Report to

International Symposium on Triassic Chronostratigraphy and Biotic Recovery

23-25 May 2005 – Chaohu, China

The International Symposium on Triassic Chronostratigraphy and Biotic Recovery was successfully held at the Tang Shan Hotel in Chaohu City, Anhui Province, China on 23-25 May 2005 and about 70 colleagues from 14 countries presented at the symposium. The Open Ceremony was chaired by Prof. Yin Hongfu and six opening speeches were addressed by Zhen Weiwen, Mayor of the Chaohu City, Tao Qingfa, official of the Ministry of Land and Resources of China, Yang Xianjing, vice-director of the Office of Land and Resources of Anhui Province, Mike Orchard, chairman of the Subcommission on Triassic Stratigraphy and IGCP-467, Wang Yanxing, vice-president of China University of Geosciences (Wuhan), and James Ogg, secretary general of the International Commission on Stratigraphy. 47 oral reports were presented at 13 sessions during two and half days, and 15 posters were displayed at the Symposium.

Most speeches at the symposium expounded the Permian-Triassic transition with emphasis on the nature and pattern of extinction and events, the ecosystems and evolution during the crisis and recovery, and the processes of the biotic recovery and radiation. **Yin Hongfu** addressed the multiple phases of events leading to the extinction. **Yukio Isozaki** expressed the process of the anoxia from the late Permian to middle Triassic. **Pedro Marenco** proposed a hypothesis to explain the sulfur isotopic excursion around the Permian-Triassic transition. **Feng Qiao** reported an idea about the influence of climate change on the mass extinction according to a study on the terrestrial P-T sequences. **Shen Shuzhong** provided evidence of the transitional events from the peri-Gondwana facies.

Richard Twitchett ascribed the fossil dwarfism (Lilliput Effect) to the secular atmosphere oxygen-depletion and oceanic anoxia during the transition and crisis. **David Bottjer** considered the reduction of bioturbation as the spareness of benthic communities resulted from the harsh environmental conditions in the Early Triassic. **He Weihong** assumed that the brachiopod miniaturization was a special appearance and resulted from the increasing environmental stress during the crisis. **Margaret Fraiser** suggested that a biocalcification crisis caused by an increased atmospheric CO_2 bought on the ecologic switch at the P/T boundary and prolonged biotic crisis in the early Triassic. **Yan Jiaxing** related the secular Phanerozoic chemical evolution of seawater to the selectivity of taxonomic biocalcification during the extinction-recovery transition. **Chen Zhongqiang** proved that the brachiopods were highly selective in taxonomy, ecology and biogeography through the extinction, survival and recovery. **Adam Woods** correlated the seafloor precipitates with the anachronistic anoxic facies, which resulted in the biotic recovery first at high latitudes and shifting to low latitudes over time.

Michael Orchard demonstrated the origination and explosive radiation of some major conodont groups during the Permian-Triassic transition and Early Triassic in a multielement perspective. **Robert Nicoll** explicated the conodont lineages from *Hindeodus* to *Isarcicella* at the beginning of the Triassic. **Demir Altiner** illustrated the evolution of calcareous foraminifers through the Early Triassic and their representations in the survival and recovery. **Christopher McRoberts** expatiated the revolution of the marine bivalve Myalinidae from the Permian to Triassic and suggested that the Early Triassic myalinids were more like “squatter” than “disaster” species. **Lar Schmitz** and **Jiang Dayong** narrated the origin, evolution, radiation and spreading of the ichthyopterigians during the Triassic, and expressed the connection of the shell-eating marine reptiles with the recovery and radiation of the shellfish in the early Triassic. **Tyler Beatty** documented the ichnofossil assemblages from the Lower Triassic of the northwest margin of the Pangea (western North America) and explained the variable recovery along the margin.

The calcimicrobialites at the Permian-Triassic boundary and in the Lower Triassic have become popular and attractive. Besides the designed post-Symposium Field Excursion 2 for the observation of the “Great Bank of Guizhou” that includes a well-developed Permian-Lower Triassic calcimicrobialite sequence, several reports

specialized the microbialites from various regions over the world. **Wang Yongbiao** displayed some clues (microfossils) to cyanobacteria observed in the Permian-Triassic boundary calcimicrobialites from various areas of South China and deduced the environmental origination of the rocks. **Daniel Lehrmann** demonstrated the origination, growth and drowning of the "Great Bank of Guizhou" that provided the circumstance for the development of calcimicrobialite at the Permian-Triassic boundary and through the Lower Triassic, combining with the standing deleterious marine and/or atmospheric conditions — preventing rediversification of metazoa, and stimulating microbialite deposition. **Oliver Weidlich** introduced the microbialites from the Lower Triassic of the Central European Basin (Germany) and testified their marine origination. **Demir Altiner** also briefly mentioned the microbialites at the Permian-Triassic boundary and in the Lower Triassic of Turkey. **Aymon Baud** summarized the Early Triassic microbialites into four episodes and especially detailed the first microbial episode at the Permian-Triassic boundary.

In stratigraphy of the Permian-Triassic boundary, **Jin Yugan** presented a re-study on the sedimentology at the Meishan Section, indicating that Bed 27 contains some hard-ground structures. **Wu Yasheng** proposed an amendment for some conodonts at the boundary sections. **Thomas Algeo** introduced a Permian-Triassic boundary section of carbonate facies in the northern Vietnam, which is well expressed in geochemistry with the transitional events. **Tea Kolar-Jurkovsek** showed us some Permian-Triassic boundary sections with good conodont records in Slovenia. **Ian Metcalfe** stated the age dating in the boundary strata at the Meishan and Shangsi sections and presented a correlation of the Permian-Triassic boundary between the marine and terrestrial sequences. **Peng Yuanqiao** traced the Permian-Triassic boundary from the marine to terrestrial via a paralic facies in the western Guizhou and eastern Yunnan.

Since the West Pingdingshan Section in Chaohu has been proposed as the GSSP of the Induan-Olenekian boundary and this Symposium is held in Chaohu, the Lower Triassic stratigraphy and the Induan-Olenekian boundary are of course one of the key topics at the symposium. **Tong Jinnan** summarized the main achievements in the Lower Triassic of Chaohu, including conodont, ammonoid and bivalve biostratigraphy, carbon isotope stratigraphy, magnetostratigraphy, etc., and especially the definition and recognition of the Permian-Triassic boundary and Induan-Olenekian boundary in Chaohu. The West Pingdingshan Section covering strata from the topmost of the Permian to the lower Spathian and the upper part of the South Majiashan Section, where the ichthyosaur *Chaohusaurus* is yielded and the Olenekian-Anisian boundary located, were visited on the morning of May 24 during the mid-Symposium Field Excursion. **Zhao Laishi** exhibited the conodonts from the Lower Triassic in Chaohu, introduced the Lower Triassic conodont zonation and demonstrated the taxonomic subdivisions of *Neospathodus dieneri* and *Neospathodus waageni*. **Charles Henderson** correlated the Induan-Olenekian boundary between the Canadian Opal Creek Section and Chaohu Section to confirm that the definition of the I-O boundary based upon the conodont succession *Neospathodus waageni* n. subsp. A-*N. waageni* n. subsp. B–*N. waageni waageni* is applicable to both low-latitude Tethyan and high-latitude Boreal realms. **Leopold Krystyn** also recognized the conodont succession at Mud, Spiti, Indian Himalaya, which was in the southern margin of the Tethys, co-occurring with ammonoids *Flemingites* and *Euflemingites*, and proposed the Mud Section as one of the GSSP candidates for the Induan-Olenekian boundary. **Manfred Menning** correlated the Germanic (Lower) Triassic with the sequence in Chaohu though the numbers of magnetoplarity zones are slightly different, and calculated the time spans of the Induan and Olenekian stages (1.4-1.5 m.y. and ~3.7 m.y., respectively) based upon the sedimentary cycles. **Micha Horacek** confirmed the carbon isotopes excursion at the West Pingdingshan Section and correlated it to the Iranian and Italian Dolomites Lower Triassic sequences though this correlation is to be further confirmed in chronostratigraphy. He also reported the results of the Moessbauer spectroscopy on the Fe^{2+} and Fe^{3+} phases at the West Pingdingshan Section, showing that the Lower Triassic at the section was mainly formed in a suboxic stratified oceanic condition except for the middle Smithian that seems formed in a circulated oxic environment. **Zuo Jingxun** showed several Lower Triassic carbon isotopes excursions

from various facies throughout South China and they are quite coinciding with that one in Chaohu, indicating that the carbon isotopes excursion might be regarded as a good accessory marker for the Lower Triassic correlation.

Some reports also laid stress on the upper part of the Lower Triassic and the Olenekian-Anisian boundary, and some even on the Upper Triassic. **Ian Metcalfe** briefly introduced a Spathian conodont sequence in the Dalishan Section, Jiangsu Province, which contains some ash beds to be dated. **Valery Vuks** documented the Olenekian foraminifer assemblages from Caucasus and its neighboring areas and their application to the reconstruction of paleogeography. **Yuri Zakharov** exhibited some excellent Olenekian-Anisian outcrops with good ammonoid records in South Primorye, Russian Far East and supposed that it might be suggested as one of the GSSP candidates for the Olenekian-Anisian boundary if conodonts are properly studied. **Yao Jianxing** reported two Olenekian-Anisian boundary sections with good conodont sequence in South Guizhou, including an isotope dating for the boundary tuffaceous rocks. **Daniel Lehrmann** expressed that the Guandao Section in South Guizhou has a well-documented Olenekian-Anisian boundary sequence, including conodont biostratigraphy, carbon isotopes excursion, magnetostratigraphy, as well as age dating. The sequence was visited during the post-Symposium Field Excursion 2. **John Marzolf** provided an excellent example for the correlation between marine and non-marine Triassic sequences based upon the sequence surfaces. **Kagen Tekin** reported a new Norian radiolarian assemblage from SW Turkey, which contains some new valuable taxa. **Michaela Bernecker** demonstrated the history of the Kawr isolated carbonate platform of Oman in the neo-Tethys and compared it with the Early Triassic "Great Bank of Guizhou" in a similar architecture.

There are, meanwhile, two reports focusing on the Permian stratigraphy and GSSPs at the Symposium. **Vladimir Davydov** introduced the situation of the Lower Permian stages and boundaries and indicated the possible locations of the GSSPs. **Wang Yue** described the potential GSSP section for the base of the Changhsingian Stage at Meishan, which was visited during the pre-Symposium Field Excursion.

In addition, there are some critical and inimitable speeches. **James Ogg** explained the Geologic Time Scale 2004 (GTS2004) and the current status of the GSSPs as viewed from the ICS. **Bruce Wardlaw** and **Vladimir Davydov** reported the progress of the Permian-Triassic Time Slice Project of CHRONOS and PaleoStrat database system, and encouraged researchers for the Permian-Triassic time to join in the system and share the various data with colleagues.

Finally, Mike Orchard made the closing remarks. As a summary his speech is quoted as follows:

> In the opening presentation of the symposium, Prof. Yin Hongfu spoke of the multiple nature of events leading to the P-T extinction. Numerous contributions to this meeting have indeed confirmed this as fact. Furthermore, during the course of the meeting, we encountered increasing evidence that further anomalies and abherrations characterize the rock record through most of the Early Triassic and even into the Middle Triassic. I like to think that we are, nevertheless, moving slowly but surely towards a deeper understanding of the complex interplay between all the biological-chemical and –physical phenomena that we now recognize as having effected planet Earth during this most unusual time. A primary tool in achieving this will be a more highly resolved time scale, towards which each of our sponsoring organizations are working.
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> Our task now is to continue these multidisciplinary studies and produce syntheses that draw an each others expertise and experience to define a "horistic" explanation for what we observe in the rocks. One contribution to this will be in the form of a Symposium Volume to which you are all invited to contribute.
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> Finally, I would like to thank the meeting organizers — especially Yin Hongfu and our very busy secretary Tong Jinnan and his staff, including Zhao Laishi, the pre-meeting excursion leader. We must also not forget Wolfram Kuerschner, the editor of Albertiana, who provided printable copy of the special issues of abstracts and field guides.
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> I would like also to give special thanks to the people and government of Chaohu City, and the staff and volunteers of the Tang Shan Hotel — all of whom have made our stay most enjoyable.
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> Some of you may have now received a gift from the People Government of Chaohu City, which includes a

DVD about this remarkable place. It quotes Chairman Mao who described Chaohu Lake as one of the five lakes that formed the “Cradle of Chinese Civilization”, and Chaohu City as having “arisen from a diamond embedded in the rich earth of Anhui Province”. This rich metaphor seems remarkably appropriate to officially end this most enjoyable meeting of the geoscientists.

Thank you all for coming to our meeting, and ‘bon voyage’.

Three Symposium Field Excursions associated with the symposium were executed in South China.

Pre-Symposium Field Excursion was carried out on 21-22 May 2005 and 27 participants from 10 countries joined in the trip from Hangzhou–Meishan–Nanjing–Chaohu. The excursion had a stop at Meishan, Changxing to visit the type Changhsingian Stage including the potential GSSP of the base of the Changhsingian and the GSSP of the Permian-Triassic boundary, and the Griesbachian sequence. The other stop was at Hushan, Nanjing to view a Lower Triassic profile, especially the cyclic sedimentary sequence and the Induan-Olenekian boundary. Meanwhile, a paleontological museum at the Nanjing Institute of Geology and Paleontology was visited during the excursion. The excursion was led by Drs. Zhao Laishi and Wang Yue and it was assisted by Nanjing Institute of Geology and Paleontology, Office of Land and Resources of Zhejiang Province and Government of Changxing County.

Mid-Symposium Field Excursion was taken on the 24th morning and all symposium participants visited the West Pingdingshan Section that exposes the strata from the topmost Permian to the lower Spathian, and the upper part of the South Majiashan Section. Some key boundaries, such as the Permian-Triassic boundary, Induan-Olenekian boundary, Smithian-Spathian boundary and possible Olenekian-Anisian boundary, were especially examined and discussed. The excursion was guided by Tong Jinnan and assisted by the Government of Chaohu City and Office of Land and Resources of Anhui Province.

Post-Symposium Field Excursion happened on 26-29 May 2005 and 28 participants from 11 countries attended the visit in the southern Guizhou. The excursion had taken us to check the various facies across the “Great Bank of Guizhou”, the calcimicrobialites at the Permian-Triassic boundary and in the Lower Triassic, the Middle Triassic coral reef and carbonate precipitates, and the Guandao sections at the edge of the bank, which had been well studied from the Permian-Triassic boundary to the lower Carnian and especially at the Olenekian-Anisian boundary. The trip was guided by Dr. Daniel Lehrmann at the University of Wisconsin and Wei Jiarong and Yu Youyi in Guiyang. It was assisted by the Bureau of Geology and Mineral Resources of Guizhou Province, Guizhou University and Office of Land and Resources of Guizhou Province.

The symposium received 68 abstracts, which are all published on Albertiana 33 together with the symposium program and all field excursion guides including the cancelled post-Symposium Field Excursion 1.

The symposium and field excursions had attracted a good attention to the local news media. The news from the symposium and excursions mostly occurred on the front pages of the local newspapers, such as Chaohu Daily, Anhui Daily, Guizhou Daily, etc. It was also reported continuously by the local newscast and television.

The Symposium was co-sponsored by the Subcommission on Permian Stratigraphy, Subcommission on Triassic Stratigraphy, IGCP-467, Task Group on Induan-Olenekian Boundary, NSF-CHRONOS Project, as well as the National Natural Science Foundation of China and China National Commission of Stratigraphy. It was organized by the China University of Geosciences and hosted by the Government of Chaohu City and Office of Land and Resources, Anhui Province. Dr. Mike Orchard acted as the chairman and Drs. Yuri Zakharov and Yin Hongfu as the vice-chairmen, while Dr. Tong Jinnan served as the secretary.

The Symposium and Field Excursions were financially assisted by the Subcommission on Triassic Stratigraphy, IGCP-467, National Natural Science Foundation of China, China University of Geosciences, Government of Chaohu City, Office of Land and Resources of Anhui Province, as well as Office of Land and Resources of Zhejiang Province and Bureau of Geology and Mineral Resources of Guizhou Province.

Tong Jinnan and Mike Orchard