Subcommission on Triassic Stratigraphy report to the ICS, 2016

1. TITLE OF CONSTITUENT BODY and NAME OF REPORTER

Subcommission on Triassic Stratigraphy (STS)

STS officers reporting: Hounslow (Lancaster), McRoberts (Cortland, NY).

2. STS OVERALL OBJECTIVES AND FIT WITHIN IUGS SCIENCE POLICY

- Rationalization of global chronostratigraphical classification for the Triassic.
- Intercalibration of all types of stratigraphies, integrated zonations, and recognition of globally- significant data to achieve this.
- Establishment of physical, cyclostratigraphic and chemo-stratigraphic scales.
- Definition of stage boundaries and selection of GSSP sections.
- Correlation of Triassic successions and events, including marine to non-marine.
- Climatic evolution and modelling relevant to the Triassic.

The objectives satisfy the IUGS mandate of fostering international agreement on nomenclature and classification in stratigraphy, by facilitating international co-operation in geological research, improving publication, dissemination, and use of geological information internationally. The STS encourages new relationships between and among disciplines of science that relate to Triassic geology world-wide, attracting competent research workers to the discipline and fostering an increased awareness among individual scientists world-wide, of what related programs are being undertaken.

3. ORGANISATION - interface with other international projects / groups

The STS is a Subcommission of the Commission on Stratigraphy and consists of three executive officers and 21 voting members of the STS and about 110 corresponding members. The secretary is the editor of *Albertiana* and manages the web site (www.albertiana-sts.org) for STS announcements and task group discussions. The *Albertiana* editor is supported by an editorial team of ten drawn from the voting and corresponding members. Subcommission members represent a broad spectrum of specialized stratigraphical disciplines from those countries or regions where Triassic rocks are extensively studied, in relation to fundamental and applied geological research.

Interfaces : a) IGCP 630: "*Permian-Triassic climatic and environmental extremes and biotic response, leaders*": Zhong-Qiang Chen, Thomas J. Algeo, Margaret L. Fraiser, Steve Kershaw, Jinnan Tong, Sylvie Crasquin, Michael J. Benton, Guang R. Shi, Charles M. Henderson, Arnie Winguth, Paul B. Wignall, Kunio Kaiho, Ghulam Bhat, and Yuri D. Zakharov. Most interconnection is relevant to the Olenekian WG, although, in practice as explained in previous reports, the interface to this IGCP project has been minimal so far.

b) All-Russian Scientific Conference "Golden age of Russian Malacology" (Moscow-Saratov, May-June 2016).

Nominated Officers for 2016-2020

Chair: Mark W. Hounslow, Lancaster Environment Centre, Lancaster University, UK; (m.hounslow@lancaster.ac.uk.)

Vice-Chair: Wolfram M. Kürschner, UiO Department of Geosciences ,Oslo, Norway (w.m.kuerschner@geo.uio.no)

Secretary: Christopher A. McRoberts, Geology Department, SUNY, Cortland, New York, USA (mcroberts@cortland.edu)

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

No direct financial, help, only help in kind from many contributors, and their funding bodies.

5. CHIEF ACCOMPLISHMENTS IN 2016 (including any publications arising from ICS working groups)

Rhaetian GSSP: *Albertiana* **43** (67 pages) was published in April 2016 with a primary aim to summarise the work on the Norian/Rhaetian boundary, which includes the two candidates at a) Pignola-Abriola, Italy (Rigo et al., 2016; Maron, 2016; Bertinelli et al., 2016), with a primary marker of conodont *Misikella posthernsteini* s. str. (with proposed main secondary marker of $6^{o}/_{oo}$ negative excursion in $\delta^{13}C_{org}$, along with ternary magnetostratigraphic and radiolarian zonal indicators) and the b) Steinbergkogel section, Austria (FAD of *Misikella posthernsteini,* with secondary ammonoid, magnetic polarity and palynology markers). The original proposal of a primary $\delta^{13}C_{org}$ marker at Pignola-Abriola by Rigo et al. (2016) was updated to a primary *M. posthernsteini* ss marker by Bertinelli et al. (2016).

Rhaetian GSSP: The FAD of *M. posthernsteini* had been proposed by the working group some years ago, but now its chronomorphocline has been clarified (Bertinelli et al., 2016), leading to a clearer understanding of conodont changes across the proposed boundary. This proposed revision is being discussed for its impact on the proposed Steinbergkogel section, hopefully leading more swiftly to a decision on this GSSP.

Anisian GSSP: The FAD of the conodont *Chiosella timorensis* had been informally proposed by the working group some years ago as the guide for the base of the Anisian using the Desli Caira section in Romania (Grădinaru et al., 2007, vol 37 in *Albertiana*), supported by ammonoid and foraminifera turnovers, magnetic polarity and $\delta^{13}C_{carb}$ data. However doubts remained according to some data about the strongly diachronous nature of the FAD of *C. timorensis*. These doubts appear to have been quashed somewhat (Ovtcharova et al., 2015) with a re-assessment of the conodont fauna coupled with high resolution (CA-ID-TIMS) U–Pb dates which demonstrates that "no detectable diachronism of the FO of *C. timorensis*, within the resolution of our U–Pb ages" is apparent (Ovtcharova et al., 2015).

Publications of the working groups:

Bertinelli, A., Casacci, M., Concheri, G., Gattolin, G., Godfrey, L., Katz, M. E., ... & Rigo, M. (2016). The Norian/Rhaetian boundary interval at Pignola-Abriola section (Southern Apennines, Italy) as a GSSP candidate for the Rhaetian Stage: an update. *Albertiana*, **43**, 5-18.

Casacci, M., Bertinelli, A., Algeo, T. J. & Rigo, M. (2016). Carbonate-to-biosilica transition at the Norian–Rhaetian boundary controlled by rift-related subsidence in the western Tethyan Lagonegro Basin (southern Italy). *Palaeogeography, Palaeoclimatology, Palaeoecology*, **456**, 21-36.

Deutsche Stratigraphische Kommission, Hrsg.; Redaktion, Koordination und Gestaltung (Menning , M. & Hendrich, A.), 2016. Triassic. In: *Stratigraphische Tabelle von Deutschland* 2016. Potsdam (Deutsches GeoForschungsZentrum). (1) Tafel plan 100x141 cm, (2) Falt-Tafel A4.

Golding, M. L., Mortensen, J. K., Zonneveld, J. P. & Orchard, M. J. (2016). U-Pb isotopic ages of euhedral zircons in the Rhaetian of British Columbia: Implications for Cordilleran tectonics during the Late Triassic. *Geosphere*, **12**, 1606-1616.

Li, M., Ogg, J., Zhang, Y., Huang, C., Hinnov, L., Chen, Z. Q., & Zou, Z. (2016). Astronomical tuning of the end-Permian extinction and the Early Triassic Epoch of South China and Germany. *Earth and Planetary Science Letters*, **441**, 10-25.

Liang, L., Tong, J., Song, H., Song, T., Tian, L., Song, H., & Qiu, H. (2016). Lower-Middle Triassic conodont biostratigraphy of the Mingtang section, Nanpanjiang Basin, South China. *Palaeogeography, Palaeoclimatology, Palaeoecology*, **459**, 381-393.

Maron, M. (2016). *Contribution to the late Triassic geochronology by magnetostratigraphic correlations between Tethyan marine sections and the Newark APTS*. PhD, University of Padova. http://paduaresearch.cab.unipd.it/9200/

Onoue, T., Zonneveld, J. P., Orchard, M. J., Yamashita, M., Yamashita, K., Sato, H., & Kusaka, S. (2016). Paleoenvironmental changes across the Carnian/Norian boundary in the Black Bear Ridge section, British Columbia, Canada. *Palaeogeography, Palaeoclimatology, Palaeoecology*, **441**, 721-733.

Olsen, P. E., S. T. Kinney, N. V. Zakharova, R. W. Schlische, M. O. Withjack, D. V. Kent, D. S. Goldberg, & B. E. Slater, 2016, New Insights on Rift Basin Development and the Geological Carbon Cycle, Mass Extinction, and Carbon Sequestration from Outcrops, and New Core, Drill Holes and Seismic Lines from the Northern Newark Basin (New York and New Jersey). In: A. E. Gates, and J. B. Bennington (eds.), New York State Geological Society Annual Field Conference, Rutgers University-Newark, 85pp.

Ovtcharova, M., Goudemand, N., Hammer, Ø., Guodun, K., Cordey, F., Galfetti, T., ... & Bucher, H. (2015). Developing a strategy for accurate definition of a geological boundary through radio-isotopic and biochronological dating: The Early–Middle Triassic boundary (South China). *Earth-Science Reviews*, **146**, 65-76.

Rigo M., Bertinelli A., Concheri G., Gattolin G., Godfrey L., Katz M., Maron M., Mietto P., Muttoni G., Sprovieri M., Stellin F., Zaffani M. (2016). The Pignola-Abriola Section (Southern Apennines, Italy): A new GSSP candidate for the base of the Rhaetian Stage. *Lethaia*, **49**, 287–306.

Shigeta, Y. & Kumagae, T., 2015. *Churkites,* a trans-Panthalassic Early Triassic ammonoid genus from South Primorye, Russian Far East. *Paleontological Research*, **19**, 219-236.

Shigeta, Y. & Kumagae, T., 2015. Spathian (late Olenekian, Early Triassic) ammonoid genus from the Artyom area, South Primorye, Russian Far East and implications for the timing of the recovery of the oceanic environment. *Paleontological Research*, **20**, 48-60.

Urlichs, M. & Krystyn, L. 2016. Stratigraphic Significance of the early Rhaetian ostracods From The proposed Norian/Rhaetian GSSP At Steinbergkogel (late Triassic, Upper Austria). *Albertiana*, **43**, 19-23.

Weems, R. E. Tanner, L.H. & Lucas, S. G. (2016). Synthesis and revision of the lithostratigraphic groups and formations in the Upper Permian?–Lower Jurassic Newark Supergroup of eastern North America. *Stratigraphy*, **13**, 111–153.

Zakharov, Y.D., Horacek, M., Smyshlyaeva, O.P., Popov, A.M., Bondarenko, L.G.& Guravskaya, G.I., 2016. Early Olenekian ammonoids from the Kamenushka River basin, South Primorye and

their environment. Sbornik truov Vserossiskoi nauchnoi konferentsii “Zolotoi vek rossijskoj malakologii” (Collective volume of All-Russia scientific conference “Golden age of Russian malacology”). Moscow-Saratov, p. 167-177 (in Russian).

7. SUMMARY OF INCOME IN 2016:

None other that from the ICS

8. BUDGET

BUDGET REQUESTS (in US$)

Pignola Abriola Field workshop: This workshop will group together the members of the research groups working on the Steinbergkogel section (Austria) and Pignola-Abriola in order to resolve: 1) The differing views on the conodont *Misikella posthernsteini.* 2) Correlation of the stable isotope curves and other secondary markers. The requested budget will support part of the travel costs of some WG members, as well as rent of two mini-vans. It will take place in spring 2017, organised by Manuel Rigo and Angela Bertinelli.

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

- The stasis with the progress on the Rhaetian and Norian working groups is in large part caused by continual changes in the taxonomy of the conodonts across these two boundaries, leading to re-assessment of correlation relationships between the proposed candidate sections. The plan is to resolve this by the Pignola-Abriola workshop, which brings conodont workers together to identify the common ground between definitions of species and genera.
- A field meeting to the Pignola-Abriola section in Italy, so the Rhaetian Working Group can examine and discuss this new proposed section in more detail.
- A volume of *Albertiana*, with elicited contributions on the Carnian-Norian boundary, to try and summarise progress to date on the two candidates at Black Bear Ridge in Canada and Pizzo Modello in Sicily. This will be linked to a field workshop (organised by JP Zonnefeld, Mike Orchard and Martyn Goldring) to Black Bear Ridge, British Columbia in spring 2017. The field workshop will be mostly sponsored by the SEPM (but partly by the STS).

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

- No new work is planned on the two proposed Norian GSSPs, and the proposals just need updating prior to going to vote on the candidate boundary marker and the section. This should hopefully be achieved by the end of 2017.
- The introduction of the Pignola-Abriola section as one of the proposed Rhaetian GSSPs will delay a decision on this boundary until 2018, unless the new controversial conodont taxonomy can be resolved quickly. The boundary interval at Pignola-Abriola is being sampled at greater resolution for conodonts and $\delta^{13}C_{org,}$ since the proposed primary marker is in the top of a ~ 2 m gap in conodont data with only two $\delta^{13}C_{org,}$ data points in this interval.
- There are two proposed candidates for the Olenekian GSSP (1) West Pingdingshan (Chaohu, South China) and (2) Mud (Spiti, India). The Mud section was the preferred option by the Olenekian working group based on a previous informal vote. Re-sampling of both conodonts and ammonoids at Mud has informally suggested the base the I/O boundary at Mud should be based on the FAD of *N. waageni* s. str. (L. Krystyn pers. com.). This event is one bed below the original proposal (Krystyn et al., 2007) and within a positive $\delta^{13}C_{org,}$ excursion. Hugo Bucher has informally suggested an Olenekian GSSP proposal may come forward on a the Nammal (Salt Range, Pakistan)- a section with a better ammonoid succession than other proposals. If this

Nammal proposal does not appear by 1st April 2017, the WG chairman plans to go to a formal vote on the existing proposals in late spring 2017.

- The proposed Anisian GSSP at Desli Caira (Romania) has failed to yield detailed published work on the ammonoids, which has stalled this proposal for many years. However, recently more work has begun on this, and Grădinaru and others have indicated a published work (in progress now) may appear in 2017. In early 2017 the executive will re-evaluate progress on this and if feasible will elicit a new proposal on a different section, probably in China. Realistically it is more than possible we will not resolve the Anisian GSSP until 2019 or 2020.

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

STS Chair: Mark W. Hounslow, Lancaster Environment Centre, Lancaster University, UK; (m.hounslow@lancaster.ac.uk.)
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~110 STS corresponding members, not listed here			

Chairs of Working Groups:

Base Rhaetian Working Group, M. Balini.
Base Norian Working Group, M. W. Hounslow.
Base Carnian Working Group, M. Gaetani, Task Group work completed. *
Base Ladinian Working Group, A. Baud, Task Group work completed. **
Base Anisian Working Group, M. Balini.
Base Olenekian Working Group, Y. D. Zakharov
Base Induan Working Group, Yin Hongfu, Task Group work completed. ***
Non-marine Boundaries Project Group, S. Lucas.

15 Nov, 2016