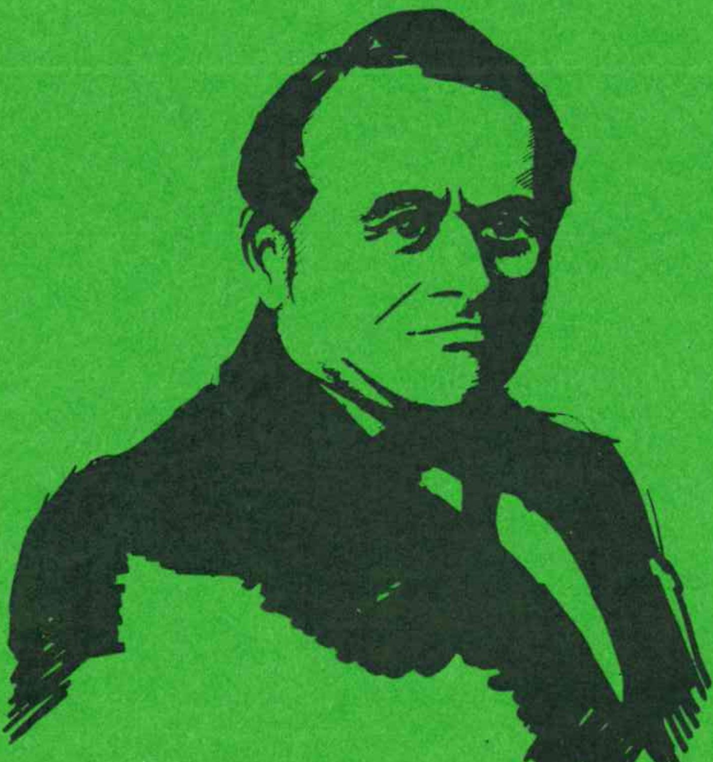
ALBERTIANA

SUBCOMMISSION ON TRIASSIC STRATIGRAPHY



FRIEDRICH AUGUST VON ALBERTI (1795 - 1878)

3 MARCH, 1985

ALBERTIANA

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Heidelberglaan 2
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The primary intention of ALBERTIANA is to promote the interdisciplinary collaboration and understanding among the members of the I.U.G.S. Subcommission on Triassic Stratigraphy. Within this scope, ALBERTIANA serves both as a newsletter for the announcement of general information and as a platform for discussion of new developments in the field of Triassic stratigraphy. ALBERTIANA thus encourages the publication of announcements, literature-reviews, progress-reports, preliminary notes, etc. - i.e. those contributions in which information is presented relevant to current interdisciplinary Triassic research.

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Non-members of the Subcommission on Triassic Stratigraphy can obtain ALBERTIANA at the cost of US $ 2.50 per issue (bank-cheque to Mr.A.J.Goslinga,Laboratory of Palaeobotany and Palynology, Heidelberglaan 2, 3584 CS Utrecht, The Netherlands).

SUBCOMMISSION ON TRIASSIC STRATIGRAPHY

REPORT 1984

H. VISSCHER

In 1984 the STS continued the general discussion of the scheme of chronostratigraphical classification and correlation proposed by the IGCP project no. 4: "Triassic of the Tethys Realm". There are still many fundamental controversies with regard to (a) the ammonoid zones applied, (b) the relative value of zonation schemes based on a variety of fossil groups other than ammonoids, (c) the position of biostratigraphical and chronostratigraphical boundaries, (d) stage and substage nomenclature, and (e) the status of some of the chronostratigraphical units.

As a preliminary result of these discussions a scheme of Triassic subdivision at a stage level was prepared for presentation to the 27th International Congress. During the STS meetings in Moscow stage nomenclature was amply discussed. The following modified scheme was accepted:

				204±4
TRIASSIC	UPPER	RHAETIAN		
				(210±5)
		NORIAN		
				220±8
		KARNIAN		
				229±5
	MIDDLE	LADINIAN		
				233±4
		ANISIAN		
				239±5
	LOWER (SCYTHIAN)	OLENEKIAN	SPATHIAN	
			SMITHIAN	
		INDUAN	DIENERIAN	
			GRIESBACHIAN	
				245±5

Triassic (sub)stage terminology accepted at meetings of the Subcommission on Triassic Stratigraphy, Moscow, 1984.

It was agreed to include the North American units Griesbachian, Dienerian, Smithian and Spathian as divisions of the Lower Triassic; the resulting subdivision ought to be regarded as an alternative to the concept of the Lower Triassic propagated in the USSR (Induan, Olenekian Stages). It has to be noted, however, that some authorities maintained that the North American units should be ranked as substages rather than stages.

It was further agreed to place a broken line in the scheme beneath the Rhaetian, to signify that the lower limit of this unit is of an uncertain position with respect to the Norian. There is no consensus about the status of the Rhaetian (stage, or substage of the Norian).

Also the Permian-Triassic boundary working group had its first meeting in Moscow. On the basis of a questionnaire a discussion was initiated which must lead to (a) the selection of an age in the biochronological hierarchy that can be recommended as defining the earliest Triassic, and (b) the selection of a stratotype where earliest Triassic rocks have their typical development. It has become apparent that the base of the *Otoceras* beds is largely, though not unanimously, favoured as a realistic base of the Triassic System.

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All members are requested to give their further comments on the 1984 schema of Triassic Subdivision. It is particularly important to include alongside the column the major tectonic, magnetic and significant biological events.

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Contributions for the next issue of ALBERTIANA should reach the Editor of the Secretary General before September 1985.

The lay-out of contributions should be preferably comparable to that of the contributions in the present issue of ALBERTIANA.

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COLOQUIO DE ESTRATIGRAFÍA Y PALEOGEOGRAFÍA

DEL PÉRMICO Y TRIÁSICO DE ESPAÑA

21 - 28 SEPTEMBER 1985

Presentation of new results on stratigraphy and facies of the Permian and Triassic of Spain. Discussion of stratigraphic correlations and paleogeographic reconstructions.

Field-trips to the Triassic of the Catalanides and the Permian/Triassic of the Pyrenees.

Organizers: C. Puigdefàbregas and M. Marzo,
Servei Geològic de Catalunya,
Traversera de Gràcia, 56, 4rt 1',
BARCELONA 6 - SPAIN.

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SUBCOMMISSION ON TRIASSIC STRATIGRAPHY (STS)

HISTORY 1968 - 1984

E.T. TOZER

This review of the history of STS summarizes the happenings at the meetings, particularly with the object of indicating the persons who have been involved, and how the present Subcommission came into being. * indicates a deceased participant.

1968 - 1969

In November 1968 V.V. Menner (USSR), who was then Chairman on the parent body, the Commission on Stratigraphy, wrote to me suggesting that I undertake to form the STS. In March 1969 I replied saying that I would be pleased to participate but was reluctant to be the principal organiser because I considered I might be unduly prejudiced and partisan.

1971 Calgary, Canada

August 1971 was the occasion of the International Symposium on the Permian and Triassic Systems held in Calgary. A meeting to discuss the formation of STS was held under the guidance of D.J.McLaren (Canada), who was then Chairman-elect of the Commission, in succession to Menner. Among those present were R. Assereto* (Italy), P.F. Burollet (France), J.D. Campbell (NZ), G.A. Cooper (USA), D.W. Gibson (Canada), B. Kummel* (USA), N.J. Silberling (USA), K. Seyed-Emami (Iran), E.T. Tozer (Canada). At this meeting the suggestion was made that J. Ricour (France) would be a suitable organiser for STS and it came about that he was appointed to this position by the Commission.

1972 Montreal, Canada

A meeting was held on August 29 during the 25th IGC. J. Ricour (France) took the chair. Present were A.I. Afitsky (USSR), P.F. Burollet (France), M.G. Busson (France), V.V. Menner (USSR), M. Misik (CSSR), G.P. Pialli (Italy), J. Ricour (France) and E.T. Tozer (Canada). Ricour proposed that Tozer be appointed a Vice Chairman and that A.S. Dagys (USSR) be approached to become a second Vice Chairman. The names of about 35 specialists were listed as potential participants in the work of STS.

1973 Vienna, Austria

On May 19 a meeting was held in conjunction with that of IGCP Project 4 (Triassic of the Tethys Realm). Present were D. Andrusov* (CSSR), R. Assereto* (Italy, J. Bystricky (CSSR), L. Courel (France), M. Ganev (Bulgaria), F. Hirsch (Israel), V. Jacobshagen (FRG), L. Krystyn (Austria), V. Kollarova-Andrusovova (CSSR), B. Kummel* (USA), D. Patrulius* (Rumania), B. Plochinger (Austria), G. Richter-Bernberg (FRG), J. Ricour (France), W.M. Schuurman (Netherlands), A. Tollmann (Austria), E.T. Tozer (Canada), A.W. van Erve (Netherlands), C. Virgili (Spain), H. Visscher (Netherlands), J. Wiedmann (FRG), H. Zapfe (Austria).

Ricour expressed the desire to retire and it was proposed that the definitive STS comprise H. Zapfe (Austria) as Chairman, A.S. Dagys (USSR) and E.T. Tozer (Canada) as Vice Chairmen and L. Krystyn (Austria) as Secretary. The proposed Commission statutes called for no more than 16 people as the initial membership of a Subcommission. At this meeting no decision was made regarding the full membership, but a long list of potential participants was compiled.

1975 Vienna, Austria

On October 3 a meeting was convened by H. Zapfe, again in conjunction with the meeting of IGCP Project 4. Present were R. Assereto* (Italy), K. Balogh (Hungary), J. Bystricky (CSSR), L. Courel (France, V.J. Gupta (India), V. Kollarova-Andrusovova (CSSR). E. Kristan-Tollman (Austria), H. Mostler (Austria), N.J. Newell (USA), E. Ozdemir (Turkey), G. Pisa* (Italy), G.Richter-Bernberg (FRG), K. Seyed-Emami (Iran), E.T. Tozer (Canada), M. Urlichs (FRG), H. Visscher (Netherlands), H. Zapfe (Austria). It was at this meeting, for the first time, that the initial complement of 16 members was proposed, together with 33 correspondents.

The members: J. Anderson (S.Africa), R. Assereto* (Italy), J. Bystricky (CSSR), L. Courel (France), A.S. Dagys (USSR), J. Grant-Mackie (NZ). V. Jacobshagen (FRG), H.M. Kapoor (India), L. Krystyn (Austria), R.A. McTavish (Australia and U.K.), K. Nakazawa (Japan), G. Richter-Bernberg (FRG), K. Seyed-Emami (Iran), N.J. Silberling (USA), E.T. Tozer (Canada), H. Visscher (Netherlands).

Richter-Bernberg was nominated Chairman; Jacobshagen, Secretary; Dagys and Tozer, Vice Chairmen.

The correspondents: M.G. Audley-Charles (UK), K. Balogh (Hungary), J.D.Campbell (NZ), P. De Capoa (Italy), M. Gaetani (Italy), M. Ganev (Bulgaria), J. Glazek (Poland), E. Gradinaru (Rumania), V.J. Gupta (India), M. Herak (Yugoslavia), Sir Peter Kent (UK), L.D. Kiparisova* (USSR), V. Kollarova-Andrusovova (CSSR), H. Kozur (DDR), E. Kristan-Tollmann (Austria), B. Kummel* (USA), H. Mostler (Austria), N.J. Newell (USA), A.N. Oleynikov (USSR), E. Ott (FRG), E.Ozdemir (Turkey), D. Patrulius* (Rumania), G. Pisa* (Italy), H.Rieber (Switzerland), P. Robinson (UK), S.W. Skwarko (Australia), W.C. Sweet (USA), M. Urlichs (FRG), C. Virgili (Spain), G. Warrington (UK), J. Wiedmann (FRG), L. Zaninetti (Switzerland), H. Zapfe (Austria).

This list was submitted to D.J. McLaren, Chairman of the Commission, on October 15, 1975.

1978 Munich, Germany

A conference and workshop session for STS was convened in Munich, July 3-7, by the Chairman, G. Richter-Bernberg. I was not present. Much of the discussion evidently was on the status of the Rhaetian, which resulted in a published account (J. Wiedmann, F. Fabricius, L. Krystyn, J. Reitner & M. Urlichs: Über Umfang und Stellung des Rhaet; Newsl. Stratigr., 8 (2), 133-152, Berlin-Stuttgart, 14.12.79).

1978 Budapest, Hungary

Many of the members and corresponding members of STS (including myself) attended, the workshop meetings of IGCP Project 4, October 3-5. The Chairman was not present, however, and there was no formal meeting.

1979 Cortina, Italy

A somewhat informal meeting of STS took place on June 28, during the field excursion arranged in connection with the Assereto-Pisa Memorial Symposium held in Bergamo. Present: A. Baud (Switzerland), K. Balogh (Hungary), K. Budurov (Rumania), Fan Jia-song (China), M. Gaetani (Italy), A. Gazdzicki (Poland), V.J. Gupta (India), V. Jacobshagen (FRG), L. Krystyn (Austria), J. Marcoux (France), J. Michalik (CSSR), E. Ott (FRG), A. Ramovs (Yugoslavia), H. Rieber (Switzerland), W.C. Sweet (USA), E.T. Tozer (Canada), M. Urlichs (FRG), E. Vegh-Neubrandt (Hungary), H. Visscher (Netherlands), J. Wendt (FRG), H. Zapfe (Austria).

There was some discussion concerning the organization of STS and the impression was gained that Richter-Bernberg (who was not present) was contemplating retiring. It was suggested that Carmina Virgili (Spain) might be willing to take the position.

1980 Paris, France

At the meeting of the Commission, July 9, in accordance with the suggestion made at Cortina, in 1979, Carmina Virgili (Spain) was formally appointed Chairman of STS.

1980 Bratislava, CSSR

This meeting was held on October 27. It was opened by V. Jacobshagen who announced the retirement of G. Richter-Bernberg as Chairman, his replacement by Carmina Virgili, and his own retirement as Secretary. Two new Vice Chairmen were then appointed: K. Budurov (Rumania) and L. Courel (France). It was also decided to request E.T. Tozer (who was not present) to continue as a Vice Chairman. H. Visscher (Netherlands) became the Secretary General.

The following were accepted as new members of STS: W.A. Brugman (Netherlands), Chen chu-zhen (China), G. Demathieu (France), J.M. Dickins (Australia, corresponding member), J. Doubinger (France), J.C. Gall (France), J. Marcoux (France), A. Nicora (Italy).

1981 Sarajevo, Yugoslavia

This meeting was chaired by Carmina Virgili. Present were A. Baud (Switzerland), W.A. Brugman (Netherlands), K. Budurov (Rumania), J. Doubinger (France), M. Gaetani (Italy), M. Herak (Yugoslavia), V. Jacobshagen (FRG), S. Kovacs (Hungary), J. Marcoux (France), R. Mock (CSSR), A. Nicora (Italy), D.Patrulius* (Rumania), A. Ramovs (Yugoslavia), M. Siblik (CSSR), E.T. Tozer (Canada), E. Vegh-Neubrandt (Hungary), C. Virgili (Spain), H. Visscher (Netherlands), H. Zapfe (Austria).

H.M. Kapoor (India) and T. Koike (Japan), were appointed members; J. Haas (Hungary), a corresponding member.

1982 Vienna, Austria

This meeting took place on July 8 with Carmina Virgili in the chair, attended by the Secretary General, H. Visscher. Tozer was not present. One new member, A. Gazdzicki (Poland) was appointed.

1984 Moscow, USSR

Two meetings were held, am and pm on August 10, during the 27th IGC. Members and corresponding members present: A. Baud (Switzerland), J.D. Campbell (NZ), L. Courel (France), A.S. Dagys (USSR), J.M. Dickins (Australia), J.C. Gall (France), J. Haas (Hungary), V. Jacobshagen (FRG), S. Kovacs (Hungary), H. Kozur (Hungary), J. Marcoux (France), A.N. Oleynikov (USSR), E.T. Tozer (Canada), C. Virgili (Spain), Yu.D. Zacharov (USSR).

C. Virgili took the chair in the morning; Tozer and Dagys in the afternoon.

Also present, as observers: Yu.M. Bytschkov (USSR), A.A. Dagys (USSR), I.A. Dobruskina (USSR), E.A. Gluzbar (UUSR), J. Grant-Mackie (NZ), W.B. Harland (UK), V.R. Lozovskiy (USSR), A. Oravecz-Schaeffer (Hungary), E.B. Payevskaya (USSR), I.V. Polubotko (USSR), K.O. Rostovstev (USSR), G.N. Sadovnikov (USSR), A.A. Shevyrev (USSR), V.I. Slavin (USSR), H.S. Torrens (UK), E.K. Trifonova (Bulgaria), Yang Zun-yi (China), O.P. Yaroshenko (USSR).

New appointments of officers were made. A. Baud and A.S. Dagys becoming Vice Chairmen, replacing K. Budurov and L. Courel.

Apart from administrative matters most of the discussion concerned nomenclature at the stage level for the whole of the Triassic. It was agreed to include Griesbachian, Dienrian, Smithian and Spathian as divisions of the Lower Triassic, ranked as stages or substages. Rhaetian was included at the top of the Triassic, overlapping the Norian in scope. It was agreed to place a broken line beneath the Rhaetian on the Table to be submitted to the Commission, to signify that the lower limit of the Rhaetian, as defined by the Koessen beds stratotype, is of an uncertain position within the Norian.

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EDITORIAL

The third issue of "Albertiana" has been delayed considerably for several reasons. The main reason is the removal of the Laboratory of Palaeobotany and Palynology, State University Utrecht to a new housing inside the same building (address unchanged). Moreover, the Laboratory is deeply involved in time-consuming procedures resulting from the current process of profound reorganization of Dutch academic structure. A positive factor causing some delay is the increasing number of reprints and other publications sent to be reviewed to the editor/secretary general. A negative factor in this respect is the inadequate form manuscripts to be published in "Albertiana" have been handed in. The editor would be much helped if contributors would be kind enough to provide him with manuscripts in an appropriate form, e.g. with charts and tables ready for the press.

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BRIEF COMMENTS ON THE IGCP-4 TIME SCALE

CHEN CHU-ZHEN

My personal comments on the proposed IGCP-4 time scale are:

(1) "Induan" seems to be an uncorrect spelling, the correct being "Indusian".

(2) We prefer to consider the *trinodosus/reitzi* zones as the Anisian/Ladinian boundary. The *"Protrachyceras" reitzi* was revised recently by WANG (1983) as a new protrachyceratid, namely *Xenoprotrachyceras* Wang. In China, its time-equivalent zone is represented by the *Xenoprotrachyceras primum* zone. This *primum* fauna is similar to that of the Upper Ladinian *Protrachyceras departi* zone (nearly time-equivalent *P. archelaus*) and is very different from the Anisian Qingyen fauna with *Paraceratites trinodosus*, *P. binodosus* and *Nicomedites* zones. The same holds for bivalves and conodonts.

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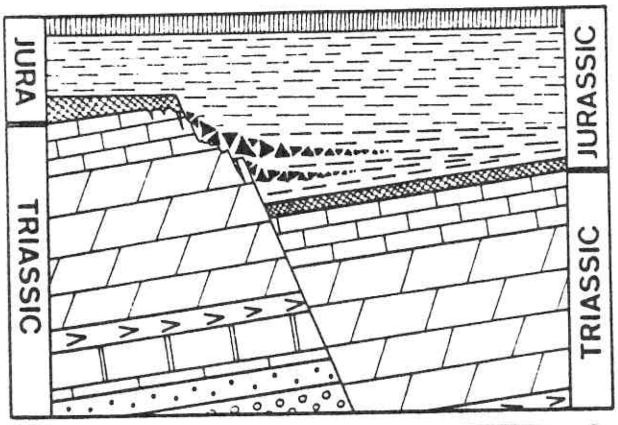

FIELD WORKSHOP

ON TRIASSIC AND JURASSIC SEDIMENTS IN THE EASTERN ALPS OF SWITZERLAND

25 - 29 AUGUST 1985

Presentation of new results on stratigraphy and facies of the Triassic and Jurassic sediments in the Austroalpine nappes of Graubünden, Switzerland. Discussion of stratigraphic correlations, paleogeographic and palinspastic reconstructions.

Organizers: R. Trümpy and H. Furrer
Geologisches Institut
ETH-Zentrum
CH-8092 Zürich

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CORRELATIONS OF THE NEW ZEALAND TRIASSIC SUCCESSION

J.D. CAMPBELL

ABSTRACT

In a thick clastic succession (7000 m) spanning much of Triassic time, firm correlation on the basis of ammonoid occurrence are made at four, perhaps five levels. Faunas are known of Olenekian (Smithian), Anisian (*Caurus* Zone: FAD *Ussurites*, *Leiophyllites* and *Sturia*; *Varium* Zone: FAD *Parapopanoceras*, *Ptychites* and *Anagymnotoceras*), Norian (a generalized placing deriving from *Rhacophyllites debilis* Hauer, *Cladiscites*, *Arcestes*, *Pinacoceras*, *Epigymnites*), and Rhaetian (Otapirian Stage with *Arcestes* cf. *rhaeticus*).

Conodonts suggest two perhaps three tie points for Torlesse carbonate rocks within the range Late Karnian to Late Norian. *Heterastridium* establishes a late Middle to early Upper Norian (*Columbianus-Cordilleranus* Zone) correlation in both Murihiku and Torlesse facies.

Proclydonautilus mandevillei (Marshall) is suggestive of higher Norian and the coleoid *Prographularia* (Otapirian Stage) might imply a Rhaetian equivalence.

The incoming of *Daonella*, *Halobia*, *Monotis* (s.l.) its subgenera, and *Otapiria* each provides a basis for correlation but for *Otapiria* the first appearance here is within the Otapirian Stage (= Rhaetian) in contrast to its ?Karnian, Norian appearance in Siberia.

Brachiopods of the Norian "grade of evolution" appear in the lower part of the range of *Heterastridium*. A related younger brachiopod fauna characterizes later Otapirian time within the range of *Otapiria dissimilis* (Cox).

The basis of a Maorian province is reviewed. The fauna has a strong Tethyan element and forms in it of Boreal occurrence were probably amphitropical.

INTRODUCTION

This paper summarizes recent work of a group of specialists in New Zealand Triassic palaeontology. Those involved are J.G. Begg, L.R.S. Braithwaite, J.S. Buckeridge, H.J. Campbell, J.D. Campbell, M.P. Cave, Y.K. Crosbie, R.E. Fordyce, N. de Jersey, Sir Charles Fleming, J.A. Grant-Mackie, M.R. Johnston, D.A.B. MacFarlan, J.I. Raine, G.J. Retallack, J.E. Simes, C.P. Strong, I.G. Speden, G.R. Stevens, J.B. Waterhouse, G.J. Wilson.

Triassic rocks form an important part of the sedimentary succession in New Zealand. Three separate occurrences each with a distinctive tectonic history are recognized:

- Murihiku Supergroup (marine, Early, Middle and Late Triassic)
- Torlesse Supergroup (marine, non-marine, Middle and Late Triassic
- Topfer formation (non-marine, Late Triassic)

M u r i h i k u   S u p e r g r o u p

Triassic sediments of the Murihiku Supergroup form the lower part of a coherent stratigraphic succession of dominantly volcaniclastic (andesitic-rhyolitic) composition. They form a 7000 m thick section in the Hokonui Hills and comparable thicknesses are known elsewhere. Although shellbeds occur as more or less persistent levels, horizons and localities that can be said to be abundantly fossiliferous in terms of diversity are relatively few. Concentrations of ammonoids occasionally occur. Overall, however, the ammonoid succession is patchy. Nautiloids are locally important. *Heterastridium* may occur in banks.

The Triassic biota consists of land plants including palynomorphs, radiolarians, foraminifera, coelenterates (including hydrozoans), "worms", brachiopods, scaphopods, gastropods, cephalopods (including rhyncholites and anaptychi), bivalves (some notably gregarious), conulariids, crinoids, cidaroids, crustaceans (including ostracods and barnacles) and ichthyosaurs and a variety of organisms known only as trace fossils.

There is little doubt about the essential continuity of the sedimentary pile but there are minor breaks and non-deposition episodes. Much detailed stratigraphic work has been done in the south Otago - Southland, Nelson and southwest Auckland areas. Now separated by lateral offset along the Alpine Fault and by cover rocks, the three exposures form part of one rock body with a single tectonic history.

The national time-stratigraphic scheme for the Triassic has its basis in the Murihiku succession but not all inter-regional correlations derive from Murihiku fossils.

T o r l e s s e   S u p e r g r o u p

The Torlesse Supergroup, commonly cited as accretionary, has a range of lithologies including bioclastic limestone, chert, argillite, flysch and a predominant quartzo-feldspathic sand-grade greywacke.

Triassic fossils form part of a Torlesse biota ranging in age from Carboniferous to Cretaceous. Groups represented within the Triassic are marine algae, land plants including palynomorphs, radiolaria, coelenterates (including hydrozoans), "worms", bryozoans, brachiopods, gastropods, cephalopods (including aptychi), bivalves (some are gregarious and some of these are rock formers), crinoids, cidaroids, conodonts and ichthyosaurs. A wide range of trace fossil producers must also be included.

There are fault-bounded blocks within the wide extent of Torlesse sediments in which a simple stratigraphy is preserved. Transitions between non-marine and marine sequences are to be found in some of these (see e.g. Campbell and Force, 1972, Retallack and Ryburn, 1982).

Triassic fossils are also present in blocks in tectonized matrix in melange (e.g. Marden, Simes and Campbell in prep.) or in sheet-like bodies (e.g. Force and Force, 1978, Campbell, H.J., 1983). Relationship between adjacent fault-bounded blocks may sometimes be discernible (e.g. Oliver, Campbell and Speden, 1982). Little or nothing is known of the detailed stratigraphic setting, however, of many, probably the greater number of localities from which collections have been made (see Campbell and Warren, 1965, Speden, 1975 and Speden, 1976).

Within the outcrop of Torlesse Supergroup and parts of Tuapeka and Haast Schist Groups) there is a crudely defined "area" in which Triassic fossils are found. In that localities within it have yielded Triassic fossils the area has been referred to in sedimentary and tectonic writings as the Triassic Torlesse even though a Triassic stratigraphy has not been properly established within it.

The fossils themselves allow the recognition of a zonal scheme (*Daonella*, *Torlessia* (or *Terebellina*), *Halobia* and *Monotis* Zones within the marine suite. The scheme allows grouping of collections and localities from which they were made. On its own, it provides no basis for mapping.

Permian-Triassic and Triassic-Jurassic boundaries have not been located with any degree of precision (cf. Gair, 1967; Mutch, 1963).

The Topfer Formation is an indifferently exposed suite of carbonaceous sandstones resting on Paleozoic granitoid bodies in the Reefton district, northern South Island (Raine, 1980).

History of description of fossil groups that are important in correlation

Ammonoids were mentioned, sometimes named (e.g. *Pinacoceras*, see Campbell, 1983), but none were described in nineteenth century writing on New Zealand Triassic rocks and fossils. They were included in Trechmann's (1918) monographic treatment of the New Zealand Triassic fauna. He gave brief descriptions of five species: *Arcestes* sp., *Arcestes* cf. *rhaeticus* Clark, *Gladiscites* sp., *Pinacoceras* sp., and *Discophyllites* cf. *ebneri* Mojsisovics. All were from the Late Triassic.

Marshall (1909) had named *Arcestes hokonui* on the basis of an unnumbered photograph and a barely adequate description. He sent the material on which the name was based to Boehm from whom it passed to Diener. In Diener's (1921; vide Kummel, 1960) view it could be either *Arcestes* or *Proarcestes* and should not be determined more finely than Family Arcestidae.

The bulk of the New Zealand Triassic ammonoids for which there are descriptions passed through the hands of Bernhard Kummel in the late 1950s - early 60s. In three papers Kummel (1959a, 1960, 1965) established the main points of correlation based on this fossil group. A further fossil collection was in his laboratory at the time of his death.

Kummel (1959a) published descriptions of *Owenites* cf. *koeneni* Hyatt and Smith, *Flemingites* cf. *lidacensis* Welter; *Subvishnuites welteri* Spath and *Wyomingites* cf. *aplanatus* (White). The fauna was considered to belong to his *Meekoceras* Zone, mid-Scythian. It and the sediments containing it form the basin of the Malakovian Stage.

In his second paper (1960) he reviewed the descriptive work of R.A.S. Browne. Browne's 1952 paper on the Etalian Fauna from Beaumont, Southland had been prepared for publication after Browne's death by J. Marwick. Its appearance had an immediate importance scientifically in that the Etalian Stage was introduced at that time but it was also published as a tribute to Browne. Specimens of Browne's collecting, done over nearly half a century, are to be found in several New Zealand scientific institutions. Browne had collected in the Hokonui Hills in the period around 1909 when *Arcestes hokonui* was described.

Kummel reviewed Browne's genus *Beaumontites* and considered it a junior synonym of *Parapopanoceras*. He redescribed *Leiophyllites marshalli* Browne and *Ptychites cultrata* (Browne) and added descriptions of *Leiophyllites* indet. (2 species), *Discoptychites* cf. *megalodiscus* (Beyrich), *Tropigastrites* sp. indet. and *Monophyllites* cf. *sphaerophyllus* Hauer. Marwick's (in Browne, 1952) Anisian age for the Beaumont fauna and the Etalian Stage was confirmed.

Kummel (1965) proposed the name *Prosphingites coombsi* for material from low in the coastal succession at Kaka Point, South Otago. He considered it to suggest a placing in the Late Scythian *Subcolumbites* Zone. It is now placed in the Etalian, Anisian (see below).

With his work (1960) the Oretian-Otamitan ammonite fauna consisted of *Rhacophyllites debilis* (Hauer), *Cladiscites* cf. *beyrichi* (Welter), *Arcestes hokonui* Marshall, *Arcestes* sp. indet., *Epigymnites* sp. indet. and *Pinacoceras* sp. . For the Otapirian Stage he noted that the poorly preserved arcestid seen by Trechmann "could well belong to *Arcestes rhaeticus* Clark", and that another Otapirian specimen available to Kummel "appears to be an indeterminate species of *Rhacophyllites*".

In the last 25 years several reviews and reconsiderations of Kummel's work have appeared. In 1971 Tozer proposed Family Parapopanoceratidae, and drew attention to its Boreal and Pacific distribution pattern. He placed Browne's *Beaumontites* in *Amphipopanoceras* and noted its Middle Anisian age. He relocated *Prosphingites coombsi* Kummel in *Stenopopanoceras* of Anisian (Early-Middle Anisian(age. He noted that *Rhacophyllites* in the Otamitan Stage "is more suggestive of Norian than Carnian".

Tozer (1980) included *Pinacoceras*, *Cladiscites* and *Rhacophyllites* in a group of 12 genera which occur in the Middle Norian *Columbianus* Zone and through the succeeding 3 zones of the Late Norian. He cited *Arcestes* cf. *rhaeticus* Clark of the Otapirian Stage as *Amoenum-Crickmayi* Zones undifferentiated.

Dagys and Yermakova (1981) reviewed the Family Parapopanoceratidae . They confirmed the synonymy of *Amphipopanoceras* and *Beaumontites* and they further synonymized *Amphipopanoceras* and *Parapopanoceras* noting that it is impossible to identify any distinct groups within the genus. They accepted that *Prosphingites coombsi* should be placed in *Stenopopanoceras*.

In recent years J.G. Begg has assembled a large collection of Etalian ammonoids, has prepared descriptions and assessed zonal placings. (J.G. Begg, Unpublished Ph.D. thesis, University of Otago, 1981, and Begg, 1977, Begg, Campbell and MacFarlan, 1983). New Zealand Triassic ammonoids are included in a wider Mesozoic cephalopod study being undertaken by G.R. Stevens.

Among other cephalopods, two coiled nautiloids deserve mention, *Cenoceras trechmanni* (Kummel) occurs in the Otamitan Stage, Middle-Late Norian. Kummel (1959b) considered it to be on the line of descent of Family Nautilidae. *Proclydonautilus mandevillei* (Marshall)-Oretian and Otamitan Stages, Karnian?, Norian-is probably conspecific with *P. natosini* McLearn (see Tozer, 1971). It is from Bitish Columbia Norian, *Dawsoni* to *Rutherfordi*, perhaps *Columbianus* Zones. A third member of the *mandevillei* group is *P. seimkanensis* Bytschkov, from Okhotsk, northeastern USSR, Norian, *Pinacoceras verchojanicum* and *Otapiria ussuriensis* Zones (Bytschkov et al., 1976). Orthoceratids have been recorded from the New Zealand Triassic but none are fully described.

Two coleoid aulacoceratids occur in the Otapirian Stage. Within 8 years of the introduction of his unit Otapiri Series, James Hector cited *Aulacoceras otapiriense* (Hector) as an important element in the Otapirian fauna. The other is a new species of *Prographularia* (Jeletzky and Zapfe, 1967; Marwick, 1953). The type species, *Prographularia triadica* Frech. is from the Rhaetian Zlambach marl, Steiermark, Austria, but the New Zealand occurrence provides only a shadowy Rhaetian connection in that the genus is also known from the Late Permian.

Triassic conodonts were first described from New Zealand by Jenkins and Jenkins (1971). More recently J.E. Simes (Marden, Simes and Campbell in prep.) has succeeded in separating a large conodont assemblage. In all, three localities are involved and in each case the rocks are limestones within Torlesse melange.

Heterastridium was described from Murihiku rocks by Campbell (1974b). His claim that this inter-regional zonal fossil might have value as an indicator of the *Suessi* Zone (equivalent to *Cordilleranus* and *Amoenum* Zones) must be seen in the light of the placing of the first appearance datum (FAD) of *Monotis* sensu lato (*M.(Eomonotis)*) of Grant-Mackie, 1976, 1978 and Tozer, 1980. In New Zealand FAD *Heterastridium* predates FAD *Monotis* sensu lato so that if the appearance of *Monotis* is accepted as a valid interregional datum, then *Heterastridium* must have a *Columbianus* Zone placing in its lower part. Grant-Mackie's (1978) revision of Monotidae systematics, following earlier work of Zittel, Trechmann and Marwick, established a sequence of faunal events somparable to those in Canada (Westermann and Verma, 1967, Tozer, 1967) and northeastern USSR (Bytschkov et al., 1976).

A study of *Daonella* and *Halobia* is being made by H.J. Campbell. *Otapiria* makes its first appearance in Otapirian Stage, well above the base of the stage. The genus continues into the Early Jurassic Aratauran Stage and appears again near the top of the Jurassic succession in New Zealand. There are occurrences in Triassic rocks in Europe (Grant-Mackie and Zapfe, 1973) and in northeast Asia (Bytschkov et al., 1976: Karnian? Norian) and in Chile (Covacevich and Escobar, 1979).

Local Stages

Stages in two series were introduced by Marwick in 1951. In part he formalised units already in existence, some having been in use since 1870. For the Upper Triassic, simple correlation with European units was implied by a Rhaetian Otapirian, a Norian Warepan and a Karnian Otamitan. Easy coincidence of boundaries was soon being questioned, however, and the wealth of data gathered in the last 30 years has delayed rather than hastened adoption of international units in place of local stages. Trechmann's "Ladino-carnic" correlation for the Kaihikuan Stage, at best a guess, has survived in the absence of alternative suggestions. An Anisian Etalian and a Smithian Malakovian are each firmly enough based but their boundaries are not well located on the international scale.

That there is a time gap (about Ladinian-Karnian) in the best documented sections (both limbs of the Southland Symcline, Heslington Syncline) at the Kaihikuan-Oretian boundary has long been suspected. The gap may be partially bridge in the Torlesse sequence, central Canterbury (Campbell and Thomson, in prep.). The LAD *Daonella* and FAD *Halobia* fall at the boundary which is also marked by a major change in spiriferinid brachiopods. The spondylium-bearing groups (*Psioidea*, *Psioidiella*) appear for the first time and there are marked changes in bivalves e.g. the appearance of *Maoritrigonia* (Fleming, 1964).

The Otapirian Stage representing a significant part of the Triassic section in Murihiku sequences, long cited as Rhaetian, has some importance in the current assessment of the international subdivisions of the system (Spath, 1951). It warrants separate treatment and an account of it will appear in a later publication.

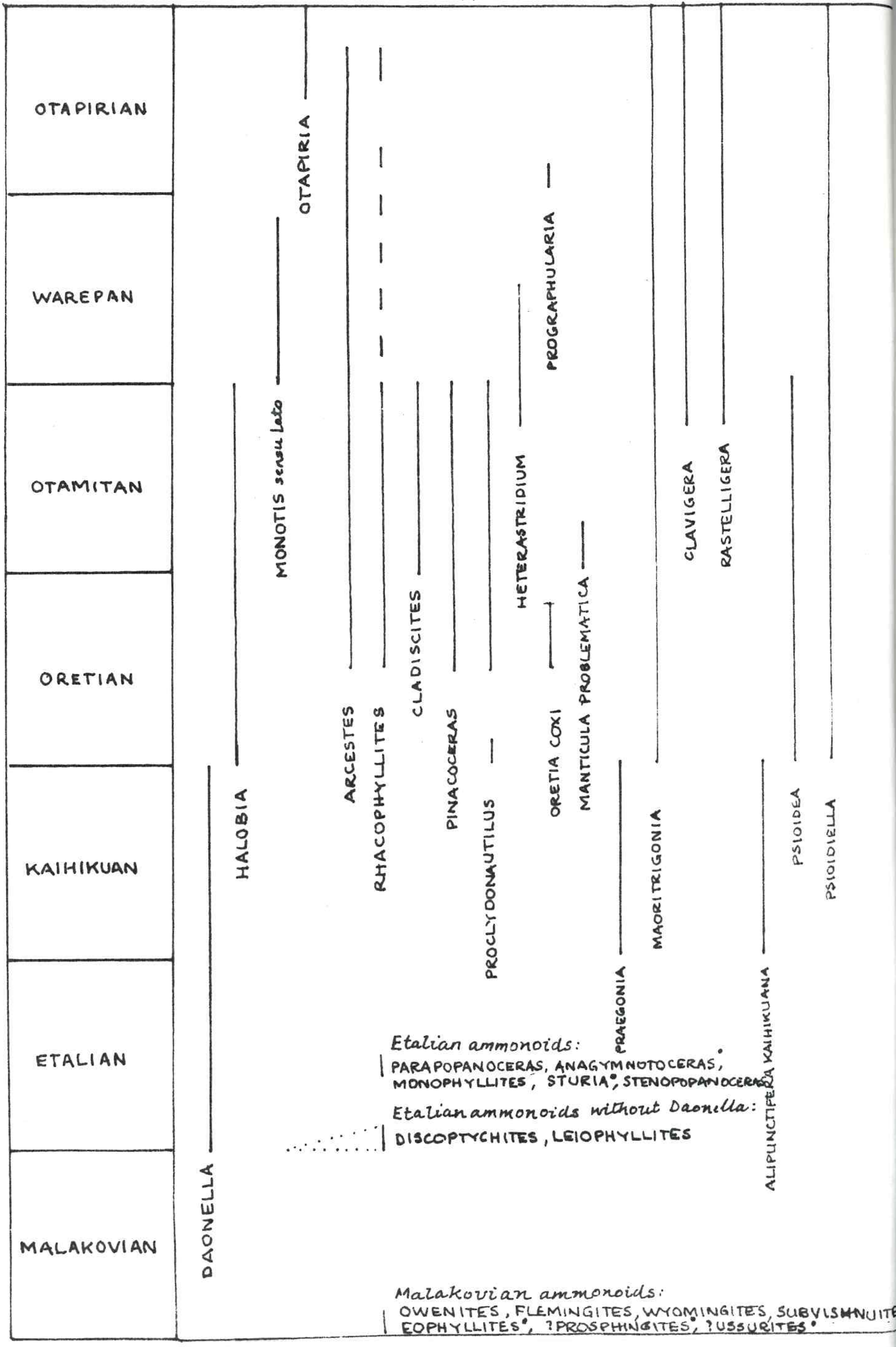
Tethyan, Notal and Maorian Elements

In describing the Malakovian *Owenites* fauna Kummel cited comparable faunas in Timor, western United Stated and Japan. He also noted that *Leiophyllites*, *Monophyllites* and *Discoptychites* of the Etalian fauna are mainly Tethyan. He, Tozer (1971) and Dagys and Yermakova (1981) have all emphasized that *Parapopanoceras* is not Tethyan. Dagys and Yermakova could find no evidence of separate evolution in the two "polar" (Boreal and Notal) regions, considered the genus to be amphitropical and postulated a deep water station for it. Kummel and Tozer each noted the strong Tethyan affinities of the Norian ammonites.

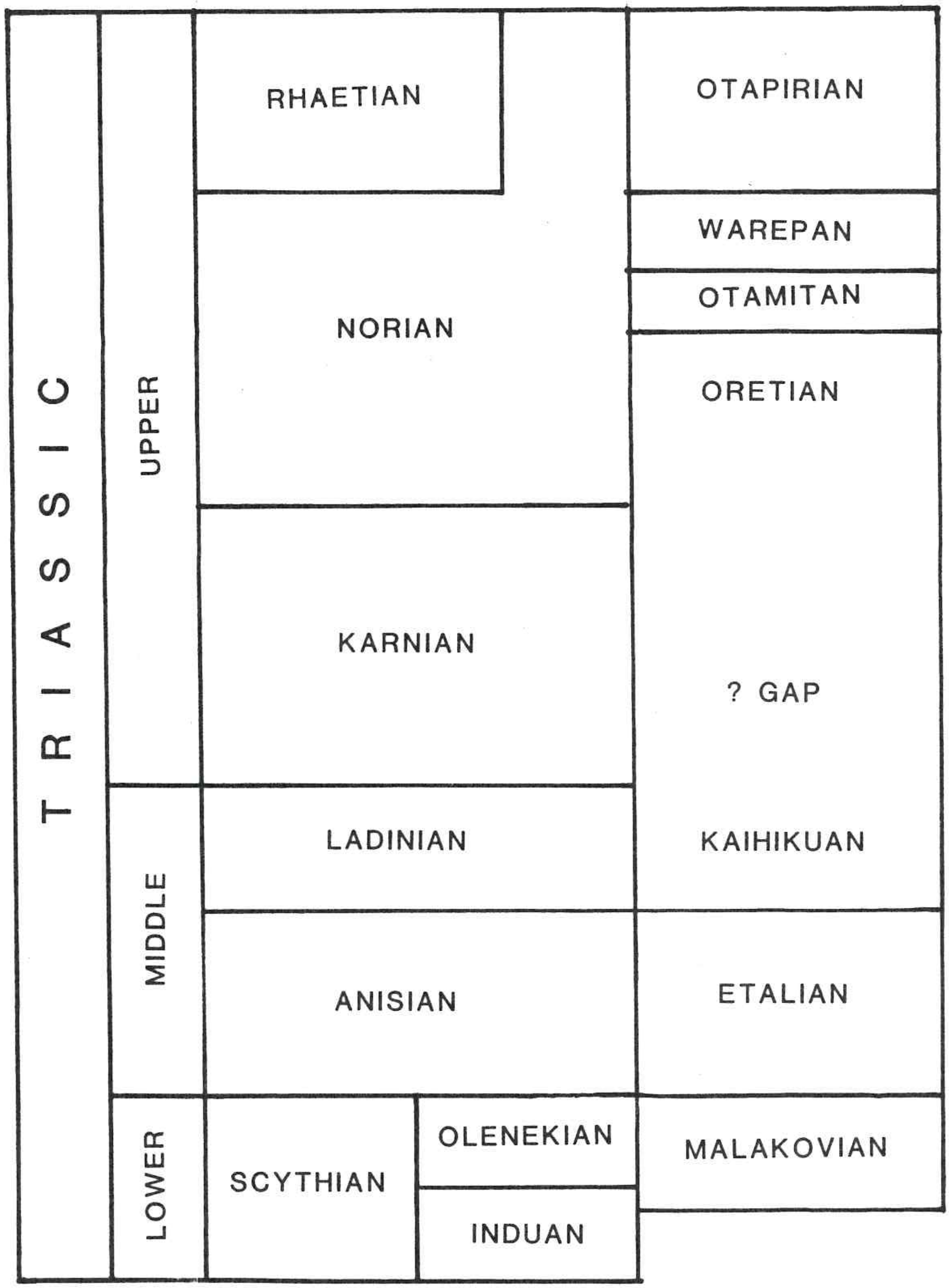
Heterastridium is characteristically Tethyan (Cuif, Fischer & Marcoux, 1972).

The notion of a Maorian province was postulated over 50 years ago (Diener, 1916; Wilckens, 1927). It expressed an observed distinctiveness in benthic faunal elements in the New Zealand and New Caledonia Triassic and Lower Jurassic, the latter having been recently described by Piroutet (1917). At the time no marine Triassic rocks were known in Australia or New Guinea, nor were any recorded from Antarctica or southern South America. The Triassic exposures in New Zealand and New Caledonia were isolated and remote. The nearest counterparts in Indonesia and the Southeast Asian mainland were more closely allied to eastern Europe than to New Caledonia and New Zealand. Within brachiopods for example, Hector's (1879) genera *Clavigera*, *Rastelligera* and *Psioidea* were unknown in Indonesia von Seidlitz's (1929) *Misolia* was absent from New Caladonia and New Zealand. The picture has since changed somewhat in that *Clavigera* is now known to occur in Papua New Guinea (Skwarko, Nicholl and Campbell, 1976) in a fauna which includes *Misolia*. The derivation of *Clavigera* from a non-strophic athyridid stock can be traced in New Zealand within the Otamitan Stage (Campbell, 1974a), however. Of the other two genera, *Psioidea* sp. recorded from United States by Cooper (1942) is not congeneric with either *P. australis* (Trechmann) or *Psioidiella nelsonensis* (Trechmann) and should be relocated. *Spiriferina (Rastelligera) canadensis* Logan from the Canadian Arctic (Logan, 1967) has become the type species of *Canadospira* (Dagys, 1972). Both *Psioidea* and *Rastelligera*, then, have known distributions in New Zealand and New Caledonia. The fauna includes rhynchonellid genera unknown elsewhere (DAB MacFarlan, pers. comm.), *Alipunctifera* Waterhouse 1975 and perhaps *Mentzeliopsis* Trechmann 1918. Records of *Mentzeliopsis* in Europe (Pearson, 1977) and Iran (Taraz, 1974) need to be confirmed.

Endemism is shown by gastropods (J.G. Begg, pers. comm.) and the bivalves *Oretia* Marwick, 1953, *Hokonuia* Trechmann 1918 and *Manticula* Waterhouse 1960, may be geographically restricted. In the Trigoniidae *Agonisca* and *Praegonia* are not known outside New Zealand. *Maoritrigonia's* position with relation to *Minetrigonia* is under review (C.A. Fleming pers. comm.).



● Determined by J.G. Begg 1981 unpubl. Univ. of Otago


TRIASSIC
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OLENEKIAN
INDUAN
OTAPIRIAN
WAREPAN
OTAMITAN
ORETIAN
? GAP
KAIHIKUAN
ETALIAN
MALAKOVIAN

At species level New Zealand-New Caledonian Monotidae form distinct groups from those elsewhere and the same is probably true of *Daonella* and *Halobia*. (H.J. Campbell, pers. comm.).

With contrasting biotic elements identified in the New Zealand Triassic, each of the rock suites (Hokonui, Torlesse and Topfer) might be characterized by the proportions it contains.

Too little is known of Topfer flora for an assessment. Plant megafossils are better known in the Torlesse than in the more fully marine Murihiku. Torlesse floras are east Australian in aspect. Megafossil remains in the Murihiku sediments are a small sampling of the same flora (Retallack, 1977). Description of Murihiku palynomorphs is well advanced (de Jersey and Raine, 1983) but generalisations are not yet available.

Halorella has its only known New Zealand occurrence in the Torlesse, *Lingula*, *Spiriferina* cf. *abichi* Oppel, *Agonisca*, *Bakevelloides*, *Balantioselena* and *Kampunea* are all primarily of Torlesse distribution but each has at least one Murihiku occurrence. The same is true of *Torlessia (= Terebellina)*, but *Titahia* is not known to occur in Murihiku rocks. The faunas do not separate on epifaunal/infaunal grounds (cf. Speden, 1976).

The differences between Torlesse and Murihiku biotas are subtle. The Torlesse faunal list is much shorter than that of the Murihiku Supergroup and yet each of the two suites of sediments represents a wide range of environments. The two were derived from different source areas. The present near juxtaposition of them would not be an inference of paleontological or sedimentological study (cf. Tozer, 1984 p.5).

Discoveries of marine fossils of Triassic age in Antarctic Peninsula (Thomson, 1975) provides a possible link with the Torlesse fauna of Middle Triassic age. Those in Chile (Escobar, 1980; Cecioni and Westermann, 1969) add a possible Triassic *Otapiria* and extend the range of *Maoritrigonia* cited as *Minetrigonia* (see also Reyes and Perez, 1979).

Apart from the important implications of the fauna of the Kuta Formation, recent discoveries in New Guinea (Skwarko, 1969), like those in Singapore (Kobayashi and Tamura, 1968) add little that supports or rejects the concept of a separate realm in the New Zealand - New Caledonia area for benthic organisms. The two Australian occurrences (Dickins and McTavish, 1963, and Runnegar and Ferguson, 1969) of marine Triassic faunas are equally non affirmative.

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THE STATUS OF THE RHAETIAN

The Rhaetian controversy is still not definitively solved. Notably ammonoid workers prefer to regard the Rhaetian as a local development of the Norian rather than a suitable unit for standardized subdivision of the Triassic System. Consequently, the unit is either discarded or applied on a substage level. Alternatively, on the basis of other groups of fossils, the classic concept of an independent Rhaetian Stage finds strong support in many parts of the world. At present one may note that the controversy has an increasing impact on the practice of classifying and correlating latest Triassic successions. Modern literature is becoming rather confusing and various bodies and individuals have urged the STS to take a formal decision. Therefore the problem will have ample attention in the coming years. It is intended to establish a special working group.

Those members of the STS who are interested in joining a Rhaetian working group are required to contact the Secretary General.

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THE "GERMANIC" TRIASSIC

In the past years, national bodies have concentrated efforts on a reevaluation of the "Germanic" Triassic in various European countries.

The STS is now considering to take initiatives with regard to the development of a unified scheme of interregional classification and correlation of the "Germanic" Triassic. Please contact the Secretary General when you have interest in participating in a "Germanic" working group.

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CORRELATION OF THE LOWER TRIASSIC PLANT-BEARING BEDS OF SIBERIA AND CHINA

I.A. DOBRUSKINA

Until recently, the fossil flora from volcanic deposits of the Tunguska basin could not be correlated with any fossil flora (Dobruskina, 1980, 1982). This flora which we - after V.D. Prynada - call Korvunchanian flora was considered endemic. However, some years ago similar plant complexes were discovered in Verkhojanie (Durante and Biterman, 1978; Mogutcheva, 1982). Lycopods and conifers of wide geographical distribution were found in the Tunguska basin itself. The revision of *Elatocladus*-type conifers from the Kuznetz basin and the Tunguska basin (Meyen, 1981) has shown their connection with conifers of Western Europe (Grauvogel-Stamm, 1978). In China analogues of Lower Triassic West European floras have been discovered and described in recent years (Yao, 1978; Zhou and Li, 1979; Huang and Zhou, 1980; Yao and Ouyang, 1980; Wang et al., 1978; Wang and Wang, 1982; Wang, 1983). These new data show that in the beginning of the Triassic, the isolated Atlantic, Cathaysian and Siberian palaeofloristic kingdoms of the Late Palaeozoic, became more uniform. Exchange of plants between these three areas became possible. The Atlantic and Cathaysian kingdom were united in the European -Sinian area, which belonged to the Laurasian kingdom in the Triassic.

Differences in the floras of the European - Sinian and Siberian areas still existed, but they became less significant than in the Palaeozoic. In Siberia, volcanics with Korvunchanian flora, consisting mostly of ferns, replaced coal-bearing formations with a cordaitean flora. Deposits containing the Korvunchanian flora are divided into three horizons (Mogutcheva et al., 1980): the plant assemblage of the former (Tutonchanskij horizon) is practically devoid of conifers while in the plant assemblages of the Dvuroginskij and Putoranskij horizons, conifers are found in abundance. They belong to the genera *Voltzia*, *Quadrocladus* and *Lutuginia*.

In the chinese early Triassic floras there is the same sequence of the plant assemblages: a pteridophyte flora (ferns, pteridosperms, sphenopsida) in the lower part, and a plant assemblage with abundant conifers in the upper part. This sequence can be observed in northern China (Hwang Ho river) as well as in southern China (the boundary between Yunnan and Guizbou). Chinese conifers and ferns are similar to plants from the Buntsandstein (especially the *Voltzia* Sandstone) of Western Europe. Both floras (Chinese and European) can be correlated with the floras of the Dvuroginskij and Putoranskij horizons of Siberia. The Tutonchanskij horizon can be correlated with the lowermost part of Triassic Chinese sections with pteridophyte flora; in Western Europe this level has not yet yielded fossil plants.

The Triassic age of the Dongchuan Formation with pteridophyte flora in southern China is based on its position above the Changhsinian Formation which represents the uppermost Permian. The Sunjia Formation of northern China is correlated by Chinese geologists with the Changhsinian. Our correlation of Siberian volcanics containing Korvunchanian flora with Chinese sections (see fig.) confirms the traditional opinion on the Triassic age of the former. The boundary between coal-bearing formations and volcanics in Siberia corresponds to the boundary of Permian and Triassic; the age of the upper part of the sections containing conifers like those of the *Voltzia* Sandstone, may be Olenekian-Anisian in age.

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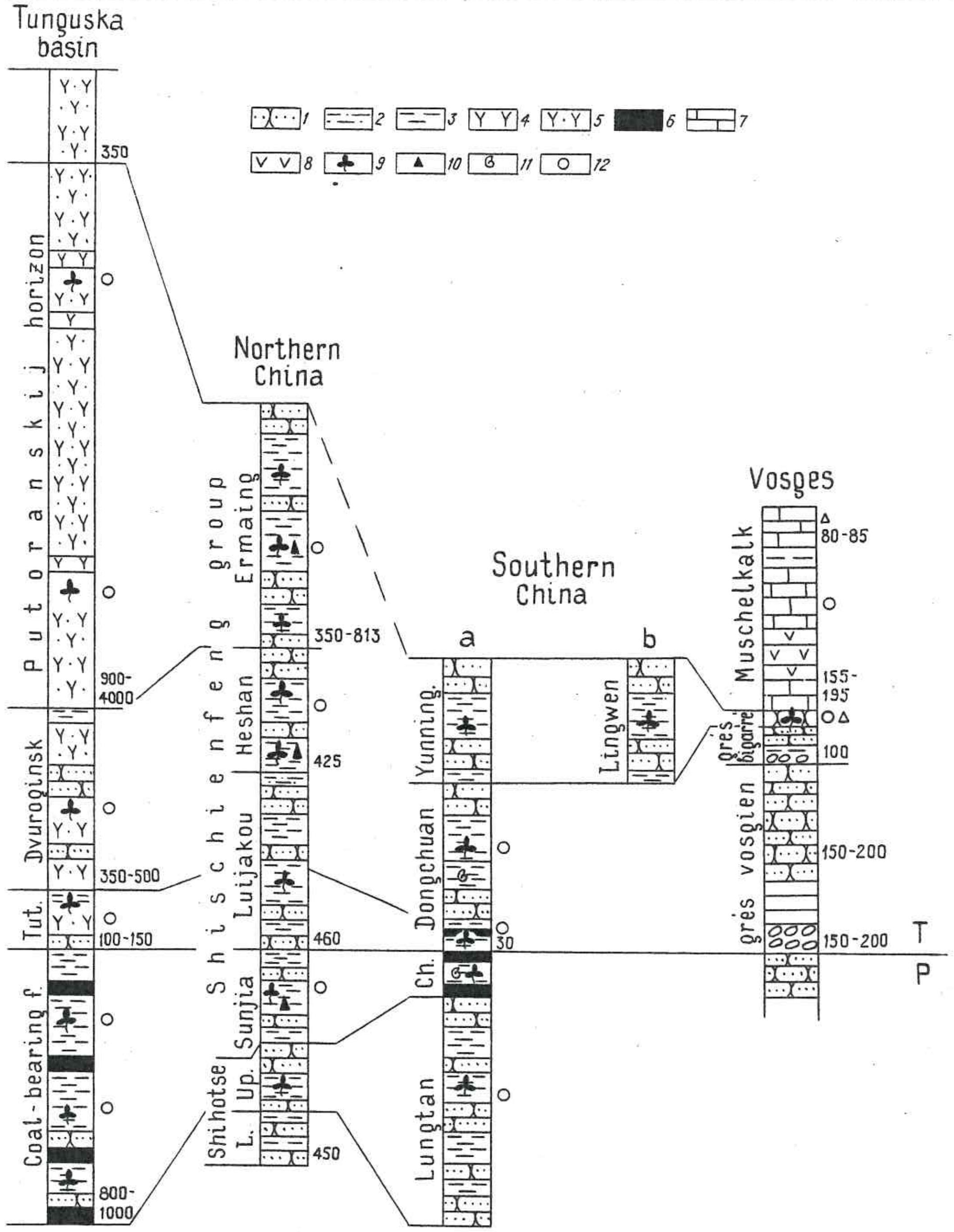

Explanations to the figure

Correlation of Lower Triassic plant-bearing beds of Siberia, China and Western Europe. The section of Tunguska basin is done after "Resolutions ..., 1981"; Northern China: after Wang et al., 1978; Wang and Wang, 1982; Huang and Zhou, 1980; Southern China (a): Yunnan-Guizhow after Yao, 1978; Southern China (b): Guandong after Zhou and Li, 1979; Vosges after Ricour, 1963.
1 - sands, sandstones; 2 - siltstones; 3 - clays, claystones; 4 - lavas; 5 - tuffs; 6 - coals; 7 - limestones; 8 - gypsums; 9 - fossil plants; 10 - tetrapods; 11 - marine invertebrates; 12 - palynological complexes.

ANNOTATED TRIASSIC LITERATURE, 1983, 3

M. BOERSMA

Under this heading new relevant literature on the Triassic research received by the editor or the secretary general of the S.T.S. will be briefly annotated.

Anderson, J.M. & Anderson, H.M., 1983. Vascular plants from the Devonian to Lower Cretaceous in southern Africa. Bothalia, 14(3/4): 337-344, 2 figs., 1 table (with French summary).

The succession of pre-angiospermous megafloras in southern Africa from the Devonian to the Lower Cretaceous is outlined. Interrelationships between continental drift, global climatic trends, and floral and faunal evolution are emphasized. Data are given on numbers of assemblages sampled; on species diversity;and on relative abundance of each genus per productive "formation". A total of 79 genera and about 250 species are recognized in the 150 assemblages from the 11 horizons considered. Floras are unknown from the Carboniferous and are as yet undescribed from the Jurassic. Aside from these gaps, a good idea of the floral development is obtained. Diversity lows of around 5 to 10 species per "formation" are witnessed in the Devonian, whereas a peak of 112 species is encountered in the Upper Triassic Molteno Formation. Diversity remains around 20 to 30 species for all other "formations".

Brugman, W.A., 1983. Aspects of Early and Middle Triassic palynology. 1. On *Dyupetalum vicentinense* nov. sp. from the Upper Anisian of the Southern Alps. Review Palaeobot. Palynol., 39: 47-64, 2 figs., 6 pls. (with English and Italian summaries).

During palynological investigations of Anisian sediments in the Southern Alps pollen grains with a unique morphology were encountered. These forms are attributed to the formgenus *Dyupetalum* Jansonius et Hills, 1979 emend. Brugman The morphology, taxonomy, the stratigraphical and geographical distribution of the new species *Dyupetalum vicentinense* are extensively discussed.

In fig.1 the localities of investigated sequences are shown. Fig. 2 provides with a schematic representation of the investigated sequences. The plates include some scanning micrographs. The paper is a contribution to the multidisciplinary I.G.C.P. project no. 4 "The Triassic of the Tethys realm".

Eshet, Y., 1983. Palynostratigraphy, thermal Alteration Index and Kerogen Analysis of the Permo-Triassic Succession in Makhtesh Katan 2 Well, Negev, Israel. Geol. Surv. Israel, Report S/12/1983: 164 pp., 21 figs., 11 pls., 7 tables.

An almost complete Permo-Triassic section, which is unconformably overlain by Lower Jurassic rocks, was penetrated in Makhtesh Katan 2 (MK2) well. Most of the Triassic section was deposited in a marginal shallow sea. The Permian section represents a mixed nearshore environment. 93 Species of 62 genera were defined and classified into assemblage zones. The prominent palynomorphs are listed per palynozone and figured on 11 plates of varying quality.

Most of these palynozones were represented in the palynostratigraphic framework proposed by COUSMINER (1981) for the Triassic of Israel. The Permian palynozones are well represented in the Negev wells. Global correlation showed that the Upper Triassic assemblages of MK2 are very much similar to other assemblages of the same age in the Northern Hemisphere. A smaller similarity of MK2 to both Laurasian and Gondwanian regimes is found in the Middle Triassic. Maximum similiarity of MK2 to Gondwana is found in the Permian and Lower Triassic. Maximum similarity to Laurasia is found in the Upper Triassic. It may indicate that Israel was a part of Gondwana or at least, a "bridge" between Laurasia and Gondwana during most of the Permo-Triassic. The results of the palynostratigraphical investigation (pp. 16/128) are visualized in 17 figures and 6 tables. For easy consultation a geographical register should have been welcome.

Two of the subjects mentioned in the title are treated in a chapter of limited proportions only (pp. 133/138). A figure illustrates the vitrinite reflectance gradient; in a table the results of kerogen analysis and TAI are compiled.

The thermal maturation study showed that most of the Upper Triassic section occurs in the immature thermal facies (above the oil window); the Middle Triassic is in a mature thermal facies (within the oil window); the Lower Triassic and Permian sections are overmature (below the oil window).

Kerogen type analysis revealed an abundance of continental organic matter and a poverty of amorphous-sapropelic matter of marine algal origin. These indicate a low hydrocarbon potential of the well.

Two appendices deal with stratigraphic ranges of all palynomorphs ranging from Autunian to Lower Jurassic. A third appendix provides with taxonomic lists for the Permian and Triassic palynozones of MK2 well.

Kimura, T., Naito, G. & Ohana, T., 1983. *Baiera* cf. *furcata* (Lindley et Hutton) Braun in the Carnic Momonoki Formation, Japan. Bull.Nat.Sci.Museum, C, 9(3): 91-114, 7 figs., 6 pls.

In fig. 1 the topography of the Momonoki locality within the Ominé area is given. The description of the fossil remains is accompanied by clear diagrammatical sketches of the four recognized leaf types. The fossil plant material is compared with similar types in the Jurassic of Yorkshire; the Norian Nariwa Group, Japan; the Upper Triassic Daedong Supergroup, Korea; the Middle Jurassic Cheremkhovo Formation, Irkutsk Basin (U.S.S.R.); various stratigraphical horizons and localities in China and the Bureja Basin (U.S.S.R.). Fig. 2 provides with the columnar section of the Momonoki Formation and its fossil plants, together with those from the Hirabara and Aso Formation.

Kozur, H. & Seidel, G., 1983. Die Biostratigraphie des unteren und mittleren Buntsandsteins des Germanischen Beckens unter besonderer Berücksichtigung der Conchostracen. Z.geol.Wiss. Berlin, 11(4): 429-464, 2 figs. (with German, Russian and English summaries).

The biostratigraphic subdivision of the predominantly fresh water and brackish water sediments of the Germanic Bunter (Brahmanian to lowermost Anisian) is discussed in detail. The conchostracans are the most important fossil group for detailed biostratigraphical subdivisions and correlations in the continental Lower Triassic of the German Basin, because they are most frequent both in grey and red sediments and because their phylomorphogenetic ranges are rather fast. But also other fossil groups (e.g. sporomorphs, charophytes, ostracods, vertebrates) yield important data for the biostratigraphic subdivision of the Germanic Bunter, at least in some facies. 10 Conchostracan zones or assemblage zones respectively could be discriminated from the basal part of the Germanic Bunter up to the Hardegsen Formation (Brahmanian to Olenekian). The conchostracans, too, are useful for correlation of the Germanic Bunter with Lower Triassic sediments outside the German Basin (Greenland, Russian platform, NE Siberia, Africa, India).

Pérez Arlucea, M. & Sopeña, A., 1983. Estudio stratigrafico y sedimentologico de los materiales Permicos y Triasicos en el Noroeste de la Sierra de Albarracin (Provincia de Guadelajara). Estudios geol., 39: 329-343, 14 figs.

Stratigraphy and sedimentology of Permian and Triassic rocks in the northwestern area of Sierra de Albarracín are dealt with. The only Permian outcrop is situated south of Orea. It includes volcanic, volcanoclastic and sedimentary rocks. The unit has been named "Cojunto Vulcano-Sedimentario de Orea". The Triassic is here of the Iberian type with three main lithotypes. Six lithostratigraphic units have been established; descriptions are given.

Sedimentation began with alluvial fans forming the lower Buntsandstein passing up into a siliciclastic tidal flat and a carbonate lagoon forming the Muschelkalk.

The relationship has been studied between tectonics and sedimentation during the Triassic. A palaeorelief SW of the Sierra de Albarracín was the source for the fluvial sediments forming the lower Buntsandstein. The palaeorelief is related to the faults acting during the last phases of the hercynian orogeny.

Sheng, J.-z., Chen, C.-z., Wang, Y.-g., Rui, L., Liao, Z.-t., & Jiang, N.-y., 1983. Permian-Triassic boundary in South China. Palaeontologica Cathayana, 1: 181-193, 1 fig., 1 table.

Marine Permian and Triassic strata are well developed in South China. Their contact was generally considered to be disconformable. However, recent studies have shown, that, apart from the exposure in a few localities, they are mostly conformable. In the boundary beds an abundance of fossils occurs, with a mixed fauna appearing near the base of the Triassic.

The uppermost Permian is roughly classified into five, and the lowermost Triassic into three lithofacial types. The uppermost Permian is represented by the *Rotodiscoceras-Pseudotirolites-Pleuronodoceras* assemblage zone or by the *Palaeofusulina* zone. The lowermost Triassic beds contain a *Hypophiceras* fauna, *Otoceras*, *Claraia wangi* assemblage, *Isarcicella isarcica* or *Pteria ussurica variabilis*.

At the boundary between Permian and Triassic a significant faunal change took place in South China, characterized by an extinction of all such marine invertebrates as fusulinids, rugose corals and trilobites, while at the beginning of the Triassic quite a number of new taxonomic groups appeared. This boundary seems definable at first glance. However, after careful examination no definitely clear demarcation line can be traced: both biological contents and lithological characters point to a transitional nature.

In fig. 1 the location of the Permian-Triassic boundary stratotype in South China is shown; table 1 provides with a correlation chart of the Upper Permian and Lower Triassic in the Tethys province.

Taugourdeau-Lantz, J., 1983. Associations palynologiques définies dans le Trias languedocien (France): Interprétation stratigraphique. Cahiers micropaléontologie, 1983(3): 5-20, 3 figs., 7 pls, 1 table (in French, with French and English summaries).

Seventy-three spores and pollen species have been identified in Triassic sediments of the languedocian region (S.E. Massif Central, France). They allow to recognize 4 zones attributed respectively to: middle Anisian (guide-taxa: *Hexasaccites muelleri*, *Verrucosisporites thuringiacus*, *Cristianisporites triangulatus*); Anisian-Ladinian transition, characterized by (a) the absence of guide-taxa, (b) a great number of *Triadispora* and (c) the sporadic presence of Anisian spores and pollen; Ladinian (guide-taxa: the appearance of *Ovalipollis pseudoalatus* and the first development of *Circumpolles*). At the top of this zone appears *Porcellispora longdonensis*. In the lower Carnian, *Camerosporites secatus* with a group of *Circumpolles* marks a new biostratigraphic zone. In the Languedoc an Upper Carnian assemblage has not yet been collected. In this marginal facies an impoverishment of the flora can be observed from the Anisian to the Carnian.

Fig. 1a shows the topographic position of the languedocian basin. In fig. 1b the investigated localities within the basin are indicated. Fig. 2 gives the position of the investigated samples in lithostratigraphical columns of the area. Table 1 shows the stratigraphic distribution of the identified spores and pollen grains. The studied assemblages enable to interpret the lithological sequence chronostratigraphically (p. 18). It is concluded that the transgression in Triassic time had its maximum in the Lower Carnian, since Carnian sediments occur on top of the Cambrian palaeorelief.

Warrington, G., 1983. Late Triassic and earliest Jurassic palynomorph assemblages from the Western English Channel and neighbouring areas. Proc. Ussher Soc., 5: 473-476, 2 figs.

Late Triassic (Carnian) miospores were recovered from mudstones proved beneath Cretaceous rocks in *Zephyr* well 87/16-1 in the South-Western Approaches Basin. In the Western English Channel Basin, Late Triassic (Rhaetian) to Early Jurassic (Hettangian) palynomorph assemblages were obtained from the Lower Lias and underlying beds, identified as the Penarth Group, in *Zephyr* well 88/2-1, and from beds proved beneath *liasicus* or *planorbis* Zone (*johnstoni* Subzone) Lias deposits in the "Sealab" SLS 17 borehole.

In Fig. 1 the locations of boreholes referred to in the paper are shown. Fig. 2 summarizes the stratigraphic distribution of palynomorphs in Late Triassic and Earliest Jurassic deposits in the *Zephyr* 88/2-1 an "Sealab" SLS 17 boreholes.

Warrington, G., 1983. British Triassic palaeontology: supplement 7. Proc. Ussher Soc., 5(4): 493.

Since the submission of the writer's previous supplement (Proc. Ussher Soc., 5: 394, 1982) to his paper on British Triassic palaeontology, another 25 works dealing with or including aspects of that subject have to be added.

De Zanche, V. & Farabegoli, E., 1983. Anisian stratigraphy in the northern Grigna area (Lake Como, Italy). Memorie di Scienze geologiche, Padova, 36: 283-291, 2 figs. (with Italian summary).

The stratigraphic sequence in the northern Grigna area (Lake Como, Italy) has been studied and discussed. The Anisian succession is different from other ones in the Grigna area.

The most interesting result is the fact that in the Anisian-Lower Ladinian sequence at least two tectono-sedimentary cycles have been recognized. The lower one, of Pelsonian- Lower Illirian (?) age, includes (from the bottom to the top): Val Sassino Conglomerates, Angolo Limestone, Val Muggiasca Conglomerates p.p., Prezzo Limestone p.p. . The upper cycle, of Upper Illirian-Lower Ladinian age, includes: Val Muggiasca Conglomerates, Prezzo Limestone p.p., Monte Albiga Dolomite, Perledo-Varenna Limestone p.p. and Esino Formation p.p. .

The term Bellano Conglomerates (Gaetani, 1982) has been substituted by two new informal units: Val Sassina Conglomerates and Val Muggiasca Conglomerates which belong to different sedimentary cycles.

De Zanche, V. & Mietto, P., 1983. Precisazioni sulle "Zwischenbildungen" (Triassico) dell'Alta Valsugana. Rend.Soc.Geol.It., 6: 11-12 (in Italian).

The first results are presented of the investigation of a Triassic succession in Valsugana. The term "Zwischenbildungen", introduced by Vacek (1903) is discussed; a historical review is given. Evidence is provided that the "Carniano carbonatico-bituminoso" of Largaiolli (1969), which is referred to as a "ristretto umido" environment, in reality is a complex of carbonaceous-pelitic strata, partly pelagic, holding a scarce conodont fauna, that permits a dating of Lower Ladinian (Curionii zone). The complex corresponds to the "Zwischenbildungen" as originally defined by Vacek; it is partly correlative with strata in the Val di Centa and the Val Gola. The sedimentary environment and the stratigraphical position exclude the possibility of a superposition or a confusion with regard to the Raibl Group.

In Valsugana the "Zwischenbildungen" are conformably overlain by sediments of a carbonaceous Ladinian-Carnian platform and not by the "Hauptdolomit". This platform corresponds with the "Diploporendolomit" and the "Schlerndolomit" of Venzo (1940) and Largaiolli (1969). Some questions remain, partly caused by the local tectonic situation.

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ERRATUM

ALBERTIANA 2, p. 8

The fourth paragraph of the comments by Dr. H. Kozur should read as follows:

... . This event may be correlated by Conchostracs from marine to continental sediments, and corresponds with the top of the Brahmanian Stage. ....

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ANNOTATED TRIASSIC LITERATURE, 1984, 1

M. BOERSMA

Achilles, H., Kaiser, H. & Schweitzer, H.-J. (with the collaboration of Hushmand, A.), 1984. Die räto-jurassischen Floren des Iran und Afghanistans. 7. Die Mikroflora der obertriadisch-jurassischen Ablagerungen des Alborz-Gebirges (Nord Iran). Palaeontographica, B, 194: 34 figs., 11 pls., 1 table (with English summary).

An introductory review is given concerning the stratigraphy and lithology of the Upper Triassic and Jurassic deposits of the Kerman basin (Central Iran) and of the Alborz mountains (northern Iran). In both regions terrestrial sequences occur rich in plant remains. The sequences range from the Norian up to the Middle Jurassic (Callovian and Lower Bathonian, respectively). The sequences studied in the two areas of investigation show a remarkable similarity with regard to both lithology and palynology, contradicting the assumption expressed by KRUMSIEK (1976), that sedimentation and floral development took place on two widely separated plates. The doubts with respect to KRUMSIEK's opinion, already expressed by SCHWEITZER (1978), are also confirmed by recent geophysical data. The collision of the Iranian plate (including Central Iran) and the Turanian plate (with the Alborz region at its southern margin) took place as early as the Upper Palaeozoic and not during the Tertiary.

Anderson, J.M. & Anderson, H.M., 1984. The fossil content of the Upper Triassic Molteno Formation, South Africa. Palaeont.afr., 25: 39-59, 3 figs., 13 pls., 4 tables.

A concise summary of the fossil content of the Molteno Formation is given. The megaflora (foliage, fruit, seed, and stem impressions) comprises the most significant fossil group. With 74 assemblages sampled and 115 foliage taxa encountered the Molteno is, by a wide margin, the most productive (localities and diversity) megaplant bearing formation in South Africa. The palynomorphs and silicified wood remain unpublished. The animal fossils are represented mainly by insects with 25 genera and 32 species having been described. At least as many taxa await attention in the available collection of 300 individuals from 16 of the megaplant assemblages. A few undescribed species of conchostraca from 5 localities and one species of fish from a single locality round off the animal content. Trace fossils are not considered.

Classified lists, taxa/assemblage tables, locality maps, pen sketches and photographic plates for the megaflora and insect fauna are presented.

Baudelot, S., Bouhdadi, S. & Durand-Delga, M., 1984. Datation palynologique du Trias moyen au sein des Grès rouges "permo-triasiques" des environs de Tétouan (Rif septentrional, Maroc). (Middle Triassic age, established by palynological arguments, of the Red Sandstone Formation, so-called "Permo-Trias", near Tetuan in the Riffian Internal Zones, Morocco). C.R.Acad.Sci.Paris, 2, 299(15): 1061-1068, 1 pl. (with English summary).

Thick Red Sandstones, often conglomerate-bearing, rest unconformably upon the Palaeozoic Formations of the Riffian Ghomarides units. Usually attributed to Permian or Permo-Triassic (Lower Trias) times, this Red Formation reveals

- in a coal-like level, South of Tetuan (Beni-Salah village) - an Upper Anisian-Lower Ladinian palynological assemblage. The Middle Triassic age (and the Upper Triassic dating of the superposed clayey-sandstone-dolomitic beds) are in accordance with recent data obtained in the homologous Betic (Malaguides) units. It is suggested that the "Meso-mediterranean domain", including betico-riffian, kabylian and peloritano-calabrian areas, can be distinguished from the surrounding domains (Iberia, Corsico-Sardinian block, Atlasic Morocco) by the lack of Upper Carboniferous and Permian detrital deposits at the base of their series (absence of tectonic "Grabens").

Biddle, K.T., 1984. Triassic sea level change and the Ladinian-Carnian stage boundary. Nature, 308(12): 631-633, 2 figs.

Time-stratigraphic correlations are difficult in many Middle and Upper Triassic sedimentary sections, either because the sections do not contain diagnostic fossils or because of ambiguities in biostratigraphic resolution. Recently, it has been suggested that some Triassic Stage boundaries are associated with eustatic changes in sea level. Here evidence is presented to support that view. Three widely separated examples indicate that the local sea level falls were due to a worldwide change in sea level. At any locality, the response to the global fall in sea level was controlled by the interaction between initial water depth, sedimentation rate and local subsidence rate. In the examples presented here, areas characterized by late Ladinian shallow-water sedimentation show either an erosional unconformity or a seaward shift of facies belts at the Ladinian-Carnian boundary. Late Ladinian slope or basinal settings exhibit shallowing-upward trends, an increase in sedimentation rates, or subtle lithological changes across the boundary. These types of lithostratigraphic relationships can be used to improve correlations in areas where Middle and Upper Triassic sedimentary sections are difficult to date.

In Fig. 1 stratigraphic sections are given from platformal and basinal settings in the Alpe di Siusi area of the western Dolomites, northern Italy. In Fig. 2 selected circum-Mediterranean locations and stratigraphic sections are shown where the Ladinian-Carnian boundary is represented by an erosional unconformity, a hiatus, or an abrupt lithological change.

Fisher, M.J. & Dunay, R.E., 1984. Palynology of the Petrified Forest Member of the Chinle Formation (Upper Triassic), Arizona, U.S.A. . Pollen et Spores, 36(2): 241-284, 1 fig., 13 pls., (with French summary).

The paper provides with the first detailed taxonomic account of Petrified Forest Member palynofloras. 85 Species of palynomorphs are compared with northamerican and european assemblages. It is concluded that the Petrified Forest Member is contemporaneous with certain units of the Newark Group, and with the Dockum Group. The age of the Petrified Forest Member palynofloras is late Karnian, and is in part equivalent to the *Tropites subbulatus* zone of the Tuvalian sub-stage of the European Alpine succession.

Jacobsen, V.W. & Van Veen, P., 1984. The Triassic offshore Norway north of 62°N. In: Spencer, A. (ed.). Petroleum Geology of the North European Margin: 317-327, 7 figs. .

The Triassic of the Norwegian Shelf north of 62°N has been studied in wells in the Haltenbanken and Troms I areas. The Triassic of Troms I shows a 1900 m thick, almost complete succession of open to marginal marine to occasionally terrestrial sediments. Climatic conditions during deposition were predominantly temperate. On Haltenbanken 2500 m of Upper and possible Middle Triassic is present, consisting of alluvial to shallow marine deposits. Two halite successions are conspicuous, of latest Ladinian to earliest Karnian and late Karnian age. Climate conditions were arid to semi-arid during deposition.

A comparison and integration of the data from the wells with the Triassic on Svalbard and East Greenland allow several trends to be correlated. An interpretation of these trends (lithological/transgressive-regressive, biostratigraphical) in terms of relative subsidence and tectonic episodes, eustatic sea-level changes and the occurrence of climatic variation is discussed. This suggests that the Troms area was part of the Svalbard Basin during the Triassic and that this area was responding to a tectonic regime also recorded on East Greenland. The Haltenbanken area was a separate, small faultbounded basin, reminiscent in part of its development to the North Sea during the late Triassic.

The palaeogeographical development of this area is described, accompanied by a series of sketch maps. The source rock, reservoir and cap rock potential are discussed briefly.

Kimura, T., 1984. Mesozoic floras of East and Southeast Asia, with a short note on the Cenozoic floras of Southeast Asia and China. Geol. Palaeontol. Southeast Asia, 25: 325-350, 5 figs., 3 tables.

Part of this work deals with Triassic floras (pp. 325-331). In Table 1 a summary is given of the main Triassic plant bearing strata in East and Southeast Asia. In Fig. 1 the localities of Early and Middle Triassic plants in China are given. In Fig. 2 localities of Late Triassic plants in East and Southeast Asia are shown. Fig. 3 provides with a sequence of Mesozoic floras and plant-assemblages in China. For workers not familiar with Japanese, Korean and Chinese a list is given of geographical and stratigraphical names and the way it is written in the mentioned languages. The major taxa of fossil plants are listed per locality.

Klimova, I.G. & Meledina, S.V. (eds., 1984). Stratigraphy, Fauna and Flora of the Triassic of Siberia. Trans.Acad.Sci.USSR Siberian branch, Inst.Geol. Geophys., 600: 78 pp., 17 figs., 16 pls. (with English summary).

Considered are the actual problems in stratigraphy of marine and continental beds of the Triassic of Siberia. New or firstly recorded species and genera of bivalves, ammonoids and conodonts are described. The Late Triassic flora of Eastern Taimyr is revised. An analysis is given of Early and Middle Triassic assemblages of bivalves from the north of Middle Siberia. An aberrant Late Triassic tropical fauna is described from the Koryakian upland with a discussion on its paleogeographical significance.

Makel, G.H., Rondeel, H.E., Van den Berg, J., 1984. Triassic paleomagnetic data from the Subbetic and the Malaguide complex of the Betic Cordilleras (South-east Spain). Tectonophysics, 101: 131-141, 4 figs., 1 table.

The analysis of Triassic paleomagnetic directions from the Betic Cordilleras in southeast Spain indicates a considerable amount of relative displacement of the Subbetic of the External Zone of this orogen with respect to the Iberian block. The paleomagnetic pole positions of the Malaguide Complex of the Internal Zone of the orogen are closely related to those of the Subbetic. None of the poles coincide with European, African or Iberian poles of Triassic age, but they seem to agree with Permian poles from Morocco.

Fig. 1 shows a geological sketch map of the eastern Beltic Cordilleras with the sample locations. In fig. 2 orthogonal projection figures are given of the remanent magnetization path during demagnetization. Fig. 3 provides with equal area projections of the paleomagnetic directions. In Fig. 4 an equal area projection is given of the Triassic paleomagnetic poles for the Subbetic and Malaguide Complex with respect to apparent polar wandering curves for Europe and Africa. Table I provides with a summary of characteristic paleomagnetic results from Triassic rocks of the eastern Betic Cordilleras.

Mi, Jiarong, Zhang, Chuanbo, Liu, Maoqiang, Sun, Chunlin and Luo, Gueichang, 1984. On the problem of the division of Late Triassic palaeobotanic provinces in the North of China. Paper for the 2.I.O.P.Conference, Edmonton, Canada: 1-11, 3 figs., 2 tables.

The discovery of new fossil plant localities in northern China has provided with additional information concerning the palaeophytogeography in the Upper Triassic.

Traditionally, two palaeophytogeographical provinces are recognized, i.e. a South, or coastal Province, characterized by *Dictyophyllum* and *Clathropteris* and a North, or Inland Province, characterized by *Danaeopsis*, *Bernoullia* (and *Symopteris*). The boundary of these provinces is at about 33° north latitude. The climate in the South Province is thought to be tropical-subtropical, that in the North Province subtropical-temperate.

Based upon the new information the authors arrive at the conclusion that the North Province should be divided into (1) a Far North, or Temperate Province, the southern border being at about 43° north latitude, (2) the Yanliao-South Jilin Mixed Floral District, belonging to the North Province, the northern boundary being at about 41°30' north latitude, and (3) the Yinshan land in between.

The Far North Province is characterized by an abundance of Coniferae and Ginkgopsida, and may be called a *Cycadocarpidium-Sphenobaiera* flora. Of five localities floral lists are given. Within two of them an upper and a lower assemblage could be recognized.

In the Yanliao-South Jilin Mixed Floral District the floral elements are mainly those of the northern type, mixed with taxa of the South and Far North Province. Of five localities floral lists are given.

The Yinshan land, of relatively high altitude in Triassic time, did not provide with floral remains. From the regular arrangement of the climate zones, being approximately parallel to today's degrees of latitude, it has been concluded that the Chinese continent was united in Triassic time, and that no longitudinal or latitudinal displacement or rotation has happened since in the investigated area.

Piasecki, S., 1984. Preliminary palynostratigraphy of the Permian-Lower Triassic sediments in Jameson Land and Scoresby Land, East Greenland. Bull.geol.Soc. Denmark, 32: 139-144, 2 figs. (with Danish summary).

The presumed Carboniferous, Permian and Lower Triassic sediments of Jameson Land and Scoresby Land have been palynologically investigated. Four main assemblages are recognized which form the basis for a coarse stratigraphy. The Lower Permian *Potonieisporites* assemblage occurs in all palynologically productive fine-grained sediments from the Gurreholm Dal and the Mesters Vig Formations. The lowermost part of these sediments in Skeldal may be of latest Carboniferous age. An Upper Permian *Vittatina* assemblage characterizes the lower part of the Foldvik Creek Formation. An Upper Permian/Lower Triassic *Protohaploxypinus* assemblage occurs in the upper part of the Foldvik Creek Formation. The Lower Triassic Wordie Creek Formation contains a *Taeniaesporites* assemblage.

The preliminary investigation suggests a gradual change in the palynoflora. This again points to presence of a complete or almost complete sedimentary transitional sequence from the Upper Permian to the Lower Triassic.

Prasad, M.N.V. & Lele, K.M., 1984. Triassic ginkgoalean wood from the South Rewa Gondwana Basin, India. Review Palaeobot.Palynol., 40: 387-397, 2 figs., 2 pls., 1 table.

A new species of *Baieroxylon*, viz. *B. cicatricum*, is described from the Tiki Formation, Middle Gondwana, Upper Triassic of the South Rewa Gondwana Basin, Madhya Pradesh, India. The outer surface of the wood is marked with closely spaced "eye-shaped scars" and exhibits small, distinct central protuberances. These may probably represent vascular traces. The present described wood differs from all the known species of the genus by its characteristic stem scars. *Dadoxylon graminovillae* Zimmermann has been revised and a new combination is proposed, viz. *Baieroxylon graminovillae* (Zimmermann) Prasad et Lele comb.nov. .

Fig. 2 provides with clear camera lucida diagrams of the anatomical features. *Baieroxylon* is compared with other genera, especially with *Ginkgoxylon*.

Sheng, J.-z., Chen, C.-z., Wang, Y.-g., Rui, L. & Liao, Z.-t., 1984. On the lower boundary of Triassic in Central and Eastern Tethys. In: X, 1984. Developments in Geoscience, Contribution to 27th Int.Geol.Congress, Moscow, Science Press, Beijing: 105-110.

The problem of correlation between the two types of the Lower Triassic boundary (with the base at the *Otoceras* bed or at the *Claraia* bed) in the Central and Eastern Tethys has not yet been settled so far. Recently, a transitional bed (the *Hypophiceras* bed) between the uppermost Permian Changhsingian and the lower Triassic *Claraia* bed has been discovered in South China, containing mainly *Hypophiceras* and a few specimens of *Otoceras*, *Pseudosageceras* sp., *Tompophiceras*, *Metophiceras*, in association with Permian-type brachiopods (chonetids, *Crurithyris*) and Mesozoic bivalves *(Peribositra*, *Entolium*, etc.). It is equivalent to the *Otoceras* bed of the Central Himalayas. It is shown that the lower limits of the *Claraia* beds in the Central and Eastern Tethys are not comtemporaneous. Therefore, the base of the *Otoceras* bed should represent the lower boundary of the Triassic System. Since in South China *Otoceras* occurs in the *Hypophiceras* bed, the base of the *Hypophiceras* bed could serve as the lower boundary of the Triassic System in regions without *Otoceras*.

Sheng, J.-z., Chen, C.-z., Wang, Y.-g., Rui, L., Liao, Z.-t., Bando, Y., Ishii, K., Nakazawa, K., Nakamura, K., 1984. Permian-Triassic boundary in middle and eastern Tethys. J.Fac.Sci.Hokkaido Univ., 4,21(1): 133-181, 22 figs., 2 pls., 5 tables.

The recent investigation on the conformable Permian-Triassic transition beds in South China revealed the existence of the mixed-fauna beds immediately above the Changhsing Formation or its equivalent, which contain the Permian-type brachiopods and the Triassic-type ammonoids and bivalves. Three successive mixed-fauna beds, numbered 1 to 3, can be distinguished at many places. The first two are referred as the *Otoceras* Zone and the last one as the *Ophiceras* Zone based on the new discovery of *Otoceras* sp. from the mixed-fauna bed no. 1 and a common occurrence of *Ophiceras* and *Claraia* in bed no.3.

The correlation of the Chinese sections with Permian-Triassic sequences in other parts of the Tethys province, such as Iran, Pakistan and India, shows some time gap between the Upper Permian and Lower Triassic in those regions with the exception of the Kashmir region. The Chinese sequences contain abundant ammonoids, brachiopods and conodonts that are useful for international correlation. Thus, the Chinese section, especially of the Changxing area, is considered to be a candidate of the stratotype of the Upper Permian and the Permian-Triassic boundary.

The paper holds a correlation chart of the Upper Permian and Lower Triassic in the Middle and Eastern Tethys province. Furthermore, numerous columnar sections are included showing the stratigraphic distribution of fossils.

Surlyk, F., Piasecki, S., Rolle, F., Stemmerik, L., Thomsen, E. & Wrang, P., 1984. The Permian basin of East Greenland. In: Spencer, A. (ed.): Petroleum Geology of the North European Margin: 303-315, 26 figs. .

A major transgression took place in East Greenland in late Permian times. The resulting marine basin can be traced over 400 km, from Jameson Land to Wollaston Forland in the north. More than 300 m of limestone, evaporite, shale and sandstone were deposited in mainly shallow marine and hypersaline lagoonal environments. The lateral facies changes are rapid and very complex and seem to some extent to have been controlled by older tectonic structures formed during an important mid-Permian phase of block faulting. A widespread black shale facies is a good source rock for oil and the Permian and Lower Triassic sequence must be characterized as attractive from the point of view of exploration.

Taylor, T.N., Cichan, M.A. and Baldoni, A.M., 1984. The ultrastructure of Mesozoic pollen: *Pteruchus dubius* (Thomas) Townrow. Review Palaeobot.Palynol., 41: 319-327, 2 pls.

Pollen grains extracted from a specimen of *Pteruchus dubius* (Thomas) Townrow 1962 collected from Middle Triassic sediments (Molteno beds?, Corrientes, Argentina) are examined at the ultrastructural level. The vesiculate grains possess sacci that are slightly inclined toward the distal surface and covered with delicate perforations. The cappus region is poorly developed proximally, and a narrow sulcus on the distal surface marks the probable site of germination. The sporoderm is thin and endoreticulations on saccus walls are either lacking or poorly defined. Ultrastructural features of the grains are compared with other late Paleozoic and Mesozoic types.

One of the interesting features about the pollen of *Pteruchus* is the seemingly inconsistent occurrence of endoreticulations on the saccus wall. None of the grains extracted from the pollen sacs in this study possessed clearly defined endoreticulations. Two possible explanations for the apparent absence are given. The pollen of *Pteruchus dubius* is compared with similar types. It is stressed that, among seed plants, the evolution of the saccus was a highly significant feature that evolved a number of times.

Tozer, E.T., 1984. The Trias and its Ammonoids: The Evolution of a Time Scale. Geol. Survey Canada, Miscellaneous Report, 35: I-V, 1-171, numerous figures and plates (not numbered), 3 tables (with English and French preface).

A galantly indoctrinating, easily readable, highly informative book on the Triassic in general and its ammonoids in particular. A review is given of the evolution of the concepts of Triassic biostratigraphy and ammonoidology, examplified by persons dominating successive periods: HAUER, MOJSISOVICS, BITTNER, HYATT, SMITH, SPATH, McLEARN, MULLER, TOZER (implicite). Important discoveries are described, chronologically arranged, in the Germanic and Alpine Triassic, the Salt Range and the Himalayas, North America, Timor, British Columbia and Nevada. The gradual development of an independent american time scale is dealt with, and how it fits in the concepts all over the world in the last thirty years. A useful appendix is added, holding definitions and interpretations of Triassic Series, Stages and Substages. It was a pleasure to read this book, written in a fluent, humoristic style. The illustrations, apart from the geological, stratigraphical and palaeontological information, provide with many pictures of workers in the Triassic in the past and the present.

Turner, P., Ramos, A. & Sopeña, A., 1984. Datos paleomagneticos del Permico y Triasico de la Cordillera Iberica. 1 Congreso Español de Geología, 3: 289-301, 8 figs. (with English summary).

Palaeomagnetic studies in Permian and Triassic rocks in Central Spain are of great interest in order to know the exact position of Iberia in the global tectonics framework.

The preliminary results can be summarized as follows:

1. Diagenetic magnetization during the Triassic. Both normal and reversed components were acquired because of rapid reversals of the comtemporary geomagnetic field.
2. Following burial and unroofing in the Late Tertiary the Buntsandstein succession was brought into contact with the Phreatic (ground water zone, resulting in a virtually complete remagnetization. The less porous previously deposited horizons such as the Saxonian Facies, were unaffected by the process.
3. Following and contemporaneous with the process mentioned at '2' the whole succession acquired a relatively weak normal component, which is easily removed by partial thermal demagnetization. This component may be associated with shallow burial or recent weathering in the area.

The processes described above confront us with problems regarding their dating. As a consequence, the correlation of palaeontological and palaeomagnetical time-scales from the Late Palaeozoic and the Early Mesozoic is problematic. Moreover, the palaeontological data concerning western Europe is far from complete and badly controlled.

Wild, R., 1984. Flugsaurier aus der Obertrias von Italien. Naturwissenschaften, 71: 1-11, 12 figs., 1 table (with English summary).

The earliest pterosaurs are known recently from the Upper Triassic of Northern Italy. They are represented by three different genera, *Eudimorphodon*, *Peteinosaurus* and a still unnamed speciment. They can be assigned either to the well-known Liassic family Dimorphodontidae (*Peteinosaurus*) or are related to *Campylognathoides (Eudimorphodon)* and/or to *Dorygnathus* (unnamed specimen) from the Upper Liassic. The Triassic pterosaurs show a series of characters unknown in other members, which permit the derivation of the pterosaurs directly from the diapsid eosuchians. The pterosaurs represent an independently evolved branch of the archosaurs. The Triassic members demonstrate by their small size, the enlarged hooked claws of the manus, the development of the wing membrane and elongated fourth finger that the ability to fly could have been acquired only by ancestors being climbers.

The new finds are described and figured. They are partly extremely well preserved. The figures include restorations showing the animals in various ways of propagation. For comparison reasons *Dorygnathus* and *Campylognathoides* skulls are shown, as well as reconstructions of the Upper Permian eosuchian *Heleosaurus scholtzi*. A hypothetical climbing ancestor is given in Fig. 9, showing an elongated fourth finger, a wing membrane, all four extremities provided with hooked claws. Fig. 7 shows the evolutionary relationships between pterosaurs of Triassic and Lower Jurassic age. The source strata have been given a Norian age. The unnamed specimen is thought to be chronostratigraphically older than *Eudimorphodon* and *Peteinosaurus*, mainly on the basis of characters that are considered to be primitive.

ADDENDUM

Farabegoli, E. & De Zanche, V., 1984. A revision of the Anisian stratigraphy in the western Southern Alps. Memorie di Scienze geologiche, Padova, 36: 391-401, 2 figs. (with Italian summary).

The Val Sassina Conglomerates and the Val Muggiasca Conglomerates, Upper Anisian terrigenous-carbonatic units belonging to the Braies Group and defined in the Grigne area (Lake Como), are extended throughout the western Southern Alps.

West of Lake Como two tectone-sedimentary cycles, Pelsonian to Lower Ladinian in age, have been recognized. The first cycle includes: Val Sassina Conglomerates, Angolo Limestone, Val Muggiasca Conglomerates p.p., undifferentiated Anisian-Ladinian dolomites p.p.; its age is Pelsonian-Lower Illirian (?). The second cycle, Lower Illirian (?)-Lower Ladinian in age, includes: Val Muggiasca Conglomerates p.p., Monte S. Giorgio Dolomite, Monte Albiga Dolomite, Perledo-Varenna Limestone p.p., Besano Fm, undifferentiated Anisian-Ladinian dolomites p.p..

The "Servino-Verrucane-Serie" indicated by Swiss authors, is not a single stratigraphic unit but a sum of lithostratigraphic units different in significance and age: Mesenzana Fm., Verrucano Lombardo, Werfen Fm., Val Sassina Conglomerates, Val Muggiasca Conglomerates.

The term "S. Salvatore Dolomite" is not appropriate in reference to the undifferentiated Anisian-Ladinian carbonate platforms.

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