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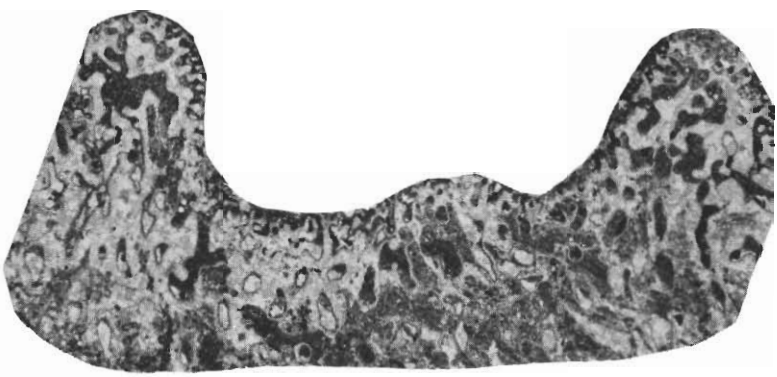

SUBCOMMISSION ON PERMIAN STRATIGRAPHY

INTERNATIONAL COMMISSION ON STRATIGRAPHY

INTERNATIONAL UNION OF GEOLOGICAL SCIENCES (IUGS)

CONTENTS

Cover:
Specimens of *Palaeoaplysina* from Ellesmere Island, Canadian Arctic. The specimens are from the Belcher Channel and Nansen formations (Sakmarian). *Palaeoaplysina* is an organism of unknown affinity (Hydrozoan ?, sponge ?). It consists of sheet-like plates displaying mammelon-like protuberances on its surface and a complex internal canal network. *Palaeoaplysina* is widely distributed in the northern hemisphere where it forms Upper Carboniferous to Lower Permian reefs. Photos by Benoit Beauchamp, Geological Survey of Canada.

1. CHAIRMAN'S NOTE

Two very successful meetings were held in August and September at Perm and Buenos Aires respectively. At Perm there were 308 registrants from 17 countries, and at Buenos Aires some 200 registrants from 21 countries. With my colleagues on the executive I should like to express our gratitude to all those who helped organise these meetings and the accompanying field excursions.

Jin Yugan

2. SECRETARY'S NOTE

The two meetings held recently in Perm and Buenos Aires have led to a number of new proposals for working groups. This is an encouraging sign and demonstrates a high level of interest. If you have any comments concerning the proposals outlined in Items 3, 6, 7, and 8 please let me know. Also don't forget to send in articles for Permophiles. The next issue will be in June, 1992 so if possible I should like contributions by May 15th.

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3. MINUTES OF COMBINED MEETING OF THE PERMIAN SUBCOMMISSION ON STRATIGRAPHY, THE CARBONIFEROUS/PERMIAN BOUNDARY WORKING GROUP AND THE PERMIAN/TRIASSIC BOUNDARY WORKING GROUP:

PERM 9 AUGUST 1991.

Preamble

It was decided by executive members Jin Jugan, Boris Chuvashov, Brian Glenister, Bruce Wardlaw, and John Utting that a combined meeting should be held because a quorum of voting members was lacking in all three groups. In view of the latter no formal decisions were possible although informal proposals could be made.

It was decided that Jin Jugan should chair the Permian Subcommission part of the meeting, but Brian Glenister should act as general chairman to cover working group topics and the meeting as a whole.

Numbers in Attendance

38 members attended the meeting.

Summary of Proceedings

Jin Jugan opened the meeting and explained that because of insufficient members from the three groups represented, we were having a combined meeting. He would chair the Permian Subcommission part and B.F. Glenister would be general chairman to provide overall continuity especially of the Working Group discussions.

Jin Jugan welcomed Dr. Paproth, chairman of the Carboniferous Subcommission and Dr. Baud, chairman of the Triassic Subcommission. Regrets were received from a number of members who were unable to attend (Wu Wang-shi, J.M. Dickins, K. Nakazawa, D.B. Smith, and J.B. Waterhouse).

Subcommission Business

Membership of Carboniferous/Permian Working Group and Permian Subcommission:

B.C. Wardlaw Secretary of the Carboniferous/ Permian boundary Working Group stated that he and Wu Wang-shi were forming a nomination committee to make any membership changes and to determine those who wished to continue serving on the working group. They planned to write to members asking them of their continued interest.

J. Utting Secretary of the Permian Subcommission stated that all titular members will be contacted by letter to determine if they wish to continue serving. Also nominations will be requested for executive positions.

He also pointed out that a number of verbal requests have been received at the congress for "Permophiles". Any persons attending the meeting who wished to have their names added to the mailing list could do so by writing their name and address on the sheet of paper circulated.

WORKING GROUP BUSINESS (General Chairman B.F. Glenister)

The chairman called upon B.I. Chuvashov to give a summary of progress made by the working group. The group was formed four years ago and has been very active especially in USSR, N. America and China.

In the Urals region of the Soviet Union good sections (in particular the Aidaralash section, and the Usolka River section) were being investigated in detail especially with regards to their conodont fauna. Three possible stratigraphic levels based on ammonoids, fusulinids and conodonts were being considered for the Carboniferous/Permian Boundary (see note below).

J. Utting added that a progress report on the group was given by Wu Wang-shi in Permophiles No. 15, November, 1989, and also that an open file report 90-233, United States Geological Survey was edited by B.C. Wardlaw entitled "Working Group on the Carboniferous-Permian Boundary; Proceedings at the International Geological Congress " Washington, D.C.; this publication contains a contribution by B.I. Chuvashov on the Carboniferous-Permian Boundary in the USSR giving the three levels being discussed for the boundary).

B.C. Wardlaw made the proposal that the chair invite the Carboniferous/Permian working group (chairman V.I. Davydov):

To formally propose that the boundary stratotype for the Carboniferous/Permian boundary be defined at the base of the *Sphaeroschwagwerina vulgaris-fusiformis* Zone between beds 19 and 20 of the Aidaralash section, with a parastratotype at Usolka River. This proposal should be provisional until:

a. Additional conodont studies especially of the shales are carried out.

b. The site is formally designated for permanent free access.

c. The exposures are improved.

There was considerable discussion concerning the proposal.

V.I. Davydov pointed out how the C/P boundary is traditionally based on ammonoids, but to define it more accurately and precisely conodonts were being considered. He pointed out the merits of the Aidaralash section which has been studied in detail in the last ten years. This section contains conodonts, fusulinids and ammonoids of Orenburgian to Sakmarian age. In progress were paleomagnetic and palynological studies, the latter being carried out by Faddeyeva.

Further discussion centred around the principle of first finding a good section, and then determining whether an evolutionary cline is present.

I.S. Barskov suggested that conodonts had the best potential for such a cline, and would thus be most useful in defining the boundary.

(Proposal approved; 26 for, 3 against, 9 abstentions).

The chairman proposed a motion concerning a formal Middle Permian Series:

a. Invite the Guadalupian Working Group (B.F. Glenister as chairman), to provide basic data through Permian Congress Proceedings and through "Permophiles" concerning the suitability of the Guadalupian as a candidate for a stratotype of the *Middle* Permian.

b. Invite submittal of alternative proposals.

There was considerable debate concerning subdivision of the Permian into two, three or four subdivisions. The recognition of "Middle" Permian was the focus of much of the discussion.

E.Y. Leven pointed out that if we want to change the Permian to three subdivisions then we need three stratotypes. He said that he personally has favoured a four fold subdivision. The general chairman invited all working groups to carefully consider this problem of subdividing the Permian in their respective deliberations.

B.F. Glenister reviewed the problems of determining facies variations from chronostratigraphic differences in units such as the Kungurian, Ufimian, Kazanian and Tatarian. He pointed out that there were good candidates for parts of the Lower Permian and Upper Permian in the world, but some consideration should be given to a "Middle" Permian section.

A. Baud believed that we should first decided whether we wanted two or three divisions of the Permian before we looked for stratotypes.

M. Menning stated that it was not necessary to define the series in one area.

B.F. Glenister replied that it makes for more problems if we use different localities.

V.G. Ganelin said that creation of the Guadalupian Series implies acceptance of three divisions of the Permian.

G.V. Kotlyar stressed the problems of drawing the boundaries between series at different localities at the same level.

Jin Jugan felt that the discussion was getting too concerned with the old problem of whether to have two or three divisions in the Permian, and that the motion should be modified to delete the term "Middle". He suggested that one should seriously consider what the Guadalupian as a section could contribute to our understanding the Permian.

B.F. Glenister agreed to delete the word "Middle" from the motion.

B.C. Wardlaw stressed that the real aim of the proposal was to encourage detailed study of the Guadalupian prior to making any further decisions.

I.S. Barskov wondered whether we should replace or change series.

V.R. Lozovsky suggested that the Guadalupian needed to be divided into stages.

B.F. Glenister replied that it already was (Wordian and Capitanian, with a proposal to recognise Roadian at base).

H. Kozur reminded members that the purpose of the motion was to encourage more work, not to make a formal decision.

B. Chuvashov approved the proposal to do more work on the sections, and that the working group should be encouraged.

M. Durante asked if the Guadalupian could be traced into the USSR and also did it have worldwide distribution.

B.F. Glenister replied that based on conodonts and ammonoids it could be traced worldwide.

(Modified proposal deleting word "Middle" was approved; 37 for, 0 against, 1 abstention)

The chairman invited the motion to:

> **Establish a N. American/Soviet Post-Artinskian Working Group (chairman B.C. Wardlaw) to investigate the possibility of a stage above the Artinskian, but below the Roadian.**

M. Menning asked why this problem was not being covered by the "Middle" Permian Working Group.

B.F. Glenister replied that the problem in question was quite specific and was suitable for detailed study.

E.Y. Leven said that this problem was already being dealt with by the Tethyan Working Group and there was no need for another working group.

G.V. Kotlyar disagreed and thought a group in the USA and Canada and the USSR would be able to deal with Tethyan and boreal correlations.

B.I. Chuvashov pointed out that more data were needed from the Artinskian and Kungurian and that this work should be done from north south and from the Urals to Canada.

B.F. Glenister added that more information was required on restricted facies.

(Proposal approved: 34 for, 2 against, 1 abstention)

The chairman invited motion to:

> **Establish a Soviet Working Group under the chairmanship of B. Chuvashov, to formally propose stages of the Lower Permian.**

G.V. Kotlyar asked why another working group was necessary.

Jin Jugan pointed out that more information needs to be obtained for the base of the Artinskian and Sakmarian, although the base of the Asselian could be established by the Carboniferous/Permian Working Group.

(Proposal approved: 32 for, 0 against, 9 abstentions)

The chairman invited motion to:

a. Invite formal proposals for the base of the Upper Permian:

i) Transcaucasus and Tethyan Dzhulfian/Dorashamian (G.V. Kotlyar, E.Y. Leven for the USSR and D. Baghbarni for Iran)

ii) South China Wujiapingian/ Changhsingian (Jin Jugan)

iii) Other areas

b. Determine stage boundaries.

A. Baud commented that in his view central Iran is the best region for study of the Transcaucasus.

Jin Yu-gan said that a letter from the Subcommission should be sent to Dr. Baghbani inviting him to participate. Also a letter should be sent to the relevant authorities concerning the organisation of a field excursion to Iran.

(Proposal approved: 38 for, 0 against, 0 abstentions)

The chairman invited a motion to:

Urge the Permian/Triassic boundary working group to:

a. evaluate new data concerning boundary especially from conodonts.

b. investigate the possibilities of placing the boundary higher in the succession than *O. woodwardi*.

A. Baud pointed out that there was a meeting 20-23 October, 1991, in Lausanne for Triassic workers. They were expecting 35 papers on the Triassic and Permian/Triassic boundary.

V.R. Lozovsky asked if a special working group could be formed concerning the correlation of continental beds at the boundary.

The chairman replied that perhaps this proposal should first be made in Permophiles, to see how much interest there was.

(Proposal approved unanimously)

Other Business

Chairman called on C. Foster to briefly summarise the report of the Upper Permian Working Group on behalf of M. Dickins. This report is included in this issue of Permophiles (Item No. 9).

John Utting

4. INTERNATIONAL CONGRESS ON THE PERMIAN SYSTEM, PERM, U.S.S.R.[1]

When earth scientists attend a conference they expect to exchange information; but equally important, they hope to make new friends and colleagues in a world fraternity of scientists with kindred interests. This is especially evident during field excursions, where the participants share the adventures, pleasures and discomforts of exploration. Geology is apolitical, it does not recognize national or ethnic boundaries.

These aims were well served by the International Congress on the Permian System of the World, held from August 5th to 10th in the Russian city of Perm, just west of the Urals, some 700 miles northeast of Moscow.

The Congress commemorated the founding of the Permian System 150 years ago by the British geologist, R.V. Murchison, when he showed that the Permian rocks form a major geologic unit between the Carboniferous and the Triassic. Murchison, however, did not discover the Permian - that was done by the Russians many years before when, because of their interest in deposits of salt, copper, and other minerals, they had already studied and mapped the Permian rocks.

The approximately 230 presentations at the Congress, in Perm, covered a wide range of subjects: paleontology, classification, refined correlation, stratigraphy and magneto-stratigraphy, sedimentation, paleoclimatology and paleogeography, tectonics, igneous geology, minerals, the history of Permian studies, geophysics and geochemistry, present Karst processes, extinctions, and conservation. There was a preponderance of palynologists and conodont specialists interested in correlation and ancient climates. There were also stimulating discussions of provinciality, bipolarity, and extinction of biotas.

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[1] Complete published version of paper in January 1992 issue of "GEOTIMES"

Seventeen countries were represented. There were 231 Russian registrants, 26 from North America, and 51 from the rest of the world. In addition, there were many students, some of whom presented excellent papers.

Additional meetings were held by International Working Groups and Subcommissions. At these there was much discussion of boundaries, and an exciting proposal for a middle (Guadalupian) stage. In addition further working groups on biostratigraphy of parts of the Permian System were formed, and a proposal was heard for future Permian Congresses at regular intervals.

Two pre-Congress field trips of approximately 10 days were held in the South and Central Urals and there was a third along the Volga and Kama Rivers. My wife and I participated in the latter, much of our time on river boats, including modern hydrofoils. There were excellent opportunities to sample the marine and non-marine Upper Permian rocks, and lively discussions took place.

We later attended a post-Congress excursion with a small group to Leningrad, to examine collections in museums and institutions there. That city must rank as one of the most beautiful in the world, and some attempt is now being made to repair and beautify buildings too long neglected.

The Congress was planned and organized by Academicians Boris Sokolov (of Moscow), Alexander Zhamaida (of Leningrad), and Boris Chuvashov and Victor Koroteev (both from Sverdlov), and Professors William Kanes and Alan Nairn of the Earth Sciences and Resources Institute of the University of South Carolina in Columbia, South Carolina.

Our hosts did everything possible to make us all welcome, and to make our stay as gratifying and comfortable as possible. We were all grateful not only to the organisers and officials, but also to the bevy of intelligent, delightful and enthusiastic young University language and geology students, who acted as our translators, friends and assistants throughout.

We came away with a feeling of admiration for our new friends, and satisfaction that the understanding of Permian history had been advanced by the Congress. A publication is anticipated, and there was much fruitful work, despite inevitable problems. Our hosts expressed the hope that the Congress would lead to much future beneficial collaboration and important field trips.

As a final note I might add that our Russian colleagues repeatedly said how much they appreciated receiving reprints. They also pointed out that if duplicate copies were sent to individuals, they could then distribute them to the appropriate Librarians, so that the works could be readily available for students.

Norman D. Newell
Gillian W. Newell

5. OPENING ADDRESS AT PERM, U.S.S.R.

Dear Chairman, Ladies and Gentlemen!

On this unique occasion, the one hundred and fifty anniversary of the establishment of the Permian System, I would like to thank our chairman, and our generous host, USSR Academy of Sciences, Uralian Branch, for providing so many Permian friends from all over the world with such a pleasant atmosphere to meet, to exchange views and to share thoughts and findings.

The Permian is important in the earth's history, not only from the scientific point of view, but also in terms of its economic value. The full understanding of the evolution of life, the development of continents and the mineral deposition during the Permian greatly depend on firm knowledge of the stratigraphic sequence and precise age-dating. The International Subcommission on Permian Stratigraphy is required to designate the type section of each subdivision and to elaborate on the correlation of the Permian.

In recent years, the Subcommission reorganized the International Working Group on Carboniferous/Permian Boundary, set up an International Committee on the Subdivision of Upper Permian, supported the International Committee on Continental Permian in Europe, and developed cooperative work on magnetostratigraphy of the Permian. We are glad all of these endeavours are very active and have been working fruitfully. Before this congress, many of us were excited to see the candidate section of the stratotype for Carboniferous/Permian boundary, the Aidaralash section and the sections of Lower Permian extensively studied by our Permian friends in Soviet Union. We are equally delighted to learn that a proposal on the Guadaulupian Series is going

to be put forward during this congress based on the recently held Guadaulupian Symposium. We also expect to be getting together to see the Upper Permian in South China, or other Tethyan areas, within the next few years. Quite clearly our cooperative works are beginning to bear fruit, and we are approaching a worldwide unified Permian System.

Again, I would like to express our warm congratulations to the opening of the congress and wish it every success.

Thank you!

Jin Yugan

6. MINUTES OF MEETING OF PERMIAN SUBCOMMISSION ON STRATIGRAPHY

Buenos Aires, 22 September

Numbers in Attendance

Informal discussion centred around the topic of whether joint meetings of the Carboniferous and Permian should be held in future, or whether the Permian Subcommission should organise it own meetings. This year there were meetings on the Permian, the Carboniferous and Permian, and Gondwana. The consensus was that because of the universal shortage of funding to attend conferences it would be better to combine the Carboniferous and Permian meetings, especially as so many workers work on both systems. There was a suggestion however that more representation for Permian workers was desirable on the Permanent Committee of the ICC and this sentiment was transmitted to that committee. The next joint meeting (XIII ICC-P) will be held in Poland in 1995.

The secretary presented to the meeting the proposal by Professor T. Güvenç, Ankara, Turkey for a project on the Permian of Turkey and the Transcaucasian-Central Asia (see Item No. 8). This proposal generated considerable interest at the meeting; members are encouraged to send their views to the chairman or secretary.

John Utting

7. PROPOSAL FOR A NEW WORKING GROUP ON CONTINENTAL BEDS AT THE PERMIAN/TRIASSIC BOUNDARY IN THE CONTINENTAL SERIES

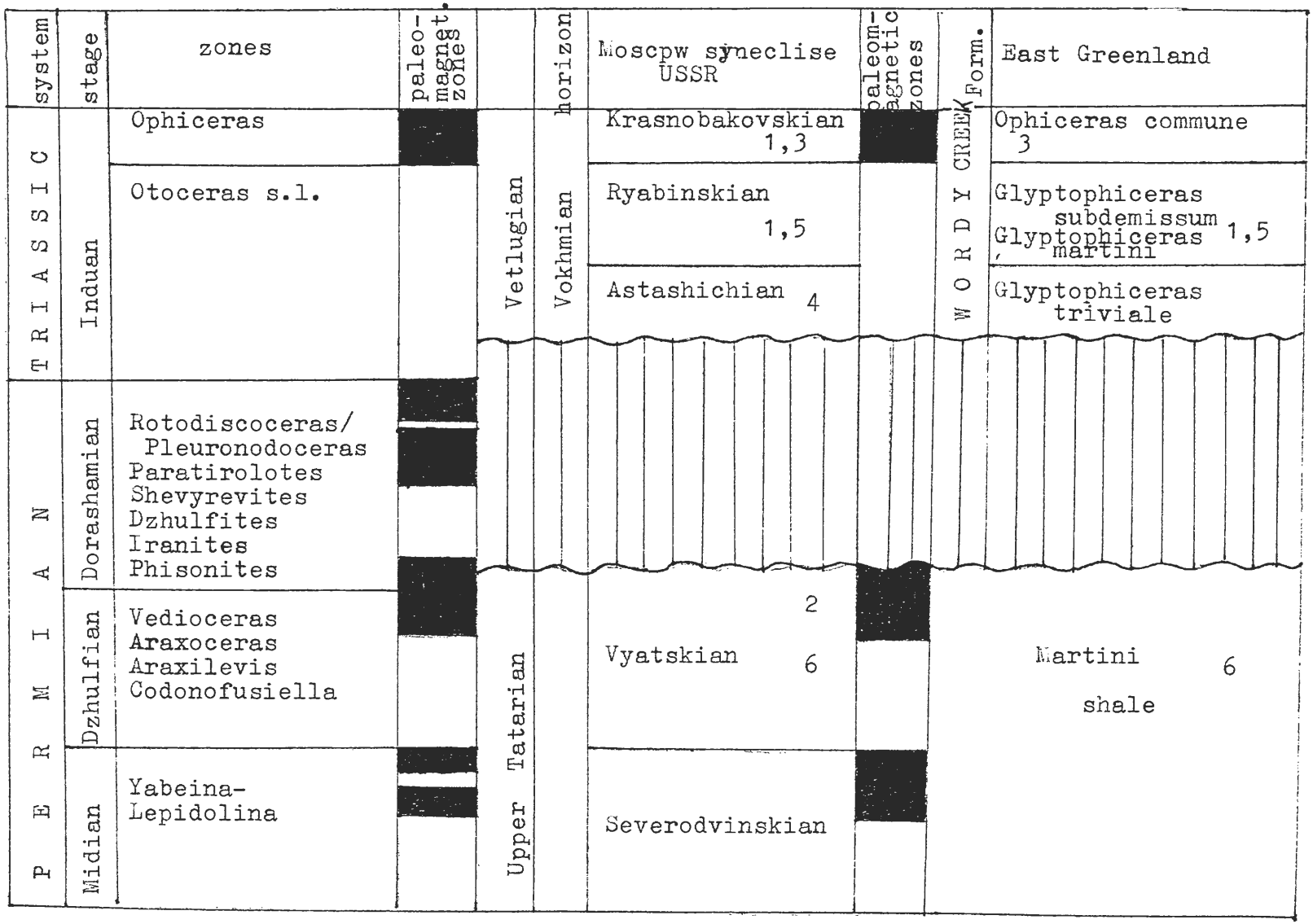
When R. Murchison established the Permian system in Russia in 1841, he included in its upper part the continental series, named later the Tatarian stage by Nikitin (1887). After a long discussion about their age (Permian, Permo/Triassic or Triassic) it was proven that the lower part of Nikitin's Tatarian (which keeps this name until today) is of Permian age, and the upper part, named later as Vetlugian, belongs to the Triassic. Consequently in the stratotypical section the P/T boundary is within the continental series.

Let us examine the position of Tatarian and Vetlugian in the framework of the marine scale. Different methods for correlating the continental and marine deposits are used; paleomagnetic and palynological methods are the most universal. For the Triassic, the method based on Meyen's principle of mutual substitution of characters is applied; this utilizes transitional sections containing both ammonites (marine fauna) and vertebrates (continental fauna). This allows us to correlate in detail the Vetlugian with the Lower Triassic stages (Lozovsky, 1989).

The Tatarian is divided into two substages. The lower of them (with underlying Kazanian) contains the Dinocephalian fauna of vertebrates, and the Upper Tatarian contains the Pareiasaurian-Gorgonopsian fauna (Ochev, Shishkin, 1985). According to Efremov and Watson's works the latter may be correlated with the *Cistecephalus* and *Daptocephalus* fauna of S. Africa. Today that point of view is well known and generally accepted. Recently it was supported by the find of *Daptocephalus* in uppermost part of Upper Tatarian (Petuchov, personal communication).

The tetrapod and fish faunas in the above-mentioned South African zones are in turn very similar to the fauna from the continental deposits of the Lower Sakamena Fm. of Madagascar (Battail, 1987). The latter contains marine layers with ammonites *Cyclolobus*, whose time range corresponds to the Midian and Dzhulfian stages in the Tethyan marine scale. This correlation is confirmed by the presence of the same palynological complex (containing *Vittatina*) in the *Cyclolobus* beds of East Greenland (Martinia shale) and in

Tabl. 1 Correlation of some important P/T sequensis in Europe. Vertical distance not time-or Thickness related.



1. Tupilakosaurus
2. Daptocephalus
3. Luzocephalus
4. Lystrosaurus
5. Taeniaesporites
6. Vittatina

Black column- reversed polarity zone
White column- normal polarity zone

upper horizons of the Tatarian (Balme, 1979). These data show that Tatarian does not extend beyond the upper limit of Dzhulfian, so that the gap in sedimentation falls within the Dorashamian. This conclusion is confirmed by paleomagnetic data. It is known that the boundary between Kyama hyperzone (reversed polarity interval) and Illavara hyperzone (alternation of normal and reversed polarity zones) corresponds to the Lower/Upper Tatarian boundary. In the marine sections this level coincides with the lower limit of the Midian stage; here the number of normal and reversed polarity zones in the overlying part of Permian is bigger than in Upper Tatarian (Kotlyar *et al.*, 1987). Kozur (1989) holds the same opinion on the stratigraphical position of Tatarian in the framework of marine scale.

The Vetlugian overlies different parts of Tatarian. It is subdivided into three horizons: Vokhmian, Rybinskian and Sludkian, the first of them including (in ascending order) the Astashichian, Ryabinskian and Krasnobakovskian members. The vertebrates from Vokhmian are very similar to the forms from Wordy Creek Fm. of East Greenland (Shishkin, 1961, 1980). If one accepts that these common forms appear simultaneously in two regions, it is possible to correlate them (Lozovsky, 1983). Due to the presence of the amphibian *Tupilakosaurus* and a similar palynological complex as the *Taeniaesporites* Association (Balme, 1979), Ryabinskian should be equated with *Glyptophiceras martini* and *G. subdemissum* zones. Krasnobakovskian is an equivalent of the *Ophiceras commune* zone and is marked by appearance of the amphibian *Luzocephalus* which exists along with *Tupilakosaurus*. The Astashichian is probably an equivalent of the *G. triviale* zone. The Lower Triassic ostracodes and conchostracans, closely related to forms from the lowermost Induan of Western Verhoyanian region, were found in the Astashichian member.

The correlation of two lower members of Vokhmian with the *Otoceras* zone and the third (Krasnobakovskian) with the *Ophiceras* zone is confirmed by paleomagnetic data. Astashichian and Ryabinskian show the normal polarity and Krasnobakovskian the reversed one. According to Ogg and Steiner (1989), in Arctic Canada the rocks of *Otoceras* zone s.1 have normal polarity (zone GN1) and those of the *Ophiceras commune* zone the reversed (zone GR1). Consequently, the lacuna between the Tatarian and Vetlugian in East European Platform fits the Dorashamian and partially the beginning of Induan (according to Tozer and Dagys's conclusions the three above-mentioned zones of Greenland correspond to upper part of the *Otoceras* zone s.1.)

Most interesting is the presence in Astashichian member the dicynodont *Lystrosaurus* (Kalandadze, 1975), a genus typical for the South African *Lystrosaurus* zone. The latter is widespread in continental series of Lower Triassic[1] in Gondwana (Middle Beaufort Fm. of S. Africa, Panchet Fm. of India, Fremow Fm. of Antarctica and probably Arcadia Fm. of Australia (DeFauw, 1989) and Laurasia (Moscow syneclise, USSR, upper part of Guodikeng Fm. and Jincaiyuan Fm. of Xinjiang, China, (?) Luang Prabang, Laos and probably Putoranian horizon of Siberia, USSR (Shishkin *et al.*, 1986). In all of the above mentioned regions the formations characterised by *Lystrosaurus* lie with a discordance (evident or hidden) on underlying beds. The data concerning correlation of the lower part of *Lystrosaurus* zone with the *Otoceras* zone s.1 provide evidence that the presently adopted lower boundary of the Triassic in marine facies is isochronous with the continental one. It is characteristic that the marine formations with *Otoceras* also lie with discordance on underlying Permian beds (Tozer, 1988).

The lacuna between the Permian and Triassic in the continental series corresponds to a long time interval everywhere, but it was of different durations in various parts of the world. In the regions where the *Lystrosaurus* zone is present, the lacuna corresponds principally to the upper parts of Permian. Probably this time was the same in Laurasia and Gondwana regions where the Permian deposits contain *Daptocephalus* at the top, and the Triassic contains *Lystrosaurus* at the base. In the regions of Gondwana (India, Antarctica), where the red beds of the *Lystrosaurus* zone are underlain by the coal-bearing formations, this lacuna was probably longer.

The last time some investigators (Kozur, 1989 and others) attempted to revise the upper boundary of the Permian System, they included it in the *Otoceras* zone. If this decision is accepted then this boundary will be lost within the homogeneous continental series and its differentiation practically impossible (Kuchtinov, 1990).

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[1] At present it is impossible to be convinced by the arguments for Upper Permian age of lowest part of *Lystrosaurus* zone (see Dobruskina, 1976.

The question about the P/T boundary is impossible to solve based only on marine sections. Only the complex study and precise correlation of marine and continental sections will allow one to establish the natural limits of biota development and to select the boundary which would be acceptable for the investigators dealing with both marine and continental deposits. At present these two research topics are not coordinated, and the existing Permian/Triassic boundary working group studies exclusively marine sections. This situation is not advisable but it can be remedied by creating in the framework of Subcommission on Permian Stratigraphy one more Working Group to study the P/T boundary in continental series and other problems of Permian continental stratigraphy. Specialists on different groups of continental fauna and flora must be included in the WG which should also include stratigraphers, sedimentologists, paleomagnetists, etc. It would be desirable to organize the first meeting of WG during the 29 IGC (Japan, 1992).

I believe, that the stratotype of the P/T boundary may be selected from one of two sections, where the boundary occurs inside continuous continental series. The first is Daloungko in Junggar Basin, Xinjiang, China (Yang Jinduan *et al.*, 1986), and the second section is in Tungusska syneclise, East Siberia, USSR (Sadovnikov, 1991). The complex study of these and other sections and their correlation with the marine ones will help define correctly the P/T boundary.

References

Balme, B.E., 1979. Palynology of Permian-Triassic boundary at Kap Stosch East Greenland. Medd. Grønland 200 (6), 1-46.

Battail, B., 1988. Biostratigraphie des formations permo-triassiques continentales à Vertébrés tetrapodes et biogéographie du Gondwana. Ann. Soc. Géol. Nord. 107, 37-44.

DeFauw, S.L., 1989. Patterns of evolution in the Dicynodontia, with special reference to austral taxa. *In* Origins and Evolution of the Antarctic. Geol. Soc. Publ. 9/10 (Times), 63-84.

Dobruskina, I.A., 1976. The Permian-Triassic boundary. *In* Boundary of Geological Systems. Nauka, Moscow, 318 pp. (in Russian).

Kalandadze, N.N., 1975. The first discovery of Lystrosaurus in the European regions of the USSR. Paleontol. zhurnal 4, 140-142.

Kotlyar, G.V. *et al.*, 1987. The stages of Permian deposits of tethyan region and its global correlation. Sovetskaya geologia 7, 53-62. (in Russian).

Kozur, H., 1989. The Permian-Triassic boundary in marine and continental sediments. Zlb. Geol. Palaontol. 1, Stuttgart 1245-1277.

Lozovsky, V.R., 1983. About the age of beds with Lystrosaurus in Moscow syneclise. Doklady Akad.nauk USSR 272, (6) 1433-1437 (in Russian).

Ochev, V.G., Shishkin, M.A., 1985. The result of study of stratigraphical significance of Upper Permian and Triassic Tetropodes of USSR. *In* Role Paleontolgy v razvitii otechestvennoi geologii. Trudy 27 sessii VPO. Leningrad, Nauka, 110-119. (in Russian).

Ogg, V.G., Steiner, M.B., 1989. Early Triassic Magnetic Polarity Time Scale. *In* Earth and Planetary Science Letters. Wyoming, 21 pp.

Sadovnikov, G.N., 1991. Stratigraphy of the Upper Permian horizons and the Permian-Triassic boundary in continental series of Siberia. *In* Permian System of the World. Program and Abstracts. IGC Perm. August 5-10. Sverdlovsk, USSR, Columbia, U.S.A.

Shishkin, M.A., 1961. The new data about Tupilakosaurus. Doklady Akad.nauk USSR, 136 (4) 938-941. (in Russian).

Shishkin, M.A., 1980. New family of Triassic Labirinthodontia Luzocephalidae. Paleontol. zhurnal 1, 104-119. (in Russian).

Shishkin, M.A. *et al.*, 1986. Review of Triassic land Vertebrates localities in Asiatic part of USSR. Bull. of the Moscow Society of Naturalist, geol. ser. 61 (6), 51-63. (in Russian).

Tozer, E.T. 1988. Toward a Definition of the Permian-Triassic boundary. Episodes 11 (3), 251-255.

Yang, Jiduan *et al.* 1986. Permian and Triassic strata and fossil assemblages in the Daloungkou area of Jimsar, Xinjiang. Geol. Memoirs 2 (3) Geol. Publishing House, Beijing, China. 262 p.

V.R. Lozovsky

N.B. Members are urged to contact the chairman or secretary with their views concerning this proposal.

8. PROPOSAL FOR A PROJECT ON THE PERMIAN OF TURKEY AND TRANSCAUCASIAN-CENTRAL ASIA

In Turkey we have complete sequences of Devonian to Triassic on the Anatolian Platform with Crimean, Caucasian and Pamirian affinities. Also we have Upper Permian to Jurassic sequences on the Gondwanan Platform with Trans-Permian sections in the Anatolian and Gondwanan Platforms which are separated at least during Lower Bashkirian-Upper Triassic interval. These sections may help solve problems in Permian stratigraphy, as well as Carboniferous/Permian and Permian/Triassic boundary problems.

I should like to propose a project on the Permian of Turkey and Transcaucasian-Central Asia with the participation of specialists in conodonts, radiolarians, brachiopods, corals, foraminifers, palynomorphs, etc.

If you agree that the Permian of Tethys between Laurasia and Gondwana is interesting for solving problems in Permian stratigraphy we can arrange an international project which may cover all important Tethyan regions in Turkey, Iran, Afghanistan, Central Asia and China. Of course the work will be undertaken at important selected sections.

I think that the bilateral scientific projects that we are undertaking with Azerbaydjan, Tukmenistan, Ozbekistan, Kazakistan and Tadjikistan will facilitate this international project.

Tuncer Güvenç

N.B. Members are urged to contact the chairman or secretary with their views concerning this proposal.

9. IUGS SUBCOMMISSION ON PERMIAN STRATIGRAPHY UPPER PERMIAN WORKING GROUP

At the last meeting of the Subcommission, Beijing, September, 1987, following the report of the Working Group it was agreed that for the present the traditional two-fold Subdivision of the Permian into Lower and Upper be retained as best usage. The Working Group reported that there was fairly general agreement in the Working Group for a five-fold Subdivision of the Upper Permian corresponding to the Ufimian, Kazanian, Midian, Dzhulfian and Changhsingian stages. Some of these stage names, however, may not, in the long run, be the most satisfactory. It was decided to produce further Upper Permian correlation charts based on further information with a view to achieving a more general consensus.

Subsequently, correlation charts have been produced particularly those of Kotlyar and Nakazawa which have been reproduced and circulated. These correlations were particularly discussed at the meeting held during Shallow Tethys 3 at Sendai, September, 1990. Much important information will be published in the proceedings published by Saito Ho-on Kai Museum of Natural History, Sendai, Japan (Special Publication No. 3/1991). This volume is now available.

Much progress has been made on understanding the correlation of the Upper Permian and suitable subdivisions for a general world scale. Important problems remaining are correlation of the Ufimian and Kazanian with the Tethyan Scale, definition of the base of the Midian and Dzhulfian and in particular the ranges of *Lepidolina kumaensis* and the *Codonofusiella-Reichelina* Zone - see also Sendai volume. A major three-fold subdivision of the Permian is now apparent involving biostratigraphy and geological events including major tectonic and magmatic and environmental change. These correspond to the traditional oldest subdivision of the Permian - the Lower Permian of the Urals and Japan, the middle subdivision corresponding to the lower part of the traditional Upper Permian, to the traditional Lower Permian of China and the middle Permian of Japan, and the youngest subdivision corresponding to the Upper Permian of China and Japan.

Recommendations

1. Further work to refine the five-fold subdivision and appropriate names for the stages. A number of names currently used do not seem suitable, e.g. Abadehian and Punjabian seem to represent a part of the Dzhulfian. The terms Bolorian, Kuburgandian and Murgabian as presently defined are probably not suitable for the general world scale especially as they are defined from widely separated places.

2. Recognition of a formal nomenclatorial three-fold subdivision is probably premature and even in the long term may be best accomplished by two-fold subdivision of the traditional Upper Permian in order to avoid confusion of usage.

J.M. Dickins

10. CARBONIFEROUS-PERMIAN BOUNDARY WORKING GROUP

A significant contribution to the Working Group was made at the Shallow Tethys 3 meeting and the following Benthos meeting in Sendai, Japan last year. The field visits associated with these meetings were also important. The paper by T. Ozawa is of particular significance. In this paper he discusses the correlation of the *'Pseudoschwagerina'* Zone and in particular the *vulgaris-fusiformis* Zone. The Shallow Tethys 3 volume is being published by Saito Ho-on Kai Museum of Natural History, Sendai, Japan and is now available (Special Publication No. 3/1991).

It seems worth emphasizing that this Zone corresponds to a major marine transgression which follows the very significant regression of the Upper Carboniferous. This transgression appears to correspond not only to important biological change but also not only to sea-level change but tectonic and magmatic change (references below). In deciding the definition of the boundary it seems very important to take into account and to emphasize the need for correspondence between biostratigraphical definition and geological events. A boundary which takes into account only what appears to be the nicest biological boundary may not, in the long run, be the most stable or the most useful, nor the most precise. The search for a continuous section can be little more than a mirage. Two important examples where discrepancy between biological based boundary and the geological events can be seen in the Lower Silurian and the Lower Cretaceous. In both these cases this discrepancy has led to great confusion both stratigraphically and geologically. In the Lower Cretaceous, the main geological boundary is between Middle and Upper Albian and not between Albian and the Cenomanian (see also references below). A similar case is illustrated in the Silurian where the geological boundary, well established in Wales from the last century, is between the Lower and Upper Llandovery which does not correspond with the stage boundaries.

It would seem, therefore, that the most satisfactory boundary from a long term point of view will correspond to the base of the Asselian as defined by Kotlyar *et al* in the recent Permophiles where a major biological change at the base of the *vulgaris-fusiformis* Zone corresponds to the culmination of the Upper Carboniferous regression and the earliest appearance of the subsequent apparently worldwide transgression as has also been shown in Japan and other parts of the world, e.g. Ozawa paper in Sendai volume.

According to groups other than fusulinids a better biostratigraphical boundary in a narrow sense might be found higher in the Asselian or between the Asselian and Sakmarian but taking into account the geological events the base of the Asselian would appear to be a better boundary in the long term.

References

Dickins, J.M.,in press. Permo/Triassic orogenic, palaeoclimate and eustatic events and their implications for biotic alteration. *In* Permo/Triassic Events in Eastern Tethys - Stratigraphy, Classification and Relations with Western Tethys (W.C. Sweet, Yang Zunyi, J.M. Dickens and Yin Hongfu Eds.), Cambridge University Press.

Dickins, J.M., MS. Coincidences of the units of the Standard World Geological Time Scale, sea-level changes and extinctions. Prepared for publication in Historical Biology - Global Bioevents 1990.

Dickins, J.M., MS. Major global changes during the Phanerozoic. Prepared EUG Global Change Symposium, 1991.

J.M. Dickins

11. PERMIAN LIMESTONES OF PENINSULAR THAILAND AND NORTHWEST PENINSULAR MALAYSIA

Limestones are widespread in Peninsular Thailand and northwest Peninsular Malaysia between 6° and 14° latitude north; they build up abrupt and strikingly shaped hills rising commonly above low lying land. They are a delight for tourists. At the outset, all these limestones were considered Carboniferous or Permo/Carboniferous in age. Later on during the 1960's, they were divided into two groups: a Lower Paleozoic group and a Permian group. This paper deals with the Permian group called "Ratburi Limestone" in Peninsular Thailand and "Chuping Limestone" in northwest Peninsular Malaysia. Whereas Chuping Limestone has been used only for limestones of northwest Peninsular Malaysia, Ratburi Limestone has been applied loosely by some authors to Permian limestones of the whole of Thailand. Because of it's peculiarities, Ratburi Limestone must be restricted to Peninsular Thailand.

Ratburi Limestone and Chuping Limestone are interesting because they are different from the limestones of east Peninsular Malaysia, east Thailand, Laos, Cambodia and Vietnam. They rest on shale and sandstone with some interbeds of diamictite. They range from Middle to Late Permian. Fusulinidae and corals are poorly developed; many genera of Fusulinidae (e.g. *Neoschwagerina*, *Yabeina*, *Lepidolina*, *Verbeekina*, *Sumatrina*, *Palaeofusulina* and others) are entirely lacking as well as many genera of compound Rugosa (as *Ipciphyllum*, *Pseudohuangia* and others). On the contrary, brachiopods and Bryozoa are abundant at many places. Faunal affinities with the Permian of Timer are quite strong.

The stratigraphical range of the Ratburi and Chuping Limestones has been determined mainly by studies of small foraminifers and brachiopods (Waterhouse & Piyasin 1970, Yanagida 1970, Grant 1976, Waterhouse 1981, Waterhouse *et al.* 1981, Fontaine *et al.* 1986, Fontaine *et al.* 1988). Conodonts have been isolated from a single Permian locality (Metcalfe 1984). In the present state of our knowledge, the deposition of limestone appears to have started during the Bolorian and lasted until the Dzhulfian at least. The Dorashamian has not been clearly documented; it may be represented by limestone very poor in fossils or by dolomitic limestone.

As early as 1966, Ishii and Nogami showed that the so-called Permian limestones of Kodiang area in Kedah State, northwest Peninsular Malaysia, were actually Triassic in age; since 1966, other studies have confirmed this result and a new term "Kodiang Limestone" has been proposed (de Coo and Smit 1975). In 1988, Fontaine *et al.* found Triassic microfossils at Bukit Chuping, the type locality of the "Permian Chuping Limestone" in Perlis State, northwest Peninsular Malaysia. At the same time, Anisian conodonts were discovered in Phatthalung area, Peninsular Thailand (Igo *et al.* 1988). In 1990, Triassic fossils have been collected again from several areas of Peninsular Thailand and a few hills of Perlis State in northwest Peninsular Malaysia. Accordingly, Triassic limestones which were ignored in the past are relatively widespread and strewn among the Permian limestone exposures.

In some areas, limestone deposition has been continuous probably without a break from Permian to Triassic. In other areas, Permian and Triassic limestones build up parallel ridges separated by flat land without outcrop; consequently, the precise relationship between the two limestones is unknown in these areas.

During the Permian, the filtering mechanism which halted many genera of Fusulinidae and corals might have been climate.

References

Coo, J.M.C., 1975. The Triassic Kodiang Limestone Formation in Kedah, west Malaysia. Geol. Mijnb. 54 (3-4), 169-176.

Fontaine, H., Khee H.P. and Vachard, D., 1988. Discovery of Triassic fossils at Bukit Chuping, in Gunung Sinyum area, and at Kota Jin, Peninsular Malaysia. Journ. Southeast Asian Earth Sc. 2 (3-4), 145-162; 5 pl.

Fontaine, H., Tien, N.D., Vachard, D. and Vozenin-Serra, C., 1986. The Permian of Southeast Asia. CCOP Techn. Bull. 18, 171 pp., 26 pl.

Grant, R.E., 1976. Permian brachiopods from Southern Thailand. Journ. Paleont. 50 (2), suppl. Paleont. Mem. 9, 269 pp., 71 pl.

Igo, H., Nagane, N. and Nakinbodee, V., 1988. Middle Triassic conodonts from southern Thailand (preliminary report). Ann. Rep. Inst. Geosc. Univ. Tsukuba 14, 46-50.

Ishii, K. and Nogami, Y., 1966. Discovery of Triassic conodonts from the so-called Palaeozoic limestones in Kedah, Malaya. Journ. Geosc. Osaka City Univ. 9, 93-100.

Metcalfe, I., 1984. The Permian-Triassic boundary in northwest Malaya. Warta Geologi 10 (4), 139-147.

Waterhouse, J.B., 1981. Age of the Ratburi Limestone of Southern Thailand. Geol. Surv. Mem. 4, 1-42.

Waterhouse, J.B., Pitakpaivan, K. and Mantajit, N., 1981. Early Permian brachiopods from Ko Yao Noi and Krabi, southern Thailand. Geol. Surv. Mem. 4, 43-146.

Waterhouse, J.B. and Piyasin, S., 1970. Mid-Permian brachiopods from Khao Phrik, Thailand. Palaeontographica 135A (3-6), 83-197.

Yanagida, J., 1970. Permian brachiopods from Khao Phrik, near Ratburi. Geol. Palaeont. Southeast Asia 8, 69-96.

Henri Fontaine

12. PANGEA PROJECT

PROJECT PANGEA, the newest initiative of the Global Sedimentary Geology Program (GSGP, a Commission of IUGS) is under way. PROJECT PANGEA will look at the Earth's sedimentary record during the time of assembly of the supercontinent PANGEA, i.e. during late Paleozoic and early Mesozoic time, and its subsequent breakup and dispersal during latest Triassic and earliest Jurassic time, which led to the present-day disposition of continents. PROJECT PANGEA will focus on the most recent time of supercontinent accretion and dispersal when continents merge toward a geoid low. The sedimentary record of Pangea represents an ideal interval of the earth's history from which one can evaluate the processes and magnitude of environmental variability and develop a predictive rationale for evaluating current environmental concerns. A multitude of research problems have been identified and will be dealt with through PROJECT PANGEA. Perhaps the most fascinating of these problems will be to assess the causes of large scale global climatic changes such as changes from an icehouse mode to a greenhouse mode as it happened during PANGEA time and as it is likely to happen in our immediate future. The biological and environmental changes that accompanied the end-Permian and the end-Triassic extinctions will also be scrutinized.

A first meeting was recently held in San Diego, California, as part of the Annual Meeting of the Geological Society of America: PANGEA: ICEHOUSE PROCESSES, CLIMATES AND EVENTS ON A SUPERCONTINENT. October 20, 1991. The symposium brought together specialists with different backgrounds from paleontologists to climate modellers, who tried to address various issues relating to the Carboniferous to Jurassic global environments of Pangea. This first meeting was very well attended, confirming the vast interest for the new GSGP initiative.

An International Workshop on Project Pangea will be held in Lawrence, Kansas, May 24-29, 1992. This workshop is contingent on funding. A dozen of keynote speakers will present papers, after which the workshop participants will be grouped into five working groups (WG) and will address specific aspects of Pangea:

WG-1 Paleogeography, plate tectonics and paleoclimate
WG-2 Global synchroneity of the sedimentary record
WG-3 Stratigraphic constraints on global synchroneity
WG-4 Carboniferous to Jurassic resources
WG-5 Synthesis

An International conference on *Carboniferous to Jurassic Pangea: Resources and Environments* will be held in Calgary, Canada, August 15-19, 1993. This conference, to be co-sponsored by the Canadian Society of Petroleum Geologists (CSPG), will be open to anyone interested in presenting their work relating to the Carboniferous to Jurassic time interval. Papers dealing with either global environmental aspects or global resources of Pangea will be presented. Many field trips will examine the Carboniferous to Jurassic succession of the Canadian Rocky Mountains and that of the exotic terranes of the western Cordillera. The proceedings will be published in a high-quality memoir, the printing cost of which will be partially absorbed by the CSPG. A first circular will be mailed out soon.

If you are interested in PROJECT PANGEA, if you want your name to be added to the mailing list, or if you want more information concerning the Laurence Workshop or the Calgary Conference, please write to either:

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13. THE AGE OF THE PERMIAN-TRIASSIC BOUNDARY

The 5 cm. boundary clay bed in the Chinese stratotype section through the Permian-Triassic boundary has been recognized as a bentonite. SHRIMP ion microprobe dating of zircons in the bentonite indicates a magmatic age of 251.2 ± 3.4 Ma (2 σ); this is the first direct constraint on the numerical age of the Permian-Triassic boundary.

Future refinements of ages at this important, but poorly constrained, level of the Phanerozoic timescale may depend on re-analysis of this uniquely placed volcanic horizon, and other bentonites in the fossiliferous Chinese Upper Permian and Lower Triassic. The utility of defining the Permian-Triassic boundary in the Chinese stratotype section, in the vicinity of known dateable horizons, should be considered. (Abstract, *Earth and Planetary Science Letters*, 105 (1991) 182-190).

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