian Substage is the best potential level for the fixation of the base-Kasimovian boundary.

KASIMOVIAN-GZHELIAN BOUNDARY

After fixing the base of the Gzhelian Stage by using the first appearance datum of the conodont *Idiognathodus simulator* (Ellison, 1941) *s.s.* in its potential lineage *Idiognathodus eudoraensis - I. simulator* (Heckel *et al*., 2008; Villa *et al*., 2009), the task group is directing research toward selecting a section for the GSSP.

Progress in Russia

For the base of the Gzhelian, conodonts from the Usolka section (South Urals) are being studied in detail by Guzel Sungatullina (Kazan Federal University, Russia). The section was once proposed as a potential candidate of GSSP for the base of the Gzhelian Stage (Davydov *et al*., 2008). Later the boundary interval became covered by soil and vegetation and was poorly exposed when members of the SCCS inspected it in 2009. In 2013-2014, the Moscovian – basal Gzhelian interval at Usolka was newly exposed and about 70 new conodont samples collected. Because the rocks are siliceous, the processing of samples for conodonts is proceeding slowly, but the first result show that conodont zones similar to those established in the Moscow Basin are possibly recognizable in the Usolka section. In this section, the basal Gzhelian contains forms close to *Idiognathodus simulator*, but its ancestor *I. eudoraensis* has not been found. Alexander Alekseev expects the results of Gusel's study to be sufficient to propose using the Usolka section as a potential GSSP candidate for the base of the Gzhelian. The Usolka section will be demonstrated during a field trip of XVIII ICCP in 2015.

Progress in South China

Detailed investigations on conodonts across the Kasimovian–Gzhelian boundary interval in the Naqing section and nearby Narao section in southern Guizhou was conducted by Wang Qiulai and Qi Yuping in 2014. Many additional conodont specimens were obtained from new collections from both sections. The conodont fauna from Narao is enriched and more diverse than that of the Naqing section. In the Naqing section, *I. simulator* first appears in 255.55-255.75 m level and ranges upwards in a 3 m thick stratigraphic interval with its possible morphological variations. The underlying 1.5 m thick interval (254~255.55 m level), previously considered to be barren, yielded some small conodont specimens, thereby enabling the recognition of a continuous evolutionary lineage from *I. eudoraensis* to an unnamed new species, then to *I. simulator* in the section. Recently, Wang Qiulai (2013: unpublished Master thesis) established a new conodont succession across the Kasimovian–Gzhelian boundary of the Naqing section, including the *I. guizhouensis* Zone, *I. eudoraensis* Zone, *Streptognathodus zethus* Zone, *I. simulator* Zone, *I. nashuiensis* Zone, and *S. virgilicus* Zone in ascending order.

The Narao section contains abundant and diverse conodont specimens across the boundary interval. In that section, *I. simulator* first occurs at the 229.61 m level and ranges upwards in about a 4 m thick stratigraphic interval. Qi and his colleagues plan to continue with detailed studies in the coming years to better understand both conodont and fusulinid evolutionary changes across the Kasimovian–Gzhelian boundary interval in the Narao section. Sedimentologic and stable-isotope geochemical investigations are being done by Chen Jitao and Isabel Montanez on both the Moscovian–Kasimovian and Kasimovian–Gzhelian boundary intervals in the Naqing and Narao sections.

The Project Group on Carboniferous Magnetostratigraphy, chaired by Mark Hounslow (United Kingdom) m.hounslow@lancaster.ac.uk.

The magnetostratigraphy project group was formed in 2004 and chaired by Mark Hounslow to research the potential for identifying correlatable magnetostratigraphic events in the Carboniferous. Hounslow (2009) reported on some aspects of this approach in the 2009 issue of the Carboniferous Newsletter. Progress by the magnetostratigraphy project group has been hampered by a shortage of members and lack of integration with the activities of the other SCCS task groups.

There has been considerable progress in refining and integrating the magnetostratigraphy previously obtained from the Maritime Provinces in Canada and the Mauch Chunk Formation in the Appalachian Basin of the eastern USA by integrating magnetostratigraphy with palynostratigraphy through the work of Opdyke *et al*. (2014). An integrated graphical summary compiled from sections and sources described in their study with existing magnetostratigraphic data from lavas in the Asbian-Brigantian substages described in Hounslow *et al*. (2004) demonstrates a clear and validated pattern of polarity changes through the Brigantian, Pendleian and lower Arnsbergian substages (late Visean and Serpukhovian), from several overlapping sections. The data are predominantly from red-bed alluvial facies, with the sub-stage divisions related to the spore zones of eastern Canada (Utting *et al.* 2010). The Asbian-Brigantian boundary is not well defined, but occurs in the lower part of the Mauch Chunk sections measured. The position of this boundary, proposed by Opdyke *et al.* (2014) appears to approximately concur with the polarity pattern across this boundary seen in the British lava successions (data reviewed in Hounslow *et al*. 2004).

Opdyke *et al*. (2014) clearly identify the base of the Kiaman reverse superchron in the *Raistrickia saetosa* biozone (approximately near the base of the Langsettian substage), which they place at ~318 Ma using the 2012 timescale of Davydov *et al*. (2012). This date agrees closely with the base of the Kiaman Superchron identified in Australia where the normal polarity Wanganui Andesite Member (U-Pb date of 319.2 ± 2.8 Ma), is succeeded by the reversed polarity (within the base of the Kiaman Superchron) Peri–Eastons Arm Rhyolite (U-Pb date of 317.8 ± 2.8 Ma; Opdyke *et al*. 2000).

The new work shows potential to link the boundaries of the polarity chron MI12, in the late Brigantian to the Serpukhovian task forces debate about the definition of the GSSP at the base of the

Serpukhovian. It is clear that the geomagnetic polarity stratigraphy as published in the 2012 timescale volumes (Davydov *et al*., 2012) bears little resemblance to the detailed work of Opdyke *et al.* (2014), which brings into question the reliability of the old Russian data (reviewed by Hounslow *et al*. 2004), on which the 2012 polarity timescale was constructed.

New palaeomagnetic and magnetostratigraphic data from Billefjorden on Spitsbergen across the Serpukhovian-Bashkirian boundary (Iosifidi & Khramov, 2013), bears some similarity to the polarity pattern shown in Fig. 1 of Hounslow (in progress), with normal polarity dominating the lower Bashkirian. Unfortunately, insufficient section stratigraphic details, limits any more direct comparisons. The Serpukhovian- Bashkirian interval has also recently been studied in the Tengiz reservoir (Kazakhstan), where a geomagnetic polarity stratigraphy has contributed to a detailed chronostratigraphic sub-division of the reservoir units (Ratcliffe *et al*. 2013). Hopefully this work will eventually be published, and develop the magnetostratigraphic pattern through the Mississippian - Pennsylvanian boundary.

The Project Group on Carboniferous and Permian Nonmarine and Marine Correlations, chaired by Jörg W. Schneider (Germany) Joerg.Schneider@geo.tu-freiberg.de

Last year, during the International meeting on the Carboniferous and Permian Transition in Albuquerque, New Mexico, the chairs of the Subcommissions on Carboniferous and on Permian Stratigraphy, Barry Richards and Shuzhong Shen, agreed to organize a joint working group on the global correlation between Carboniferous and Permian marine and nonmarine deposits. As the kickoff for this working group, a Field Meeting on Carboniferous and Permian Nonmarine – Marine Correlation was held at the Technische Universität Bergakademie Freiberg, Germany from July 21 to July 27, 2014. The principal organizers were Jörg W. Schneider, Spencer G. Lucas, and Olaf Elicki.

The meeting brought together about 64 geological scientists who were interested in the correlation of Carboniferous, Permian and Early Triassic continental deposits with the global marine scale. The subject of the meeting was the use of any and all correlative age-relevant data from marine and nonmarine deposits for the solution of the above mentioned problem. In particular, the workers from the various continental basins were asked to promote their detailed local and regional knowledge toward the aims of the project group. Reports about methods, results and perspectives of nonmarine correlations and nonmarine – marine intra-basinal and inter-basinal correlation were presented. The meeting provided an opportunity to develop cooperative research projects for the solution of central problems that are suited to raise funds from various national and international sources for the realisation of the group's goals.

Presentations at the 2014 Freiberg meeting indicated reliable correlations between nonmarine and marine successions could be achieved through the use of several methods including palynological studies, U-Pb dating, and stable-isotope geochemical studies. Marine microfossils fossils, particularly ostracodes, foraminifers and conodonts, could be used to a limited extent in sections where marine and nonmarine strata intertongue.

RESULTS FROM CONFERENCES AND FIELD MEETINGS NOVEMBER 1ST, 2013 - OCTOBER 31ST, 2014

There were several geological conferences, field meetings, and workshops that were of substantial importance and interest for SCCS members but the two most significant meetings were 1) the Kazan Golovkinsky Stratigraphic Meeting 2014, held on the 20-23 of October 2014 in Kazan, Russia and 2) the Field Meeting on Carboniferous and Permian Nonmarine-Marine Correlation, which was a joint meeting of the SCCS and SPS held in Freiberg, Germany on the 21-27 of July, 2014.

The Golovkinsky Stratigraphic Meeting covered all aspects of Carboniferous and Permian stratigraphy, bioevents, and the evolution of sedimentary basins and their resources. 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 served as a platform for organizing the field trips and technical sessions at the August 2015 XVIII ICCP in

Kazan. The meeting included one day of presentations and several days of business meetings and workshops including a meeting of the Working Group on the stratigraphy of oil-and-gas bearing reservoirs of the late Paleozoic. Geoscientists were invited to present contributions on a wide range of topics similar to those that will be covered by the 2015 XVIII ICCP in Kazan.

The Freiberg meeting included two days of oral and poster presentations and five days of field trips to the most important Carboniferous and Permian outcrops in East Germany and the Czech Republic. Several members of the SCCS task groups and corresponding members presented the results of recent work and their abstracts were published in the conference abstract volume (Elicki *et al*., eds., 2014). An important field guidebook presenting substantial information about the Carboniferous and Permian in eastern Germany and the Czech Republic was also published (Schneider *et al*., eds., 2014). Presentations at the meeting indicated reliable correlations between nonmarine and marine successions could be achieved by using several methods including palynological studies, U-Pb dating, and stable isotope geochemical studies. Marine microfossils, particularly ostracodes, foraminifers and conodonts, could be used to a limited extent in sections where marine and nonmarine strata intertongue.

The Project Group on Carboniferous and Permian Nonmarine and Marine Correlations held their first general business meeting at the conference and the key points will be summarized in the next issue of the Newsletter on Carboniferous Stratigraphy. One of the main goals of the project group at the meeting was to establish work plans for the next two to four years on the basis of the presentations and discussions.

3b. Output

The **Newsletter on Carboniferous Stratigraphy, Volume 31**, published in August, 2014 and available for download from our website www.stratigraphy.org/carboniferous/index.asp includes commentaries by the SCCS executive on various current issues, summaries about field meetings and workshops, reports of the task groups for November 1st 2012 to October 31st 2013, and articles on various topics of interest. Volume 31 also contains a revised directory for the corresponding membership. The newsletter provides a significant outlet for timely presentation and discussion of useful information relating to boundary selection, often from areas that are not typically covered in other journal venues. During the last fiscal year, task-group and corresponding members published a number of papers in refereed journals and in abstract volumes associated with conventions. Many of the most important of these publications are cited in the progress reports included in this Annual Report. Some of the most important outputs during the year are:

BARHAM, M., MURRAY, J., SEVASTOPULO, G.D. & M. WILLIAMS (2014): Conodonts of the genus *Lochriea* in Ireland and the recognition of the Viséan-Serpukhovian (Carboniferous) boundary. – *Lethaia*, DOI: 10.1111/let.12096.

KABANOV, P.B., ALEKSEEV, A.S., GIBSHMAN, N.B., GABDULLIN, R.R. & A. BERSHOV, A., (2014a): The upper Visean-Serpukhovian in the type area for the Serpukhovian Stage (Moscow Basin, Russia): Part 1. Sequences, disconformities, and biostratigraphic summary. – *Geological Journal*, DOI: 10.1002/gj.2612.

KABANOV. P.B., ALEKSEEV, A.O. & T. ZAITSEV (2014b): The upper Visean-Serpukhovian in the type area for the Serpukhovian Stage (Moscow Basin, Russia): Part 2. Bulk geochemistry and magnetic susceptibility. – *Geological Journal*, DOI: 10.1002/gj.2623.

OPDYKE, N.D. GILES, P.S. & J. UTTING (2014): Magnetic polarity stratigraphy and palynostratigraphy of the Mississippian-Pennsylvanian boundary interval in eastern North America and the age of the beginning of the Kiaman. - *Geological Society of America Bulletin*, **126**: 1068-1083.

SCHNEIDER, J., OPLUSTIL, S., & F. SCHOLZE eds. (2014): CPC-2014 Field Meeting on Carboniferous and Permian nonmarine-marine correlation.- Excursion Guide, *Institut für Geologie, Technische Universität Bergakademie Freiberg*, Wissenschaftliche Mitteilungen, **46**: 121 p.

3c. CHIEF PROBLEMS ENCOUNTERED IN 2014

Several ongoing problems confronted the SCCS task groups during the fiscal year but the most significant issue confronting the SCCS has been the difficult and time-consuming task of locating suitable evolutionary lineages and first occurrences for boundary definition. Within the Carboniferous,

the endemism of conodont, foraminiferal and ammonoid lineages between Eurasia and North America continues to hamper the choice of the boundary levels for the Viséan-Serpukhovian and Bashkirian-Moscovian boundaries. The problem is being overcome somewhat by correlating other fossil groups to bracket the boundary levels in major regions where the boundary-event taxa have not been found. Progress by the project group on Carboniferous magnetostratigraphy has been hampered by a shortage of members, insufficient funding, and a lack of integration with the activities of the other task groups.

Essentially all lineages being chosen for GSSP definition are conodont based and have the most utility in carbonate-dominant lower-slope and basin deposits containing few other taxa than ammonoids that are suitable for global correlations. The best of the known deeper water successions, in terms of abundance and diversity of conodonts and continuity of outcrop, are in southern China and the southern Urals. The direction the current work of the SCCS is advancing indicates all of the remaining GSSPs will be placed in south China and Russia. Additional suitable sections, even if they just become reference sections, should be located and intensively studied in Western Europe, northern Africa/Middle East, and North America.

4a. WORK PLANS, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2015)

The following activities are planned for the Nov. 1, 2014 to Oct 31, 2015 fiscal year by the task groups, as communicated by task-group chairs and distilled from the reports in # 3a above.

Our principal mandate

The establishment of GSSPs for the Carboniferous and its main subdivisions is our principle mandate from the ICS. During the current four-year term, the ICS executive wants to have the SCCS establish GSSPs for as many of the Carboniferous Stage boundaries as possible. At present, GSSPs need to be established for the Viséan-Serpukhovian, Bashkirian-Moscovian, Moscovian-Kasimovian and Kasimovian-Gzhelian boundaries. In addition, the GSSP at the base of the Tournaisian has been reassessed and both a new marker event and a new section will probably be required for that boundary. Based on the information our task-group leaders have provided us in the last two issues of the SCCS annual report to the International Commission of Stratigraphy and volume 31 of the Newsletter on Carboniferous Stratigraphy, we are confident that during the next four years GSSPs can be established for most of the boundaries with the possible exception of the base of the Tournaisian.

Within the next two years, we think it will be possible to select the boundary defining events for all of the stage boundaries with the exception of the base of the Tournaisian and then direct full effort toward selecting sections for the GSSPs. At present, most SCCS task groups have selected an event to define their respective boundary and held a successful vote on it (Kasimovian-Gzhelian task group) or have located an event and are preparing proposals in preparation for taking the proposal to ballot.

Task-group and project-group work plans

The joint Devonian-Carboniferous Boundary GSSP Reappraisal Task Group A biostratigraphic analysis by Ji Qiang and his colleagues (Ji *et al*., 1989) and further work (Kaiser, 2009) indicates there are problems with the D-C Boundary GSSP (Paproth *et al*., 1991) at La Serre, France and the conodont lineage used for boundary definition. Therefore, the primary tasks for the D-C boundary task group are to locate a suitable event marker to define the boundary and then find a suitable section for the GSSP. To help achieve these goals, work in 2015 will focus on the compilation of detailed data sets for the best boundary sections throughout the world. Data to be integrated will be derived from the evaluation of lithology and facies, distribution of fauna and flora, and geochemical and geophysical data. Markus Aretz, the task-group chairman, plans to have the task group evaluate the results of the compilations at Devonian/Carboniferous boundary workshops held at two important conferences in 2015:1) the August XVIII International Congress on the Carboniferous and Permian in Kazan, Russia, and 2) the 2nd International Congress on Stratigraphy (STRATI 2015) in Graz, Austria during July 2015. Results of the workshops will provide future direction for the task group.

Considerable progress on re-evaluating all of the conodonts within the D-C boundary interval including the current D-C boundary marker, the FAD of the conodont *S. sulcata,* has been made in recent years (Corradini *et al*., 2013). Additional study of the conodonts is required, however, and the task group plans to complete that work shortly. Several task-group members have also been studying the taxonomic and phylogenetic problems within the protognathodid conodont lineages. Four species of *Protognathodus* are known from the relevant time span: *Protognathodus meischneri, P. collinsoni, P. kockeli,* and *P. kuehni.* Markus Aretz has asked the conodont specialists to evaluate the utility of using the conodonts for boundary definition by studying them in the best of their D-C boundary sections.

At recent meetings, it has been proposed that the task group consider using some component of the multiphase Hangenberg Event Interval (Kaiser *et al*., 2008) for boundary definition. Markus Aretz asked members to prepare for the D-C boundary workshop in Erfoud Morocco (March 22nd to 29th, 2013; see circular in v 29 of Newsletter on Carboniferous Stratigraphy), by developing precise correlation charts for the best D-C boundary sections in their regions of study showing the biostratigraphic, geochemical and depositional events within the Hangenberg Event interval. Markus Aretz is requesting the work on the data sets be completed for the 2015 workshops that will be held at the August XIVIII ICCP in Kazan, Russia and the July (STRATI 2015) in Graz, Austria.

Several of the ongoing D-C boundary projects that are planned for next four to five years are outlined below. 1) Yuriy Gatovsky and Lyudmila Kononova (Moscow State University) plan to complete a monograph on the conodont biostratigraphy of D-C boundary interval in the Ural Mountains of Russia. 2) Chinese colleagues along with the SCCS executive and task-group leaders initiated a re-assessment of the best D-C boundary sections in China by visiting the Dapoushang section (Ji *et al*., 1989) in southern Guizhou Province. 3) Task-group member Jiri Kalvoda & colleagues from the Czech Republic are conducting a multidiscipline project to study the D-C boundary interval in Western and Central Europe including the La Serre section. The project's principal goal is the correlation of evolutionary changes in foraminifer and conodont faunas in the D-C boundary interval with a high-resolution stratigraphic framework arising from multidiscipline stratigraphic-paleoenvironmental analysis. Anticipated benefits of the project are a better understanding of the *S. praesulcata - S. sulcata* lineage and whether or not it is suitable for definition of the D-C Boundary GSSP. Other conodont lineages relevant to the boundary (protognathodids lineages) will also be evaluated. The resulting high-resolution stratigraphy will be used to test the isochroneity of the events within the Hangenberg Event Interval. 4) In western Canada, Barry Richards and several colleagues (include Mark Schmitz and Vladimir Davydov at Boise State, Idaho; Jeffrey Over at SUNY-Geneseo, New York; Tim Hartel, Calgary) intend to continue ongoing studies of the latest Famennian to early Tournaisian Exshaw Formation (see Richards *et al*., 2002b) and its correlatives to see if the main events in the Hangenberg Event Interval can be more precisely located in the formation by using an approach that includes radiometric dating and stable carbon isotope ($\delta^{13}C$) stratigraphy. 5) Carlo Corradini has several ongoing projects related to the D-C boundary study in various part of northern Gondwana. 6) Thomas Becker (Münster) and his research group plan to continue their investigation of the D-C boundary transition in Morocco, particularly in the SE Anti-Atlas Mountains.

Task Group to establish the Tournaisian-Viséan Boundary The task group plans to continue with preparation of the final manuscript for the project. George Sevastopulo, the task group chairman, is leading that work.

Task Group to establish the Viséan-Serpukhovian Boundary The task group has determined that the FAD of the conodont *Lochriea ziegleri* in the lineage *Lochriea nodosa–Lochriea ziegleri* is the best index for boundary definition and is drafting a proposal for discussion at a workshop associated with the XVII ICCP in Kazan, Russia in August 2015. During the 2015 fiscal year, the team will continue to direct its attention toward selecting the best candidate section for the GSSP. The best two candidate

sections are the Naqing (Nashui) section by the village of Naqing in southern Guizhou Province, China and the Verkhnyaya Kardailovka section on the Ural River in southern Russia.

Activities in South China

The deep-water (slope), carbonate-dominant Naqing section in southern China is an excellent candidate for the GSSP at the base of the Serpukhovian because the *L. nodosa–L. ziegleri* lineage is well defined and the FAD of *L. ziegleri* has been precisely located. The section also contains volcanic ash layers near the boundary level. The conodont studies for the locality are essentially complete and the FAD of *L.* ziegleri has been precisely located (Qi *et al*., 2010; 2013). Qi Yuping and Tamara Nemyrovska plan to complete their manuscript on the systematics and phylogeny of conodonts within the genus *Lochriea* from the Naqing section. Paul Brenckle is continuing with the study of foraminifers in the Naqing section and several other sections in the region including the important Yashui and Dianzishang sections (see Groves *et al*. 2012).

Work on the sedimentology, stable-isotope geochemistry, and geophysical characteristics of the boundary interval are less advanced than the paleontological investigations and will be the focus of the team's work in the next two fiscal years. To place the Naqing section into its sedimentologic and paleoenvironmental context and to determine the relationship of shallow-water coral zones to the deeper-water *L. nodosa* - *L. ziegleri* transition in south China, the investigation of four reference sections - the Yashui, Dianzishang, Luokun, and Narao sections - will continue.

Activities in Southern Urals, Russia

The Kardailovka section, a deep-water, basinal-carbonate succession on the Ural River near the village of Verkhnyaya Kardailovka in the Urals remains the other strong candidate for the Viséan-Serpukhovian boundary GSSP because it contains conodonts of the *L. nodosa-L. ziegleri* transition, abundant ammonoids, and moderately common foraminifers. Conodonts, foraminifers and ammonoids in the section have been studied in detail (Nikolaeva *et al*., 2009; Pazukhin *et al*., 2010) but additional work across the boundary level is required. Sufficient conodont work has been done to precisely locate the position of the FAD of the conodont *L. ziegleri*.

Work on the sedimentology, stable-isotope geochemistry and geophysical characteristics of the section are somewhat less advanced than the paleontological work and will be a focus of the team's investigations in 2015. The team will be showing the section on a fieldtrip for the XVIII International Congress on the Carboniferous and Permian in Kazan, Russia in August 2015. The Kardailovka section contains numerous volcanic ash layers near the boundary level and the task group is having the most important ashes dated using the U-Pb isotope dilution thermal ionization mass spectrometry (ID-TIMS) methodology.

Task Group to establish the Bashkirian-Moscovian Boundary The task group plans to continue evaluating conodont lineages suitable for definition of the Bashkirian-Moscovian boundary and it is anticipated that during the 2015 fiscal year a lineage and taxon suitable for boundary definition will be selected. The group also plans to continue its search for suitable GSSP candidate sections particularly in south China and the southern Urals.

A major effort will be devoted to study of the conodonts within the Bashkirian-Moscovian transitional interval in the Naqing (Nashui) section and nearby sections in southern Guizhou Province, south China. Special attention will be directed toward the study of the lineage containing *Diplognathodus ellesmerensis* Bender 1980, the taxon considered to have the best potential for boundary definition. Qi Yuping, Tamara Nemyrovska, and Lance Lambert are doing the detailed taxonomy work on the conodonts from the Bashkirian-Moscovian boundary interval in the Naqing section. In former years, it was thought that *Diplognathodus coloradoensis* (Murray & Chronic, 1965) was the immediate ancestor of *D. ellesmerensis*. Instead, the ancestor is likely to be a new species and its taxonomic status needs to be proven. *D. ellesmerensis* appears a little above the FAD of *Declinognathodus donetzianus* Nemirovskaya, 1990 in the Donets Basin, Ukraine. If the ancestry of *D. ellesmerensis* is established in time, the group will plan to prepare a proposal for using this taxon for

boundary definition and hold discussions and possibly a vote during the business meeting at the XVIII International Congress on the carboniferous and Permian in Kazan, Russia in 2015.

Work on the sedimentology, stable-isotope geochemistry, and geophysical characteristics of the boundary interval in the Naqing and nearby sections are not as advanced as the paleontological investigations and need to be a focus of the team's work in 2015.

Task group to establish the Moscovian–Kasimovian and the Kasimovian –Gzhelian boundaries

MOSCOVIAN-KASIMOVIAN BOUNDARY

Until the 2013 fiscal year, the task group had concluded the first appearance datums (FADs) of either *Idiognathodus sagittalis* Kozitskaya, 1978 or *Idiognathodus turbatus* Rosscoe & Barrick, 2009b had the best potential as a marker for the base of the Kasimovian (Villa & task group, 2008; Ueno & task group, 2011). Now, a slightly lower level defined by the first occurrence of *Idiognathodus heckeli* Rosscoe & Barrick, 2013, which is considered as the direct ancestor of *I. turbatus* is newly proposed as a more appropriate position of the potential base of the Kasimovian. The group plans to prepare a proposal for using *I. heckeli* taxon for boundary definition and vote on it or at least discuss the proposal during their business meeting at the XVIII International Congress on the Carboniferous and Permian in Kazan, Russia in 2015.

After such a proposal is made and voted on, additional taxonomic work and comparison of morphotypes from different regions can be continued.

Activities in southern China

During the last several years, Qi Yuping & James Barrick intensively studied conodonts from the uppermost Moscovian to lower Gzhelian slope carbonates in the Naqing (Nashui) section, southern Guizhou Province (Qi *et al*., 2007; Barrick *et al*., 2010). A conodont evolutionary lineage of *Idiognathodus swadei – I. heckeli – I. turbatus* was established in the Moscovian–Kasimovian boundary interval of the Naqing section, southern Guizhou province and during future studies they will consider the FAD of *Idiognathodus heckeli* as the potential boundary marker. They will continue with studies to provide more detailed information on the conodont succession across the Moscovian-Kasimovian boundary in the Naqing section and several other limestone-dominated, turbiditic sections in the region as a potential GSSP candidate sections. Work on the sequence stratigraphy, sedimentology, stable-isotope geochemistry, and geophysical characteristics of the Moscovian-Kasimovian boundary interval at Naqing is less advanced than the paleontological investigations and will be a focus of the team's field work in 2015 and future years.

To place the Naqing section into its sedimentological and paleoenvironmental context and determine the relationship of shallow-water coral, conodont and foraminiferal zones to the deeper-water conodont markers within the Moscovian-Kasimovian transition in south China, the investigation of reference sections including the Zhongdi (Ueno *et al*., 2007), Luokun, and Narao sections will continue. Foraminifers are more abundant and better preserved than at Naqing and it is anticipated that a better correlation between conodonts and foraminifers can be achieved by the study of the other sections.

Activities in Moscow Basin, Russia

The task group will continue to study the conodonts *Idiognathodus turbatus* and *I. sagittalis* as possible markers for the base of the Kasimovian Stage in the Moscow Basin. They are going to show the Afanasievo section (Goreva *et al*., 2009) as the Kasomovian Neostratotype during a field trip of the XVIII ICCP in 2015. At this moment, they considered that the mid-Khamonvnikian Substage is the best potential level for the fixation of the base-Kasimovian boundary.

KASIMOVIAN-GZHELIAN BOUNDARY

Since 2007, when the task group voted in favor of using the first appearance of the conodont *Idiognathodus simulator* (Ellison, 1941) in the lineage *Idiognathodus eudoraensis - I. simulator* as the boundary-defining event (Heckel *et al*., 2008), the search for a suitable section for the GSSP has been the task-group's main objective, and will continue to be so in 2015.

Activities in Russia

The Usolka section in the southern Ural Mountains of Russia was proposed as a candidate section for the GSSP at the base of the Gzhelian (Chernykh *et al.*, 2006; Davydov *et al*., 2008) but examination by members of the SCCS on a field trip to the locality in 2009 revealed the section required substantial new lithostratigraphic, sedimentologic and conodont-based biostratigraphic work before it could be considered as a candidate section. During 2013-2014, the section was extensively excavated to improve exposure and was resampled for conodonts. Gusel Sungatullina (Kazan University) has been reevaluating the conodonts from the newly-exposed Usolka section and will continue that work in 2015. Alexander Alekseev anticipates her results will permit the Usolka section to be considered as a GSSP candidate for the base of the Gzhelian.

Activities in China

Yuping Qi and colleagues will continue their investigation across the proposed Kasimovian-Gzhelian boundary level in the Naqing and Narao sections in Guizhou Province, south China. At the Naqing and Narao sections in Guizhou Province, south China, Qi and his colleagues are going to continue with detailed studies in the coming years to better understand both the conodont and fusulinid evolutionary changes across the Kasimovian–Gzhelian boundary interval. Sedimentologic and stable-isotope geochemical investigations are being done by Chen Jitao and Isabel Montanez.

The Project Group on Carboniferous Magnetostratigraphy During the last several years there was considerable progress in refining and integrating the magnetostratigraphy previously obtained from the Maritime Provinces in Canada and the Mauch Chunk Formation in the Appalachian Basin of the eastern USA by integrating magnetostratigraphy with palynostratigraphy through the work of Opdyke *et al*. (2014). The project group's main efforts will be to extend the pattern established in Canada and the USA, to fill the data gap occupied by the Mississippian-Pennsylvanian disconformable boundary in North American sections, and to extend the polarity pattern down into the Viséan and Tournaisian. The project group is planning for a United Kingdom-based project that will include Andy Biggin of Liverpool and Mark Hounslow of Lancaster to undertake some of this task as part of a bigger geodynamic modelling project. The group plans to start the project in early 2016. Kate Ziegler [ZGC, New Mexico] is planning on some re-evaluation of the Pennsylvanian –Permian boundary strata in central New Mexico by searching for an original hematite magnetization.

The Project Group on Carboniferous and Permian Nonmarine and Marine Correlations The project group plans to continue their work on the correlation of the system and stage boundaries into the vast successions of Carboniferous and Permian continental deposits. During the first part of the fiscal year, important goals are to establish the membership of the project group and develop cooperative research projects for the solution of central problems, which are suited to raise funds from various national and international sources for the realisation of our aims.

Meeting-field workshop schedule with themes and anticipated results During the November 1, 2014 - October 31, 2015 fiscal year, there will be several conferences and field meetings in which the SCCS membership will participate but the most important two are the 2nd International Congress on Stratigraphy (STRATI 2015) in Graz, Austria during July, and the August XVIII International Congress on the Carboniferous and Permian (XVIII ICCP) in Kazan, Russia.

At the July meeting in Graz, Markus Aretz, the chairman of Task Group to redefine the Devonian-Carboniferous Boundary, plans to have the group evaluate the results of multi-discipline compilations made by most of the task-group members over the last two years. Results of the workshop will provide future direction for the task group.

All of the SCCS task groups and project groups will hold workshops and business meetings at our important quadrennial meeting, the August XVIII ICCP; in addition, the SCCS will hold a general business meeting at the conference. Many of our members will be deeply involved with the congress organization, leading field trips and giving presentations. The first circular was published in volume 31

of the Newsletter on Carboniferous Stratigraphy and the second circular will be ready in late 2014 to early 2015. Contact: iccp2015@ksu.ru; Website: http://www.iccp2015.ksu.ru

4b. Specific GSSP Focus for 2015

Viséan-Serpukhovian boundary

5. SUMMARY OF EXPENDITURES IN 2014: STATEMENT OF OPERATING ACCOUNTS FOR NOVEMBER 1st, 2013 TO OCTOBER 31st, 2014

Prepared by Barry Richards, Chairman SCCS

(Accounts maintained in Canadian currency)

INCOME (November 1, 2013 – October 31, 2014)	
IUGS-ICS Grant – May 6, 2014: $2,333.00 US =$2,482.31 Canadian	$2,482.31
Donations from Members; November 1, 2013 - October 31 2014	$0.00
Interest Bank of Montreal; November 1, 2013 - October 31, 2014	$0.00
TOTAL INCOME	$2,482.31
EXPENDITURES (November 1, 2013 – October 31, 2014)	
Bank Charges: Bank of Montreal	$0.00
Travel and conference registration support for SCCS voting members and executive to attend and give presentations (Freiberg, Germany meeting; Russian field trip organization for XVIII ICCP in 2015)	$1,500.00
TOTAL EXPENDITURE	$1,500.00
BALANCE SHEET (2013 – 2014)	
Funds carried forward from October 31, 2013	$706.62
Plus Income November 1, 2013 – October 31, 2014	$2,482.31
Total assets	**$3,188.93**
Less Expenditures November 1, 2012 – October 31, 2013	$1,500.00
BALANCE CARRIED FORWARD (to Nov. 1, 2014 - Oct. 31, 2015 fiscal year)	**$1,688.93**

6. BUDGET AND ICS COMPONENT FOR Nov. 1, 2014 - Oct. 31, 2015 fiscal year

PROJECTED EXPENSES	
Support for voting members to participate in July STRATI 2015 conference in Graz, Austria and August 2015, XVIII ICCP in Kazan, Russia	$1500.00
TOTAL PROJECTED EXPENSES	$1,500.00
INCOME	
Carryover (from CREDIT balance at end Nov. 1, 2013 - Oct. 31 2014 fiscal year)	$1,688.93
Estimated donation	$100.00
TOTAL PROJECTED INCOME	$1,788.93
BALANCE	
Estimated (deficit) /credit from above	$288.93
BUDGET REQUEST FROM ICS for 2015	$1,500.00

APPENDIX A

7. SUMMARY OF CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2010-2014)

Background: A vote by the ICS in late 1999 resulted in approval of the names Mississippian and Pennsylvanian along with a reconfirmation of the previous decisions of the SCCS to regard their rank as subsystems. In 2003 the SCCS voted to classify the two subsystems into Lower, Middle, and Upper Mississippian Series and Lower, Middle, and Upper Pennsylvanian Series, by a 74% majority of those 90% of the total membership who voted. This vote with its implicit acceptance of the stage names used in Russia as the global stage names for the Carboniferous now provides the Carboniferous with its

official global series and stage names (Heckel & Clayton, 2006a, 2006b), and effort is now focused on selecting events and GSSPs for stage boundaries.

The joint Devonian-Carboniferous Boundary GSSP Reappraisal Task Group Studies by Ji *et al*. (1989) and subsequent analysis (Kaiser, 2009) demonstrated problems exist with the Devonian-Carboniferous Boundary GSSP (Paproth *et al*., 1991) at La Serre Hill, France. Because of the problems with the integrity of the GSSP, the Devonian-Carboniferous Boundary GSSP reappraisal task group was established in 2008.

Initial plans for future work by the task group were outlined in the 2008 SCCS Annual Report submitted to the ICS. The plan had three recommendations: 1) the use of the first evolutionary occurrence of the conodont *Siphonodella sulcata* (Huddle, 1934) in the lineage *S. praesulcata* Sandberg, 1972 to *S. sulcata* for boundary definition requires re-evaluation; 2) if the FAD of *S. sulcata* is retained for boundary definition, either the position of the GSSP at La Serre must be lowered or a more suitable section located, and 3) because the first appearance of *S. sulcata* may not be the best marker, other conodont lineages require evaluation.

Progress

The *S. praesulcata* to *S. sulcata* conodont lineage used to define the boundary has been re-evaluated by several scientists including Kaiser and Corradini (2011), and the protognathodids, the other conodont group that had shown potential for boundary definition is being re-studied (Corradini *et al*. 2011; Corradini *et al*., 2013). The conodont studies have been disappointing because it appears that neither the siphonodellid lineage nor the protognathodids are suitable for D-C boundary definition and other appropriate taxa have not been discovered. However, there is considerable disagreement among the conodont specialists about the utility of the siphonodellid lineage and the conclusions of Kaiser and Corradini (2011) require testing by other specialists before the FAD of *S. sulcata* is abandoned for boundary definition.

The multi-phase Hangenberg Event (Kaiser, 2005; Kaiser *et al*., 2008) has been identified as a level of interest for boundary definition. More data, however, on the precise timing of phases of the Hangenberg and the correlation of the biostratigraphic, geochemical, sedimentologic and sequence stratigraphic patterns within it are needed to evaluate the event's potential for boundary definition. To obtain a better understanding of the Hangenberg and its utility for boundary definition, group members have embarked on multi-disciplinary investigations aimed at understanding the event.

From the work completed through 2014, it is clear that the La Serre section is not suitable for the GSSP. A major issue is the base of bed 84b, which contains the FAD of *S. sulcata,* is a sharp facies change Kaiser (2009) and probably erosional; in addition, underlying strata lack the evolutionary lineage from *S. praesulcata* to *S. sulcata*. An event for boundary definition has not been chosen, but the search for better GSSP sections is progressing

Tournaisian-Viséan Boundary By 2003 work by the Tournaisian-Viséan Boundary task group progressed to the point that a proposal for the GSSP in south China was published (Devuyst *et al.*, 2003), unanimously approved by the SCCS, and ratified by the ICS and IUGS. Task-group Chairman George Sevastopulo is preparing the final report and plans to have it completed during the 2015 fiscal year.

Viséan-Serpukhovian Boundary The Viséan-Serpukhovian-Boundary task group plans to use the FAD of *Lochriea ziegleri* Nemirovskaya, Perret & Meischner 1994 in the conodont lineage, *Lochriea nodosa* (Bischoff, 1957) -*Lochriea ziegleri*, for boundary definition. The *L. nodosa-L. ziegleri* lineage has become widely recognized in Western Europe, Russia and Asia (Nikolaeva *et al*., 2009; Qi *et al*., 2013). A proposal for using *L. ziegleri* for boundary definition is being written in preparation for discussion at the 2015 XVIII ICCP in Kazan, Russia and a subsequent vote by the task group and SCCS. The task group has concluded the Naqing (Nashui) section in China and the Verkhnyaya Kardailovka section in Russia have the best potential as GSSP candidates.

The identification of the *Lochriea* lineage along with recognition of the conodont, ammonoid, ostracode, and foraminiferal zones in a deep-water (basinal), carbonate section by the village of Verkhnyaya Kardailovka on the eastern slope of the Russian Urals established that section as a strong candidate for a GSSP. The section has been thoroughly examined and synthesis published about the ammonoids, conodonts, and ostracodes (Pazukhin *et al*., 2010; Nikolaeva, 2013). Conodonts that are transitional between *L. nodosa* and *L. ziegleri* occur immediately below the FAD of *L. ziegleri.* Prior to 2010, extensive parts of the section were poorly exposed but from 2010 to 2012 the covered intervals were excavated and permanent aluminum marker pins placed at one metre intervals in preparation for a bed-by-bed sedimentologic analysis (Richards *et al*., in press) and the systematic sampling for conodonts, stable-isotope geochemistry and magnetic susceptibility studies, which were largely completed by 2014. An important development at the locality has been the discovery of volcanic ash layers below the proposed boundary level. Schmitz and Davydov (2012) dated an ash sample that was considered to lie 1.48 m below FOD of *Lochriea ziegleri*. Four dated zircons gave a weighted $^{206}Pb/^{238}U$ date of 333.87+/-0.08 Ma and that was interpreted as the eruptive age.

The Naqing (Nashui) section in southern Guizhou Province, China has become a strong potential candidate for a GSSP at the base of the Serpukhovian (Qi *et al.*, 2013) and conodonts spanning the Viséan-Serpukhovian boundary in the section have undergone intensive study. Conodonts within the *L. nodosa* - *L. ziegleri* lineage are well preserved and abundant. Elements transitional between *L. nodosa* and *L. ziegleri* are plentiful, occurring through several metres of section. A detailed stratigraphic section extending from the upper Viséan into the Bashkirian has been measured at Naqing and aluminum marker pins placed at one-metre intervals through the section. Bed-by-bed sampling for sedimentologic and geochemical analyses has been completed across the Viséan-Serpukhovian and Serpukhovian-Bashkirian boundaries and the samples are being processed. A study of the foraminifers (Groves *et al*., 2012) indicates they can be used to bracket the level of the FAD of *L. ziegleri* thereby facilitating correlations into shallow-water carbonate sections lacking diagnostic conodonts. The measurement and intensive study of several other sections (Yashui, Loukun, Narao, & Dianzishang sections) in the region from 2010 through 2014 is enabling the task group to place the Naqing section into its paleogeographic, stratigraphic, and lithofacies contexts. In 2014 at the Naqing, Narao and Luokun sections, several volcanic ash beds in the upper Viséan and another in the lower Serpukhovian were discovered. Zircons have been extracted from the ash samples and are being processed in the U.S.A. by Jitao Chen and Isabel Montanez with the ID-TIMS U-Pb age dating method.

Several sections span the Viséan-Serpukhovian boundary in the Cantabrian Mountains of Spain and two of those sections, the Vegas de Sotres and Millaró in the Alba Formation, are excellent deep-water carbonate sections rivaling the better known Kardailovka and Naqing exposures. In the Vegas de Sotres and Millaró sections, conodonts within the *L. nodosa* - *L. ziegleri* lineage are well preserved and abundant; in addition, the first occurrence of *L. ziegleri* has been located with moderate precision. A major biostratigraphic advantage of the two sections is the common occurrence of abundant, well-preserved ammonoids that are being studied by Svetlana Nikolaeva. The conodont biostratigraphy has been relatively well established in the two sections (Blanco-Ferrera *et al*., 2009) but the biostratigraphic and sedimentologic work at the two localities is less advanced than at the Naqing and Verkhnyaya Kardailovka sections.

By the end of the 2014 fiscal year, the lineage had not been identified in North America but *L. ziegleri* has been found in the Barnett Shale in Texas and other species of *Lochriea* have been identified at several localities. Work has been initiated on ammonoid-rich successions in the western U.S.A. (Korn & Titus, 2011) and on foraminifer- and coral-rich successions in western Canada in order to bracket the level of the first appearance of *L. ziegleri* in North America.

Bashkirian-Moscovian Boundary The conodonts *Diplognathodus ellesmerensis* Bender, 1980 and *Declinognathodus donetzianus* Nemirovskaya, 1990 are considered to have the best potential for boundary definition. A marker for the Bashkirian-Moscovian Boundary has not been selected and

voted on but there is a good chance a proposal can be developed advocating the use of *D. ellesmerensis* and discussed at workshops at the August 2015 XVIII ICCP in Kazan, Russia.

Substantial work has gone into evaluating the *Declinognathodus marginonodosus—D. donetzianus* lineage for boundary definition but the lineage appears to lack a sufficiently wide geographic distribution. Other conodont taxa and fusulinids are being used for correlations into successions where the latter lineage has not been located. For example, members reported the appearance of the distinctive *Profusulinella prisca* fusulinid group near this boundary level in Spain, Turkey, southern Urals, and possibly North and South America.

An evolutionary lineage of *Declinognathodus marginonodosus—D. donetzianus* occurs in the Basu River section in the southern Urals, which also contains rich foraminiferal faunas, and might be a candidate for a GSSP. The well exposed Basu section contains the first appearance of the fusulinid *Profusulinella prisca* a few metres below that of *D. donetzianus*. The discovery of the *Declinognathodus* lineage at the Basu River section along with a rich fusulinid fauna including the *P. prisca* group make it a good potential candidate section for a GSSP.

In the Naqing (Nashui) section of south China, Qi *et al.* (2007) reported the appearance with *D. donetzianus* of another conodont, *Diplognathodus ellesmerensis*, which has a broader more global distribution and would help identify the level of *D. donetzianus* in places where it is absent. Several task-group members have proposed that the first appearance of *D. ellesmerensis* be considered as the marker event for this boundary because of its distribution is broader than that of *D. donetzianus.* More specimens of *Diplognathodus ellesmerensis* and its ancestral forms were found in both the Naqing and Luokun sections in Guizhou during the 2014 fiscal year. The lineage of *D. ellesmerensis* from its ancestral species is being intensively studied and its evolutionary first occurrence would provide an almost ideal GSSP to define the base of the global Moscovian Stage.

A detailed stratigraphic section extending from the upper Serpukhovian into the Moscovian has been measured at Naqing and aluminum marker pins placed at one-meter intervals. Groves (2010) completed his study of the foraminifers in the Naqing section and presented the findings at the November 2010 SCCS workshop in Nanjing. The provisional Bashkirian-Moscovian boundary recognized by Qi *et al*. (2007) on the lowest occurrence of *Diplognathodus ellesmerensis* falls 173 m above the base of the section, a level containing a foraminiferal association dominated by *Profusulinella* spp. and *Pseudostaffella* spp.

Task group to establish the Moscovian–Kasimovian and the Kasimovian–Gzhelian boundaries

Moscovian-Kasimovian Stage boundary

The Moscovian-Kasimovian task group has extensively evaluated conodonts and fusulinoideans as indices for definition of the base of the Kasimovian and has concluded that conodonts present the best potential. Fusulinid workers have conceded that problems of provincialism across the boundary interval preclude the use of that group to define the boundary.

The first appearance datums (FADs) of *Idiognathodus sagittalis* Kozitskaya, 1978 and *Idiognathodus turbatus* Rosscoe & Barrick, 2009a have good potential as markers for the base of the Kasimovian (Ueno & task group, 2011). Their occurrence (near base of Khamovnikian regional Russian Substage, the second substage of the Kasimovian in current definition) is approximately one substage higher than the traditional base of the Kasimovian (base of Krevyakinian Substage). In 2013, a slightly lower level defined by the occurrence of *Idiognathodus heckeli* Rosscoe & Barrick 2013 is newly proposed as a more appropriate position of the potential base of the Kasimovian. *I. heckeli* is considered as the direct ancestor of *I. turbatus*,

In 2013 and 2014, Yuping Qi and colleagues discovered a conodont evolutionary lineage of *Idiognathodus swadei – I. heckeli – I. turbatus* in the Moscovian–Kasimovian boundary interval of the Naqing section, southern Guizhou province and during future studies they will consider the FAD of *Idiognathodus heckeli* as the potential boundary marker. In 2013 and 2014, sedimentologic and stable-

isotope geochemical investigations at the Naqing and Narao sections were initiated by Chen Jitao and Isabel Montanez.

Kasimovian-Gzhelian Stage boundary

Members of the Kasimovian-Gzhelian Boundary task group plan to use the FAD of the conodont *Idiognathodus simulator s.s.* (Ellison, 1941) in the lineage *Idiognathodus eudoraensis - I. simulator s.s.* to define the boundary (Heckel *et al.*, 2008; Barrick *et al*., 2008).

The search for a suitable candidate section for the GSSP has started with the investigation of three sections: the Usolka section in the southern Urals of Russia (Chernykh *et al*. 2006) and the Naqing and Narao sections in Guizhou Province, south China. In 2013-2014, the Usolka section, once proposed as a potential candidate of GSSP for the base of the Gzhelian Stage (Davydov *et al*., 2008), was extensively excavated to better expose the boundary level. Gusel Sungatullina (Kazan University, Russia) is investigating the conodonts from Usolka and Alexander Alekseev anticipates her results will permit the Usolka section to be considered once again as a GSSP candidate for the base of the Gzhelian.

The other potential candidate intervals for the GSSP lie within the Naqing (Nashui) and Narao sections in south China and are undergoing a thorough biostratigraphic, sedimentologic and geochemical investigation. Within the sections, the presence of the lineage containing *I. simulator* has been proven by Yuping Qi and his colleagues. Existing conodont collections from the Kasimovian-Gzhelian boundary interval at Naqing and Narao permit recognition of the boundary but are insufficient to make a complete description of the boundary conodont faunas. Yuping Qi & James Barrick are working on new and larger collections to obtain a more complete understanding of the fauna and enable a better evaluation of the section as a GSSP for the base of the Gzhelian. In 2013 and 2014, sedimentologic and stable-isotope geochemical investigations at the Naqing and Narao sections were initiated by Chen Jitao and Isabel Montanez.

Project Group on Carboniferous Magnetostratigraphy During the last several years, there was considerable progress in refining and integrating the magnetostratigraphy previously obtained from the Maritime Provinces in Canada and the Mauch Chunk Formation in the Appalachian Basin of the eastern USA by integrating magnetostratigraphy with palynostratigraphy through the work of Opdyke *et al*. (2014). An integrated graphical summary compiled from sections and sources described in their study with existing magnetostratigraphic data from lavas in the Asbian-Brigantian substages described in Hounslow *et al*. (2004) demonstrates a clear and validated pattern of polarity changes through the Brigantian, Pendleian and lower Arnsbergian substages (late Visean and Serpukhovian), from several overlapping sections. Opdyke *et al*. (2014) clearly identify the base of the Kiaman reverse superchron in the *Raistrickia saetosa* biozone (approximately near the base of the Langsettian substage), which they place at ~318 Ma using the 2012 timescale of Davydov *et al*. (2012).

The Project Group on Carboniferous and Permian Nonmarine and Marine Correlations The project group was established in 2014 and held a very successful conference and field meeting in Freiberg, Germany in July 2014. Presentations at the Freiberg meeting indicated reliable correlations between nonmarine and marine successions at stage and system boundaries could be achieved through the use of several methods including palynological studies, U-Pb dating, and stable isotope studies. Marine microfossils fossils, particularly ostracodes, foraminifers and conodonts, could be used to a limited extent in sections where marine and nonmarine strata intertongue.

Radiometric dating Precise radiometric U-Pb zircon dating (CA and ID-TIMS U-Pb methods) now being undertaken by several groups including the Permian Research Group at Boise State University on ash beds from the latest Devonian and Carboniferous successions in several basins has led to the precise dating and correlation of important Carboniferous events and assisted substantially with calibration of the Carboniferous time scale (Davydov *et al*., 2010; Schmitz & Davydov, 2012). Since ratification of the Tournaisian-Viséan boundary proposal in 2007, task-group chair George Sevastopulo and his students have been attempting to bracket the absolute age of the Tournaisian-

Viséan boundary in Europe by using the ID-TIMS U-Pb method of dating zircons from ash bands and plan to continue with that work.

8. OBJECTIVES AND WORK PLAN FOR NEXT 4 YEARS (2015-2018)

Within the next two years, we think it will be possible to select the defining events for all of the stage boundaries with the possible exception of the base of the Tournaisian and then progress toward selecting sections for the GSSPs. Most task groups have either selected an event to define their respective boundary and held a successful vote on it (Kasimovian-Gzhelian task group) or have located an event and are preparing proposals in preparation for taking the proposal to ballot (Viséan-Serpukhovian, and Moscovian-Kasimovian task groups).

The joint Devonian-Carboniferous Boundary GSSP Reappraisal Task Group The main four-year goal of the Devonian-Carboniferous Boundary task group is the selection of an event for defining the base of the Carboniferous because the current definition, the FAD of *Siphonodella sulcata* is apparently deficient. Following selection of the event, suitable candidate sections for the GSSP must be located.

Since the project was initiated in 2008, substantial progress has been made on evaluating potential conodont event markers. Corradini & Kaiser (2009) re-evaluated the *Siphonodella praesulcata* - *Siphonodella sulcata* lineage used to define that boundary and Corradini *et al*. (2010; 2011) along with other conodont experts have studied the protognathodids, the other conodont group that had potential for boundary definition. It appears that neither the siphonodellids nor the protognathodids are suitable for D-C boundary definition. There is, however, some hope the siphonodellid lineage can still be used because considerable disagreement exists among conodont specialists about its utility and the conclusions of Kaiser and Corradini require additional testing.

In the Devonian-Carboniferous Boundary GSSP section at La Serre, seven morphotypes in the transition from *S. praesulcata* to *S. sulcata* have been identified (Corradini & Kaiser, 2009; Kaiser, 2009) but conodonts within the transition are reworked and no correlation exists between the stratigraphic level and individual morphotypes. The task group plans to determine if a correlation exists between the morphotypes and stratigraphic level in other D-C boundary sections, where reworking is not an issue.

A suitable section for the GSSP must be located because recent studies at La Serre indicate the lack of the phylogenetic transition from *S. praesulcata* to *S. sulcata* and the base of bed 84b, which contains the FAD of *S. sulcata*, immediately overlies a probable erosion surface and major lithofacies facies change (Corradini & Kaiser, 2009; Kaiser, 2009). Several sections, particularly those in south-central China, which had been proposed as GSSP candidates prior to selection of the La Serre section, will be carefully re-examined.

The task group plans to explore the possibility of using either a sedimentological or geochemical event such as a component of the multiphase Hangenberg extinction event (Kaiser, 2005; Cramer *et al.*, 2008) for boundary definition. The event presents potential for correlation into both shallow and relatively deep-water marine facies; consequently, the task group wants to know how the phases of the Hangenberg are represented in different facies and how well they can be correlated globally.

Tournaisian-Viséan Boundary By 2003 work by the Tournaisian-Viséan Boundary task group progressed to the point that a proposal for the GSSP in south China was published (Devuyst *et al,* 2003). The principal work of the task group has come to completion and the task-group chairman George Sevastopulo plans to complete the final report within the fiscal year.

Viséan-Serpukhovian Boundary Task Group The Viséan-Serpukhovian task group plans to use the FAD of *Lochriea ziegleri* in the conodont lineage *Lochriea nodosa* - *Lochriea ziegleri* for boundary definition. The task group plans to complete a proposal for submission to the task group and SSCS membership for a vote on either accepting or rejecting the FAD of *L. ziegleri* for GSSP definition. Two sections, Verkhnyaya Kardailovka (Nikolaeva, 2013; Pazukhin *et al*., 2010) and Naqing (Qi *et al*., 2013), present the best potential for the GSSP, and the ongoing integrated biostratigraphic,

sedimentological and geochemical studies of those sections will continue to project completion. Most of the field work has been completed at both localities and the remaining objective is to complete the sample study and compile the final synthesis. Identification of the *L. nodosa-L. ziegleri* lineage and recognition of associated conodont, ammonoid, ostracode, and foraminiferal zones in the richly fossiliferous section near Verkhnyaya Kardailovka in the southern Urals establishes that section as a strong candidate for the GSSP. In the Naqing section in southern Guizhou Province, China the *Lochriea* lineage has been intensively studied and the FAD of *L. ziegleri* precisely located. Field work is essentially complete at Naqing and the remaining objective is to complete the analytical work and prepare the final synthesis for publication.

The *Lochriea* lineage has not been found North America but specimens of *Lochriea ziegleri* and other species within the genus have been discovered. In order to identify correlatable faunal zones that can closely bracket the boundary interval on that continent, a global study of conodonts, ammonoids, foraminifers, and corals across the boundary interval will continue. All this suggests selection of the GSSP is possible in the next two years.

Bashkirian-Moscovian Boundary Task Group The high-priority plans for the Bashkirian-Moscovian Boundary task group during the next four years are to select an event marker for the Bashkirian-Moscovian boundary and then to look for GSSP candidate sections. Two conodont lineages show substantial potential for boundary definition and their evaluation requires immediate completion: 1) derivation of *Declinognathodus donetzianus* from *D. marginodosus* and 2) the lineage containing *Diplognathodus ellesmerensis*, which appears at the base of the Moscovian in the Naqing section (Nashui) in Guizhou Province, China (Qi *et al*., 2007, 2009) and has been widely recognized globally. In former years it was thought that *Diplognathodus coloradoensis* Murray & Chronic, 1965 was the immediate ancestor of *D. ellesmerensis*; however, additional work has demonstrated it has a different ancestor and that relationship requires evaluation.

The carbonate-dominant Naqing section in Guizhou Province is one of the best candidates for the GSSP at the base of the Moscovian because the conodonts being considered for boundary definition are abundant and their first occurrences precisely located. Foraminifers are also present and have been thoroughly investigated (Groves, 2010). Work on the sedimentology, stable-isotope geochemistry, and geophysical characteristics of the boundary interval at Nashui are less advanced than the paleontological investigations and will be the focus of the team's work in 2015 and 2016. In order to place the important Nashui section into its sedimentological and paleoenvironmental context and to determine the relationship of shallow-water coral and foraminiferal zones to the deeper-water conodont markers within the Bashkirian-Moscovian transition in south China, the investigation of two reference sections - the Zhongdi, and the Luokun sections - will continue.

Because substantial work still is still required before a GSSP can be selected, 2016 is the earliest likely completion date.

Task group to establish the Moscovian-Kasimovian and Kasimovian-Gzhelian boundaries

Moscovian-Kasimovian Stage boundary

The high-priority plans for the Moscovian-Kasimovian task group are to select an event marker for the Moscovian-Kasimovian boundary and then to search for GSSP candidate sections. Task-group members, who attended the 2008 Oviedo meeting, reached unanimous agreement to focus future work on two conodont species as the potential biostratigraphic marker by which the base of the Kasimovian can be selected and correlated globally. The first is *Idiognathodus sagittalis*, based on material from the Donets Basin (Ukraine) and also identified from the Moscow region and southern Urals of Russia, and the Cantabrian Mountains (Spain). A potential ancestor-descendent lineage from *I.* aff. *sagittalis* n. sp. to *I. sagittalis* may be present in the Moscow region. The second potential marker is *Idiognathodus turbatus* based on material from the Mid-continent region of the U.S.A., and also recognized in the Moscow Basin, the southern Urals, and the Donets Basin. A lineage from *Idiognathodus swadei* to *I. turbatus* has been described from the U.S. Midcontinent and a new option that was presented in 2013,

is to use the first occurrence of *Idiognathodus heckeli* Rosscoe & Barrick, 2013 in that lineage. *I. heckeli*, the precursor species to *I. turbatus*, might be more appropriate marker because its first appearance is closer to that of the traditional definition of the Kasimovian than that of either *Idiognathodus sagittalis* or *Idiognathodus turbatus*. *Idiognathodus heckeli* is also present in the Naqing section in Guizhou Province of South China, which would allow that section to serve as the GSSP for the base of the Kasimovian. While the event marker for the Moscovian-Kasimovian boundary still needs to achieve consensus, continued assessment of the lineages and clarification of the taxonomy of species involved will hasten the process. The task group will continue to evaluate the utility of the three lineages and potential GSSP candidate sections.

Kasimovian-Gzhelian Stage Boundary

Members of the Kasimovian-Gzhelian task group plan to use the conodont lineage *Idiognathodus eudoraensis - I. simulator s.s.* to define the boundary at the first appearance of *I. simulator s.s*. Now that an event maker has been selected, task-group members will proceed on selecting a suitable section for the GSSP. So far only the Usolka section in the southern Ural Mountains of Russia has been proposed as a candidate section for the GSSP (Davydov *et al*., 2008); other proposals are required.

The widespread disconformities within the Kasimovian-Gzhelian transition across most of the shelf regions presents a substantial problem for selecting a section for the GSSP**,** but work on the essentially complete carbonate-slope sections in the southern Urals (Usolka River section) and on the slope deposits in the Nashui section, are providing more appropriate sections for a potential GSSP. Conodont studies are well advanced at the two localities, but sedimentologic, geochemical and geophysical studies at the sections are at an early stage and require completion. Guzel Sungatullina (Kazan University, Russia) is restudying the conodonts across the boundary within the Usolka section. Alexander Alekseev expects the results of Guzel's study will be sufficient to propose using the Usolka section as a potential GSSP candidate for the base of the Gzhelian.

Therefore, 2014 - 2016 is probably the earliest a GSSP for the boundary will be selected and approved.

Chemostratigraphy, magnetostratigraphy and radiometric dating The SCCS executive is hopeful that ongoing work in chemostratigraphy and magnetostratigraphy will identify events that can be used to supplement the boundaries that will be defined by means of faunal events, and will eventually provide the basis for correlating these boundaries into the northern-hemisphere Angara region and the southern-hemisphere Gondwana region, where the pan-tropical biotas are replaced by provincial cold-climate communities. We are also hopeful that new, precise radiometric dating on biostratigraphically well-constrained marine successions, such as are being reported from the Pennsylvanian of the southern Urals by the Boise State group will both narrow the age disparities that currently exist within much of the Carboniferous and also provide better correlation with more precise modern radiometric dates that will hopefully be obtained from the Angara and Gondwana regions.

9. ORGANIZATION AND SUBCOMMISSION MEMBERSHIP

In addition to the three executive voting members, the SCCS has 17 rank-and-file voting members and approximately 280 corresponding members (see latest issue of Newsletter on Carboniferous Stratigraphy for contact information).

9a. ***NAMES AND ADDRESSES OF CURRENT OFFICERS AND VOTING MEMBERS***

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9b. *WORKING GROUPS/TASK GROUPS AND OFFICERS*

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

Task Groups and officers

The joint Devonian-Carboniferous Boundary GSSP Reappraisal Task Group [base of Carboniferous is also the base of the Lower Mississippian Series and Tournaisian Stage] is a task group that was established in early 2008 and is chaired by Markus Aretz (France; aretz@get.obs-mip.fr). It comprises members appointed by Thomas Becker former Chairman of the Devonian Subcommission (SDS) and members selected by Philip Heckel former Chairman of the SCCS in 2008, who summarized the reasons for establishing the group in the 2008 issue of Newsletter on Carboniferous Stratigraphy [v. 26, p. 3]. Carlo Corradini is the Vice-chairman. Aretz has summarized the recent work of the group through October 2014 in this annual report and in volume 31 of the Newsletter on Carboniferous Stratigraphy, published in August 2014.

Task Group to establish the Tournaisian-Viséan Boundary [which is also the base of the Middle Mississippian Series] is chaired by George Sevastopulo (Ireland; gsvstpul@tcd.ie). Using e-mail communications from the chairman, the recent activities of the group are summarized herein through October 31st 2014.

Task Group to establish the Viséan-Serpukhovian Boundary [which is also the base of the Upper Mississippian Series] is chaired by Barry Richards (Canada; barry.richards@canada.ca), who summarized the recent work of the group through October 31st, 2013 in volume 31 of the Newsletter on Carboniferous Stratigraphy (published August 2014) and herein.

Task Group to establish the Bashkirian-Moscovian Boundary [which is also the base of the Middle Pennsylvanian Series] is chaired by Alexander Alekseev (Moscow State University, Russia; aaleks@geol.msu.ru), who summarized the recent work of the group through October 31st, 2013 in volume 31 of the Newsletter on Carboniferous Stratigraphy and herein.

Task Group to establish the Moscovian-Kasimovian Boundary [which is also the base of the Upper Pennsylvanian Series], and the **Kasimovian-Gzhelian Boundary** is chaired by Katsumi Ueno (Japan; katsumi@fukuoka-u.ac.jp). Ueno summarized the recent work of the group through October 31st, 2013 in volume 31 (published August 2014) of the Newsletter on Carboniferous Stratigraphy and herein.

Project Group on Carboniferous magnetostratigraphy is chaired by Mark Hounslow (United Kingdom), who has summarized the recent work of the group in this annual report.

The Project Group on Carboniferous and Permian Nonmarine and Marine Correlations is chaired by Jörg W. Schneider (Germany) Joerg.Schneider@geo.tu-freiberg.de. The project group was established in 2013 and their recent work is summarized in this annual report.

9c. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

The SCCS works closely with the subcommissions and task groups 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 working relationship with the Permian Research Group at Boise State, which has initiated a program of obtaining precise ID-TIMS U-Pb radiometric dates from biostratigraphically constrained uppermost Devonian to Permian successions.

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