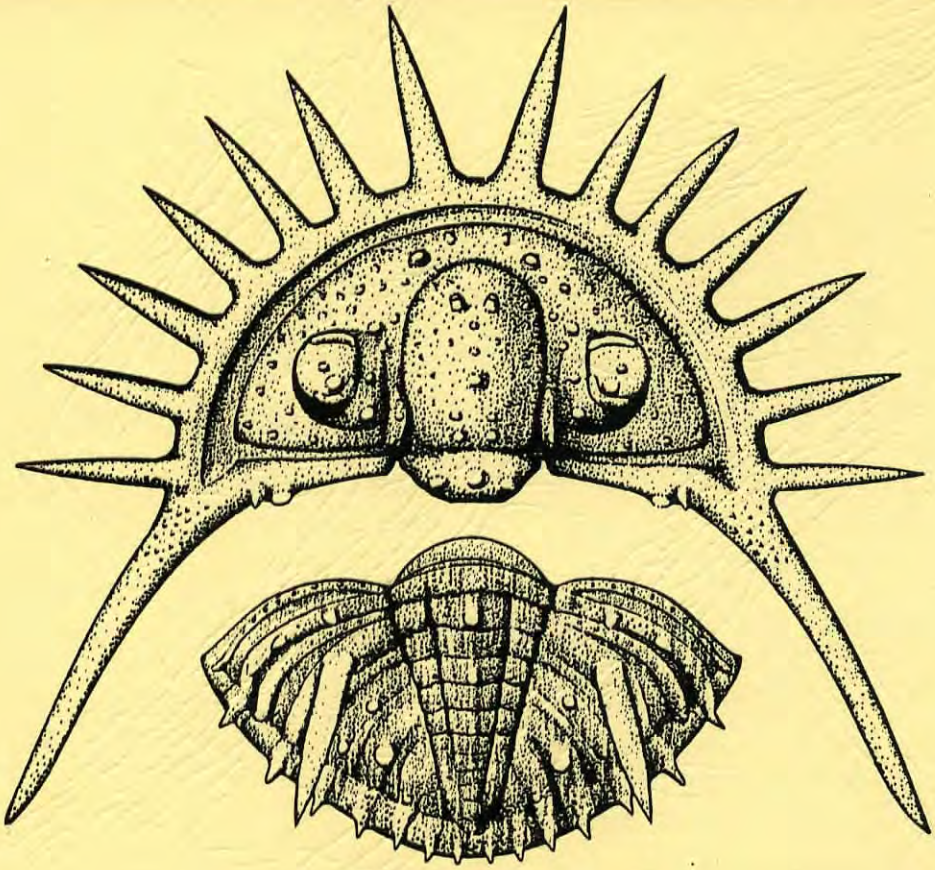
NEWSLETTER ON CARBONIFEROUS STRATIGRAPHY

Volume 8 July 1990



SCCS

I.U.G.S. SUBCOMMISSION ON CARBONIFEROUS STRATIGRAPHY

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The Newsletter on Carboniferous Stratigraphy is distributed free of charge to Corresponding and Titular Members of SCCS. Financial Support from IUGS, distributed through ICS, is gratefully acknowledged. Due to the high costs of printing and distributing the Newsletter, this assistance is insufficient to cover the operating expenses of the Subcommission. Small donations from members, sent to the Secretary, would help to keep the SCCS financial and will be acknowledged in subsequent Newsletters, subject to the donor's agreement.

Dr B. A. Engel, SCCS Secretary
Department of Geology
University of Newcastle, NSW 2308 Australia

NEWSLETTER ON CARBONIFEROUS STRATIGRAPHY

Official publication of the I.U.G.S. Subcommission on Carboniferous Stratigraphy

VOLUME 8 **JULY 1990**

1.1 THE CHAIRMAN'S COLUMN

The main events since Newsletter 7 (1989) were certainly the working program initiated at the SCCS meeting in Provo in September 1989, and the final definition by the Devonian Carboniferous Boundary Working Group of the base of the Carboniferous in the La Serre section, southern France. Both events demonstrate continuing progress towards the exact stratigraphic subdivision of the Carboniferous. The Subcommission has applied its skills towards this goal for many years, as a result of which it has been recognised:

- that an "ideal" subdivision, satisfying all scientific and practical needs in a global sense, cannot be achieved;
- that it is necessary to be realistic about the claims which a stratotype section can fulfil.

The definition of the mid-Carboniferous Boundary is now imminent. So long as a more appropriate section is not described, SCCS and its mid-Carboniferous Boundary Working Group should start to prepare the definition of that boundary in one of the proposed stratotype sections.

Another goal is being prepared for the next SCCS meeting in Buenos Aires in September 1991: the description of up to six biostratigraphic levels in the Carboniferous, in order to assess their potential for global correlation. A further step for SCCS will be the initiation of discussion on the nomenclature of Carboniferous series and stages.

Consideration of other than biostratigraphic methods should also be encouraged. Recent success with the SHRIMP ion probe to determine radiometric ages, using zircons from stratigraphically locatable tuffite layers, makes this dating a much more reliable tool for stratigraphic correlation. Research in this direction may open new doors for stratigraphic correlation of tuff bearing rock sequences which lack an appropriate fossil record.

We should all continue to try hard to reach international agreement on the stratigraphic subdivision of the Carboniferous. This does not mean bringing forward any decision that is not thoroughly documented! The Carboniferous is one of the most intensely studied systems and a firm decision is needed now to find and propose exact and practicable definitions for internationally acceptable subdivisions of the Carboniferous.

Eva Paproth, Chairman

1.2 DONATIONS BY SCCS MEMBERS

In response to a general invitation to SCCS members to make voluntary donations towards our operating expenses, the Subcommission has received further contributions of US$160, during 1990, from those members whose names are listed below. (AUS$1.0=US$0.76). This assistance is gratefully acknowledged.

	AUS $	US $
Dr N. Armstrong, Australia	($30.00)	$22.80
Dr M. Dickins, Australia	($20.00)	$15.20
Dr P.J. Jones, Australia	($20.00)	$15.20
Dr G. Playford, Australia	($15.00)	$11.40
Dr W.J. Sando, USA		$30.00
Dr S. Stojanovic, Australia	($40.00)	$30.40
Dr R.R. West, USA		$10.00
Anonymous (Fed.Rep.Germany)		$10.00
Anonymous (USA)		$15.00
TOTAL DONATIONS FOR 1990		$160.00

STOP PRESS

European members of SCCS who wish to contribute to the cost of the Newsletter are asked to forward all donations to the Chairman, Dr Eva Paproth who will act as a central collection agency for the area.

Funds may be sent direct to DEUTSCHE BANK, KREFELD for deposit in ACCOUNT No. 598367.

2.0 ANNUAL REPORT OF THE SUBCOMMISSION ON CARBONIFEROUS STRATIGRAPHY

2.1 SUBCOMMISSION OBJECTIVES

SCCS is engaged in a program of stratigraphic research with the ultimate aim of selecting stratotypes for one set of agreed worldwide chronostratigraphic units covering the whole of the Carboniferous, starting at the subsystem, and then proceeding to finer subdivisions.

To this end, the Subcommission has:

- Established a mid-Carboniferous Boundary for which a current Working Group is seeking a potential stratotype section.
- Contributed to the discussions of the independent Working Groups on Devonian-Carboniferous and Carboniferous-Permian Boundaries.
- Commenced deliberations on the designation of boundary stratotype sections for the principal subdivisions of the Carboniferous.

The work of the Subcommission forms an integral part of the statutory objective of ICS to develop a standard global stratigraphic scale, including subdivisions, major boundaries and correlation criteria for the Carboniferous System.

2.2 MEMBERSHIP & OFFICERS

The Subcommission has 26 ***Voting Members*** comprised of 3 *Bureau Officers*, 1 *Past Chairman*, 21 *Titular Members* and 1 *Working Group Chairman*. In addition, there are 213 ***Corresponding Members*** who have updated their membership during 1989.

SCCS holds biennial meetings, one in conjunction with the International Congress on Carboniferous Stratigraphy and Geology (four yearly intervals) and the other at a Field and General Meeting of the Subcommission midway between Congresses. The next meeting of the Subcommission will take place in conjunction with the XII Carboniferous Congress in Buenos Aires (September 1991).

BUREAU OFFICERS:

Chairman: Dr Eva Paproth, Schönwasserstrasse 103, D-4150 Krefeld, FED. REP. GERMANY

Secretary/Vice Chairman: Dr B.A. Engel, Department of Geology, University of Newcastle, NSW 2308 AUSTRALIA

Associate Secretary: Dr Hisayoshi Igo, Institute of Geoscience, University of Tsukuba, Ibaraki 305 JAPAN

The Subcommission has an international membership in which national allegiances are not stressed. Titular/Bureau Membership is drawn from regional groups in:

- Eastern Europe (3);
- Western & Central Europe (6) (incl. Chairman,1 Past Chairman);
- North Africa (1);
- North America (6) (incl. 1 W.G.Chairman);
- South America (2);
- Peoples Republic of China (5);
- Japan (Assoc.Sec.);
- Australia (1 + Sec.).

It is with regret that we place on record the death of **Dr A.D. Grigorieva** (USSR) who has served the Subcommission as a Voting Member for a great many years.

Dr Jeanette Doubinger has advised the Chairman that she can no longer take an active part in SCCS meetings and so has decided to relinquished her Voting Membership. Dr Doubinger will continue as a Corresponding Member so that she can be kept fully informed about the activities of the Subcommission. The Bureau extends its sincere thanks to Dr Doubinger for the major contribution she has made over her long service as a Titular Member of SCCS.

Corresponding Membership is drawn from scientists in 26 countries including Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Czechoslovakia, Egypt, Federal Republic of Germany, France, Hungary, Ireland, Japan, Malaysia, Norway, Peoples Republic of China, Poland, Portugal, Spain, Switzerland, The Netherlands, United Kingdom, USA, USSR and Yugoslavia.

Subsequent to decisions taken at the Provo Meeting, a ballot will shortly be conducted for the filling of a number of existing vacancies in the ranks of the Titular Membership.

2.3 INTERFACE WITH OTHER INTERNATIONAL PROJECTS

SCCS has an interface or informal contact with a number of Working Groups and IGCP Projects which include:

- Subcommission on Geochronology (E. Paproth - Corresponding Member);
- Working Group on the Devonian-Carboniferous Boundary (E. Paproth - Chairman);
- Working Group on the Carboniferous-Permian Boundary;
- IGCP Project 211: Late Palaeozoic of South America;
- IGCP Project 272: Late Palaeozoic and Early Mesozoic Circum-Pacific Events.

SCCS has an efficient collaboration in existence between its own marine and non-marine/terrestrial stratigraphers primarily because of the strong development of both marine and coal measure facies within the Carboniferous succession.

The experience gained in this context may be of interest to the new Working Group on Stratigraphic Correlation of Oceanic and Continental Records when it is set up. SCCS will be most eager to enter into active dialogue when appropriate.

The Subcommission is also willing to contribute to the new project on "Past Global Change" in a number of different areas of stratigraphy, evolution, and palaeoenvironmental and palaeogeographic changes when the charter of this project has been established.

2.4 ACCOMPLISHMENTS IN 1989

Ballots submitted to ICS for ratification

Subcommission Voting Members endorsed eight proposals which were forwarded to ICS/IUGS for formal ratification in 1989. These included:

- 1. "That the Carboniferous comprise a single system";
- 2. "That the primary subdivision of the Carboniferous shall be into two and not three divisions, and that the boundary between the two divisions shall be taken at the level selected in Madrid as the Mid-Carboniferous Boundary";
- 3. "That each of the two divisions of the Carboniferous be recognised as a Subsystem";
- 4. "Langsettian Stage to replace Westphalian A Stage with a stratotype being located in south Yorkshire;
- 5. "Duckmantian Stage to replace Westphalian B Stage with a stratotype being located in north Derbyshire";
- 6. "Bolsovian Stage to replace Westphalian C with a stratotype being located in north Derbyshire";
- 7. "That the base of the Cantabrian Stage be moved to a higher position at the base of the Vilanueva Marine Formation in the section at Velilla de Tarilonte, N.W. Palencia, Spain";
- 8. "Barruelian Stage to replace Stephanian A Stage with the current stratotype location being unchanged".

Advice from the Secretary General of ICS indicates that the Full Commission will first vote on Items 1 to 3 just as soon as SCCS has reached a final decision on the stratotype for the mid-Carboniferous Boundary (GSSP) and decided on the names for the two subsystems. It may also be necessary at that time to re-confirm the vote which has already been taken by SCCS. No immediate confirmation of a vote on the European Stages is envisaged despite the fact that formal ratification of these stratotypes is essential for purposes of their official preservation.

It is presumed that the Subcommission will debate its future action on all these proposals and any consequential issues at the next Carboniferous Congress in Argentina (1991).

Re-structuring of Subcommission Working Groups

Reorganisation of the Subcommission Working Groups by Chairman Ramsbottom at Beijing in 1987 took the form of a move from numerous regional groups to a focus upon just three, namely the mid-Carboniferous Boundary Working Group, and two new International Groups dealing with 'lower' and 'upper' Carboniferous subdivision. Chairmen of the previous regional groups have now been invited to set specific achievable targets for their group if they wish to continue operation.

The Chairmen selected for each of the 'lower' and 'upper' Carboniferous subdivisions were Dr Paul Brenckle and Dr C.F. Winkler Prins. Each was charged with organising an *ad hoc* Working Group to evaluate potential boundaries which could provide further global subdivision of their respective subsystems. The SCCS General Meeting held in Provo, Utah (September 24-26, 1989) provided a forum for progress reports from each Chairman as well as detailed contributions from those specialists who were present at the meeting (Newsletter 7, p.13). These *ad hoc* Working Groups have completed their charter and have been discharged.

As a result of the presentations, six stratigraphic levels were nominated as being worthy of further investigation, three being located in each of the 'upper' and 'lower' subdivisions. These levels will now form the central focus of future work by the Subcommission. Current action plans require the presentation of a first evaluation of these levels in Argentina in 1991 (see Chapter 4).

Mid-Carboniferous Boundary Working Group

The Working Group has completed two further field inspections of potential stratotype sections, the first in the Donets Basin/Kiev region (USSR) and the second in Utah/Nevada (USA) in association with the Provo General Meeting. Both inspections are reported in Newsletter 7 (p.14 and 19-20) and details thereof have not been repeated here. This Working Group is fast approaching a final vote on the selection of a stratotype which should be debated at the Argentina Meeting in 1991.

2.5 PUBLICATIONS 1989

It was the intention of the editors to have "**The Carboniferous of the World**", Volume III with the printers by the end of 1989 (Newsletter 7, p.4). This series will be continued to its conclusion of five volumes. Volume IV has mostly been written but has yet to undergo the editorial process and Volume V will be a summary volume for which contributions are now being prepared. Other relevant Subcommission communications will appear in the appropriate '***Compte Rendu***' associated with the XI Carboniferous Congress.

Publication of various aspects of the work of the Subcommission has continued in the following article in ***Episodes*** and editorial work is well advanced on a special volume of ***Courier Forschungsinstitut Senckenberg*** which will contain the proceedings of the Provo Meeting.

Skipp, B.A., Brenckle, P.L., Poletaev, V.I., Nemirovskaya, T.I., Lane, H.R. and Manger, W.L. 1989: The continuing international search for a Mid-Carboniferous boundary Stratotype - Donets Basin, USSR, 1988. *Episodes* 12(3), 179-183.

3.0 SUBCOMMISSION FINANCIAL REPORT

3.1 STATEMENT OF INCOME AND EXPENDITURE 1988-89

INCOME (US$)

Balance carried forward (1988)	68.59
Funds transferred from Past Secretary	1077.30
IUGS Allocation for 1989	700.00
Donations of members	494.00
Bank interest	27.53
TOTAL INCOME	2367.42

EXPENDITURE (US$)

Stationery Expenditure	
Envelopes	34.32
Photocopying	2.34
	36.66
Printing Costs	
Laserprint Proofs	9.36
Newsletter 7 (300 copies)	215.28
	224.64
Subsidy Transfers from IUGS Grant	
Provo Field & General Meeting	200.00
"Carboniferous of the World"	100.00
Bank Charges	4.62
	304.62
Postal Charges	
(includes US$100 subsidy to Mid-Carboniferous Working Group).	
Nov.,1988	44.92
Dec.,1988	3.59
Jan.,1989	15.68
Feb, 1989	29.87
Mar.,1989	29.94
Apr.,1989	5.25
May.,1989	3.04
Jun.,1989	4.91
Oct.,1989	258.18
	395.38
Sundry Expenses	
Part-time typing costs (15 hours @ AUS$10)	117.00
Bank Charges	0.58
Returned Cheque	10.72
	128.30
TOTAL EXPENDITURE	1089.60

BALANCE SHEET:

Funds carried forward from 1987/88	$ 1145.89
PLUS Income 1988-1989	$ 1221.53
LESS Expenditure 1988-1989	$ 1089.60
CREDIT balance carried f/wd to 1990	$ 1277.82

EXPLANATORY NOTES:

(a)For purposes of this balance sheet, AUS$ income and expenditure has been converted to US$ at an exchange rate of AUS$1.00=US$0.78.

(b) The operating surplus for 1988-89 of US$131.93 was made possible by the donation of US$494 by several members of the Subcommission (see Newsletter 7, p.4). Because of the late dispatch of the Newsletter 7, the above balance sheet includes only the postal charges for bulk dispatch to selected distribution points. There may be further costs for local postage in the various countries unless these charges are subsidised by national or private organisations.

(c) Production costs and postage of the annual newsletter (US$483+ in 1989) exceeded the annual IUGS subsidy of US$300. In addition, IUGS provided $400 for ancillary activities of the Subcommission. These included US$100 for secretarial support of "Carboniferous of the World" Volume III; Provo Meeting costs (US$200); and support of the mid-Carboniferous Working Group (US$100). Funding for these activities is gratefully acknowledged.

3.2 BUDGET ESTIMATES FOR 1990:

ITEM	COST(US$)
1. Printing	
Letterheads (1 ream)	$ 23
Circular (240 copies)	$ 25
Newsletter 8 (300 x 30 pages)	$234
Laser Printer proof sheets	$ 12
2. Stationery	
Paper, computer address labels	$ 55
Envelopes for circular, newsletters	$ 35
Photocopying	$ 10
3. Postage Costs	
Bureau correspondence (20g air @ $1)	$ 62
Circular (240 x 20g surface mail)	$120
Newsletter (240 x SAL+Local postage)	$296
4. Part-Time Typing Assistance	
Bureau typing (15 hours @ AUS$12)	$140
Secretarial support for "Carboniferous of the World", Volume III	$200
Secretarial support for the Mid-Carboniferous Working Group	$200
TOTAL BUDGET REQUEST	$1412

I.U.G.S. GRANT FOR 1990

At the end of 1989, IUGS finances had reached a critically low level, approaching insolvency. The ICS Treasurer has advised (April 11, 1990) that the SCCS subsidy for 1990 is $300 and that activities should be restricted so that they are commensurate with this lower level of support.

4.0 S.C.C.S. FIELD AND GENERAL MEETING, UTAH-NEVADA, SEPTEMBER 1989

4.1 CARBONIFEROUS SUBDIVISION PROPOSALS

At the Carboniferous Congress in Beijing (1987), two *ad hoc* working groups were set up to identify potential global subdivision levels within the Carboniferous, in addition to the mid-Carboniferous Boundary which had already been nominated. Paul Brenckle (lower Carboniferous) and Cor Winkler Prins (upper Carboniferous) were invited to chair appropriate working groups with the task of assembling a report for the SCCS Field and General Meeting which was subsequently held in Provo, Utah in September 1989.

Each Chairman gathered, from the members of his working party, a great deal of information about the most significant faunal and floral groups within their Subsystem. The immediate objective was to identify evolutionary changes in the various groups which had the potential to delineate suitable stratigraphic horizons at which it might be possible to establish one or more levels of intercontinental correlation.

Each Chairman presented a summary of this data to the Provo Meeting where they nominated several chronostratigraphic intervals which appear to contain well documented, widely dispersed, evolving lineages suitable for further palaeontological investigation. It must be made abundantly clear that this study was divorced from existing time-stratigraphic and zonal terminology in order to remove bias. In the longer term, there is no reason why currently used boundaries could not be used, if the evolutionary palaeontology supports their nomination. We have aimed for a global perspective, unfettered by the constraints of existing regional schemes.

The results of this global analysis, combined with discussion at the meeting, saw the acceptance of the recommendations of the two Chairmen that there were six faunal/floral assemblages, three in each of the two Subsystems, worthy of further detailed investigation. They include:

Project 1: A chronostratigraphic boundary in the Middle to early Late Tournaisian. This interval starts approximately at the appearance of the foraminifers *Palaeospiroplectammina tchernyshinensis* up to that of *Spinoendothyra costifera*. For the conodonts, it includes the changeover from siphonodellids to *Gnathodus typicus* and associated forms (e.g. *G. cuneiformis*). (***Leader*** - Dr Paul Brenckle, Amoco Production Co., Tulsa, Oklahoma, USA.)

Project 2: A chronostratigraphic level in the Late Tournaisian delimited by the appearance of *Scaliognathus anchoralis* in Late Tournaisian and by the appearance of primitive Archaediscidae (Planoarchaediscinae) within Early Visean. (***Leader*** - Dr George Sevastopulo, Trinity College, Dublin, assisted by Dr Nick Riley, British Geological Survey, Keyworth, Nottingham, UK.)

Project 3: A chronostratigraphic level around the Visean V3a/V3b boundary, which includes the first occurrence of *Gnathodus bilineatus bilineatus* and the Asteroarchaediscidae. (***Leader*** - Dr Zdzislaw Belka, Geol. Institut, Universität Tübingen, Sigwartstr. 10, D-7400 Tübingen, FRG.)

Project 4: A boundary at the base of the *Branneroceras branneri* Zone. (Base of G2). (***Leader*** - To be determined.)

Project 5: A boundary at the base of the *Fusulina - Beedeina* Zone. (Atokan-Desmoinesian; mid Moscovian).(***Leader*** - To be determined.)

Project 6: A boundary at the base of the *Protriticites* Zone. (basal Kasimovian; basal Missourian; mid-Cantabrian). (***Leader*** - Dr Elisa Villa, Fac.de Biologia, Unidad de Geologia, Universidad de Leon, E24071 Leon, Spain.)

At the conclusion of the meeting, it was agreed that the two Chairmen should extend an invitation to six colleagues, each with a special interest in the chosen interval, to head up a project group of appropriate specialists. These Project Leaders would be asked to undertake the following program of investigation.

- 1. By correspondence, the Project Leaders will gather around them a group of appropriate specialists who have an expert knowledge of the particular chronostratigraphic interval assigned for their investigation. Membership should include specialists in all relevant aspects of faunal/floral evolution, stratigraphy and sedimentology.
- 2. The prime objective of each group will be to prepare a preliminary report for the next Subcommission Meeting, to be held in conjunction with the XII Carboniferous Congress which is scheduled to meet in Buenos Aires, Argentina in September 1991. This report should contain:

  (a) An evaluation of the most promising fossil horizons for global correlation (if any) within the Project's nominated time interval and,

  (b) A small selection of stratigraphic sections, distributed on a global basis, which could profitably be the subject of further investigation. For this purpose, it was decided that only previously studied sections are needed at this time.
- 3. If the outcome of this exercise demonstrates that the interval has a substantial potential for global correlation, the titular membership of the Subcommission may then proceed, after a formal vote, with the creation of one or more Working Groups charged with carrying the investigation forward by specifically defining the indicative evolving faunas/floras and choosing a boundary stratotype section, as is being currently attempted by the mid-Carboniferous Boundary Working Group.

4.2 GROUND RULES FOR THE CHOICE OF POTENTIAL STRATOTYPE SECTIONS

In order to set the pattern of investigation for the different projects, it was decided at Provo that potential stratotype sections should have a number of attributes:

- 1. Selected potential localities must be fully accessible by normal transport without logistical, political, or other restrictions.
- 2. The section(s) should be reasonably continuous (or composite) with good exposure, a lack of structural complexity, and a diverse and abundant fossil content.
- 3. Faunal studies of evolving lineages should be completed or at least well advanced; ideally, they should include conodonts, foraminifera, ammonoids and spores, where appropriate.
- 4. The chosen section(s) should have available fossil lists based on the first occurrence of relevant species on a sample-by-sample basis through the critical interval.
- 5. Each section will require information about its geological setting and the presence of any tectonic influences. The sedimentology of chosen sites needs to be documented or at least under active study.

It is of course realised that these objectives are hopelessly optimistic and, in fact, are unlikely to be achieved even after a prolonged and detailed investigation by a Working Group. It is fully appreciated that such ideal conditions will not be determinable by the Project Groups in the very short time they have at their disposal.

It is clear from the above that the Subcommission has stepped back from its traditional role of trying to achieve harmony in correlation between the various regional developments of Carboniferous strata. We have examined our accumulated knowledge of fossil distribution throughout the System and have perceived that at some time intervals there are apparent widespread (?global) occurrences of particular fossil groups which have been the subject of investigation by a large number of specialists. It may well be that we have embarked upon an exercise in circular logic but it was felt that an effort should be made to examine these intervals closely to see if there were any significance in the distribution of particular evolving lineages. If there is then we will have achieved a quantum leap in the reliability of global correlation. To do this, it is necessary to avoid confusing this program with existing biostratigraphic and chronostratigraphic subdivisions. It is most likely that they will coincide but they should not be allowed to prejudice the progress of the investigation.

The relevant Project Leaders have been asked to:

- 1. Document evolving fossil groups in the selected interval, ignoring all spot occurrences and obvious 'gaps' in the fossil record which should never have been used as a basis for stratigraphic definition.
- 2. Establish the global distribution of those groups which survive the 'evolving lineage' test.
- 3. If any groups remain, nominate those sections where these occurrences are present.
- 4. Select from those sections a few which go closest to meeting the ideal conditions set out above.
- 5. Prepare a report for the next Subcommission Meeting detailing the results of the 'lineage' investigations and if appropriate a short list of sections (geographic location; a lithological column; a list of fossils on a sample-by-sample basis) worthy of further investigation.

4.3 PAPERS PRESENTED BY THE LOWER CARBONIFEROUS GROUP

Brenckle, P.L. Lower Carboniferous (Mississippian) Boundaries Working Group: Organization, progress, and a recommendation for further study.

Brenckle, P.L. Foraminiferal division of the Lower Carboniferous in North America.

Carter, J.L. Subdivision of the Lower Carboniferous in North America by means of articulate brachiopod generic ranges.

Engel, B.A. & Morris, L.N. Lower Carboniferous trilobites of Eastern Australia: their biostratigraphic potential.

Hahn, G. Palaeobiogeographic distribution and biostratigraphic significance of Lower Carboniferous trilobites, a review.

Kullman, J., Korn, D., & Weyer, D. Ammonoid zonation of the Lower Carboniferous Subsystem.

Legrand Blain, M. Brachiopods as potential boundary-defining organisms in the Lower Carboniferous of western Europe: Recent data and productid distribution.

Sevastopulo, G.D., Land, N.G. & Waters, J.A. Stratigraphical distribution of crinoids and blastoids in the Lower Carboniferous.

Webster, G.D. & Groessens, E. Conodont subdivision of the Lower Carboniferous.

4.4 PAPERS PRESENTED BY THE UPPER CARBONIFEROUS GROUP

Winkler Prins, C.F. Upper Carboniferous (Pennsylvanian) Boundaries Working Group report.

Conil, R., Groessens, E., LaLoux, M., Poty, E., and Tourneur, F. Carboniferous guide foraminifera, corals, and conodonts in the Franco-Belgian and Campine Basins.

Eagar, R.M.C. A recently found band of non-marine pelecypods in the "Supai" of Mogollon Rim, Arizona, and its correlation with a horizon in the Monongahela succession of Pennsylvania (Poster paper).

Gillespie, W.H. and Englund, K.J. New observations on the Mississippian - Pennsylvanian Boundary in the Appalachian Basin, USA.

Lambert, L.L. and Heckel, P.H. The Atokan/Desmoinesian Boundary: Considerations for locating a boundary stratotype.

Manger, W.L. and Sutherland, P.K. Anomalies in fusulinid-based and ammonoid/conodont-based correlations, Morrowan-Atokan Series, Middle Carboniferous.

Owens, B., Varker, W.J., and Hughes, R.A. Lateral biostratigraphical consistency across the Mid-Carboniferous Boundary - a section close to the basin margin.

Varker, W.J., Owens, B., and Riley, N.J. Integrated biostratigraphy for the proposed Mid-Carboniferous Boundary stratotype, Stonehead Beck, Cowling, West Yorkshire, England.

5.0 XII INTERNATIONAL CARBONIFEROUS CONGRESS - BUENOS AIRES, SEPTEMBER 1991

The XII International Congress of Carboniferous-Permian Stratigraphy and Geology will be held September 22-27, 1991, in Buenos Aires, Argentina. The Congress venue will be the (5 Star) HOTEL LIBERTADOR, Av. Córdoba y Maipú, 1054 Buenos Aires.

Members of SCCS who did not return the first circular or who have not received the second circular, which was distributed about the beginning of April 1990, should request a copy from XII ICC-P, División Paleobotánica, Museo Argentino de Ciencias Naturales "B. Rivadavia", Av Angek Gallardo 470, 1405 Buenos Aires, Argentina.

The President of the Organising Committee, Dr. Sergio Archangelsky has advised that:

- English and Spanish will be the official languages of the Congress and simultaneous translation will be encouraged.
- The International Committee for Coal Petrology will meet the week before the Congress in Porto Alegre, Brazil. A one day excursion has been planned in order to allow participation in both events.
- Dr T. Peryt formally confirmed, at the last Permanent Committee Meeting, that Poland is willing to host the XIII Carboniferous Congress in 1995. No other proposals were received and the subject will be a matter for consideration during the next meeting of the Permanent Committee.
- The official carrier Aerolíneas Argentinas has sponsored a visit to Spain and Portugal by the Congress President to stimulate interest in the Congress. We can expect about 30 specialists from that region to attend the Congress. Similar visits to USA have also indicated that a good attendance can be anticipated.
- Participants will be able to send their cheque and registration form to either of two regional Congress Delegates Dr W.H.C. Ramsbottom, Brown Cottage, Kirkby Malzeard, Ripon, N.Yorks, HG4 3RY, ENGLAND or Dr Thomas N. Taylor, Botany Department, Ohio State University, Neil Av.1735, Columbus OH 43210, USA.

5.1 Scientific Program

5.1.1 Technical Sessions

Dealing with standard subjects developed in previous Carboniferous Congresses, the following themes will be considered:

- **Stratigraphy** (a) Regional; (b) Biostratigraphy; (c) Chronostratigraphy; (d) Magnetostratigraphy.
- **Palaeontology** (a) Micropalaeontology; (b) Vertebrate Palaeontology; (c) Invertebrate Palaeontology; (d) Palaeobotany; (e) Palynology; (f) Trace Fossils.
- **Palaeogeography** (incl. Palaeobiogeography)
- **Palaeoecology and Palaeoclimatology**
- **Tectonics and Magmatism**
- **Palaeomagnetism and Geophysics**
- **Sedimentology**
- **Coal Petrology and Geology**
- **Geochronology**
- **Geochemistry**
- **Economic resources:** exploration and exploitation.
- **Global Subdivision of the Carboniferous (SCCS)**

5.1.2 Symposia

Several symposia are being organised:

- **Late Palaeozoic Palynology** (G. Playford, B. Owens, C.L.Azcuy)
- **Late Palaeozoic Palaeomagnetism** (J.Vilas, D.Tarling)
- **Glacial events through Gondwana** (J.N.Visser, J.M.Dickins, O.L.Gamundi)
- **Late Palaeozoic Coal** (M.Wolf, H.Villar)
- **Hercynian Tectonics** (V.Ramos)
- **Permian Floras: problems and progress** (T.N. Taylor)
- **Late Palaeozoic metalliferous resources** (M.K.de Brodtkorb, A.Brodtkorb)
- **Brachiopods and Mollusca:** correlation between Gondwana and other provinces (C.Winkler Prins, N.Sabattini)
- **Gondwana magmatism** (R.Pankhurst, C.Rapela)
- **Late Palaeozoic Geochronology** (U.Cordani, E.Linares)
- **Preservation of Plant Fossils:** geological and botanical consequences and applications (A.C.Scott, J.Galtier)
- **Late Palaeozoic Phytopalaeoecology** (R.Gastaldo & R.Cúneo)

5.1.3 IGCP Meetings

Leaders of some IGCP projects are organising scientific and/or administrative meetings during the Congress:

- **211 Late Palaeozoic of South America** (Amos & Archangelsky). Presentation of final results with reports from the countries involved.
- **237 Gondwana Fossil Floras** (O. Rösler).
- **249 Andean Magmatism** (C.Rapela) + **279 Terranes of South America** (F.Hervé).
- **272 Late Palaeozoic and early Mesozoic Circumpacific events and their global correlation** (Dickins).

5.1.4 Invited lectures

Following the opening session, invited lectures devoted to local/regional stratigraphy as well as general topics have been considered. These include:

- History of ICC and ICC-P;
- Carboniferous and Permian Stratigraphy of Argentina;
- Late Palaeozoic of South America;
- The meaning of Gondwana;
- Late Palaeozoic economic resources.

5.1.5 Special sessions

During the Congress, SCCS will convene meetings of both the general and Titular membership. It is anticipated that a special session will be devoted to reports by the Project Leaders of the groups investigating the subdivision of the Carboniferous. Meetings of other groups will also be incorporated in the program.

5.1.6 Displays

Poster sessions for those wishing to use this form of presentation will be arranged. Please contact the Secretary General for further information. Abstracts of posters will be published. Papers presented as posters will also be considered for publication. Exhibitions of instruments, equipment, publications, etc. will be arranged for interested parties.

5.1.7 Publications

Abstracts: These should be received NOT LATER THAN MARCH 1, 1991, stating (a) Title, (b) Author(s), (c) Address, (d) A text of maximum 250 words. Authors may indicate a preference for a section or symposium (in the last case, send a second copy to the symposium convener). All abstracts should be in English. The volume of abstracts will be available at the Congress.

Final Publication: Papers presented at the Congress and accepted by the editorial committee will be published in the ***Compte Rendu.*** Manuscripts must be submitted to the Publication Committee before or during the Congress. Manuscripts submitted after the Congress will not be accepted. The length of papers should not exceed 10,000 words (including illustrations and bibliography). Congress discussion will be recorded and published. Instructions will be sent on request or after the receipt of abstracts. All participants (except accompanying members and student members) will receive the ***Compte Rendu*** free of charge.

5.2 Field Excursions

The number of participants is limited in each case to 25. Final registration date for field excursions is March 1, 1991; (A)=Pre-Congress excursions; (B)=Post-Congress excursions.

Excursion 1A, 1B: Sierra de la Ventana, Buenos Aires Province (4 days)

Leaders: S. Japas, A. Amos, S. Rodriguez

Start and End: Buenos Aires; travel by bus.

Dates: **1-A** From Tuesday, September 17 (8AM) to Saturday, September 21 (8PM); **1-B** From Saturday, September 28 (8AM) to Tuesday, October 1 (8PM).

Cost: US$250

Venue: Visiting Buenos Aires Hills. Thick clastic section of Late Carboniferous and Early Permian rocks. Invertebrate and plant fossils; glacigenic sedimentation; tectonics. Strongly folded early Palaeozoic sediments underlying the Gondwana sequence. Fine mountain scenery. Relaxing area. Rain may be expected.

Excursion 2A, 2B: Calingasta-Uspallata Basin, Mendoza & San Juan provinces (6 days)

Leaders: O.L. Gamundi, O. Limarino, S. Césari, A.C. Taboada, T. Simanauskas.

Start & End: Buenos Aires hotel; travel by plane (Buenos Aires, San Juan); bus (San Juan -Mendoza); plane (Mendoza-Buenos Aires).

Dates: **2-A** From Monday, September 16 (4PM) to Saturday, September 21 (11PM); **2-B** From Saturday, September 28 (4PM) to Friday, October 4 (11PM).

Cost: US$690

Venue: Visiting Carboniferous (mainly marine) sections at Huaco Creek, San Juan River Valley, Calingasta, Barreal and Uspallata. Glacigenic sedimentation, glacial pavement, marine invertebrates (early Carboniferous plants), tectonics and magmatism. Splendid Cordillera scenarios, visit to Aconcagua, highest mountain of the Americas and the Leoncito Astronomic Observatory. Mostly uplands (up to 3,000 m), some walking, usually sunny, dry and cold.

Excursion 3A, 3B: Paganzo Basin, San Luis, Córdoba, La Rioja and San Juan provinces (6 days).

Leaders: C. Azcuy, G. Bossi, E. Ottone.

Start & End: Buenos Aires hotel; travel by plane (Buenos Aires-San Luis or Buenos Aires-Córdoba); bus (San Luis or Córdoba-San Juan); plane (San Juan - Buenos Aires).

Dates: **3-A** From Monday, September 16 (6AM) to Saturday, September 21 (11PM); **3-B** From Saturday, September 28 (6AM) to Friday, October 4 (11PM).

Cost: US$690

Venue: Visiting Carboniferous and Permian (mainly continental) sections at Bajo de Veliz, Arroyo Totoral, Malanzán, Paganzo, Tupe, Huaco and Agua Negra. Late Carboniferous and Early Permian land invertebrates (insects, arachnida), plant fossils (*Nothorhacopteris, Glossopteris*), good palynological sampling, coal mines, basalts (C-P boundary, 295 my), mostly fluviatile and lake sedimentation. Visit to Ischigualasto Valley (Triassic) and Talampaya (Triassic red beds). Xerophytic vegetation (splendid Cactaceae), sunny and dry climate.

Excursion 4A, 4B: Patagonia, Chubut and Santa Cruz provinces (7 days).

Leaders: R. Andreis, O. Arrondo, R. Cúneo, C. Gonzáles, G. Jalfin.

Start & End: Buenos Aires hotel; travel by plane (Buenos Aires-Esquel); bus (Esquel-Comodoro Rivadavia); plane (Comodoro Rivadavia-Buenos Aires).

Dates: **4-A** From Sunday, September 15 (8AM) to Saturday, September 21 (7PM); **4-B** From Saturday, September 28 (8AM) to Friday, October 4 (7PM).

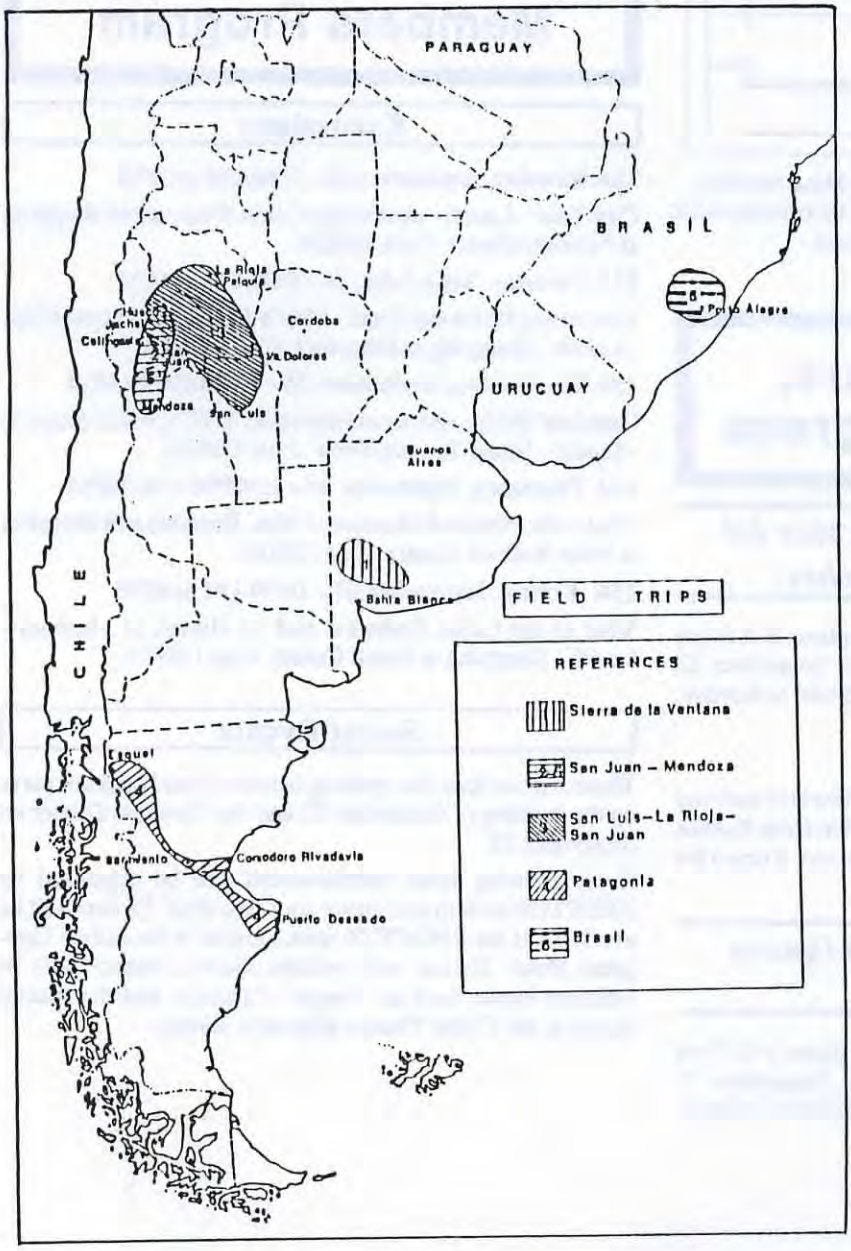
Cost: US$810

Venue: Visiting Carboniferous and Permian sections (marine and continental). Deltaic sedimentation at Nueva Lubecka-Betancourt area, invertebrates (varied marine fauna), plants (mixed flora with large lycophytes, ferns, sphenophylls, conifers and glossopterids), coal. Late Permian Bajo de la Leona area, fluviatile sedimentation and plant fossils (mixed flora with ferns, sphenophylls and glossopterids). Visit to the Jurassic Araucaria Petrified Forest and Palaeocene Sarmiento Petrified Forest. Oil fields in Comodoro Rivadavia, vast scenes of typical Patagonian flat "mesetas". Wild country. Weather may be cold and late snow can be expected. [This excursion is subject to suitable weather conditions].

Excursion 5B: Cordillera Frontal Late Palaeozoic magmatism (San Juan, Mendoza) (4 days).

Leaders: C. Rapela and E. Llambías.

Start & End: Buenos Aires hotel; travel by plane (Buenos Aires-San Juan); bus (San Juan-Mendoza); plane (Mendoza-Buenos Aires).



Dates: 5-B From Saturday, September 28 (4PM) to Wednesday, October 2 (11.30PM).

Cost: US$580

Venue: Permian Frontal Cordillera magmatism (granodiorite-granite batholith and an ignimbrite plateau, with common silic dyke swarms) and Miocene vulcanism of Precordillera (andesitic-dacitic calcalkaline subvolcanic bodies) will be examined. The Precordillera Terrane at Rodeo-Calingasta Valley and the northern part of Frontal Precordillera are desert regions with altitudes between 2,000 m above sea level at Pismanta and up to 4,000m on the farther outcrops of Choiyoi volcanics. Lodging during the excursion will be at Pismanta Hotel, with thermal curative waters. Weather is rather hot in the lowlands and very cold in the highlands.

Excursion 6A: U.S. of BRAZIL (1 day).

Leaders: Z. Correa da Silva, M. Marques Toigo, M. Guerra-Sommer.

This excursion is combined with the ICCP Annual Meeting that will take place in Porto Alegre, Rio Grande do Sul. Good chance to visit the Geoscience Inst. of the Federal University and meet colleagues in Palaeobotany, Palynology and Coal Petrography (An extra day is needed).

Date of Excursion: Friday, September 20, 1991. Visit to open pit coal mines at Fraxinal and Recreio and to the new underground Leão II mine. Depositional environments of S. Brazil, Permian coal bearing strata, plant fossils (*Glossopteris*), palynological sampling. Participants should fly to Porto Alegre from home and then continue to Buenos Aires (Saturday 21 or Sunday 22).

For further details please contact Dr Z. Correa da Silva, Inst. de Geociências (UFRGS), Av. Benito Gonçalves 9500, CP 15052 - (91500) Porto Alegre RS, Brazil. Phone (0512) 36-1211 extn. 222 or 233.

Excursion 7A: Bolivia Republic (4 days).

Leaders: M. Suarez Riglos, R. Suarez Soruco, D. Merino.

Start: La Paz;

End: Santa Cruz de la Sierra.

Venue: Visiting Carboniferous and Permian sections at Lake Titicaca (highest in the world, 3,800 m), mainly marine (with conodonts), Tunari-Apillapampa (marine with conodonts) and El Tunel-Pasorapa (marine). Palynological sampling, good Silurian and Devonian sediments. Archaeological places with possible visit to Tiahuanacu ruins. Splendid geological scenarios. Participants must fly direct to La Paz, Bolivia, travel by plane and bus during the excursion, and then make their own

travel arrangements from Santa Cruz de la Sierra to Buenos Aires for the Congress.

For this excursion, please contact Dr. M. Suarez Riglos, Télex: 4248 IGAS BV, Santa Cruz de la Sierra, Bolivia;

EXCURSION 7: 1-Lago Titicaca, Yaurichambi, Mina Matilde, Belén, Copacabana, Tiahuanacu. 2-Cochambamba, Apillapampa. 3-El Túnel y Pasorapa.

5.3 Tourist Tours, Pre- & Post-Congress

Excursion 8A, 8B: Tour to Mar del Plata City (Sea and beaches)

Start & End: Buenos Aires hotel, travel by plane; **8-A** From Saturday, September 21 (8AM) to Sunday, September 22 (8PM); **8-B** From Saturday, September 28 (8AM) to Sunday, September 29 (8PM).

Cost: US$180

Venue: MAR DEL PLATA is the most important summer resort of Argentina. It is a modern city, 400 km from Buenos Aires, with extensive beaches and wonderful sea. Known for its delightful seafood and famous Casino.

Excursion 9A, 9B: Tour to Iguazu (Falls)

Start & End: Buenos Aires hotel, travel by plane; **9-A** From Friday, September 20 (8AM) to Sunday, September 22 (8PM); **9-B** From Saturday, September 28 (8AM) to Monday, September 30 (8PM).

Cost: US$290

Venue: IGUAZU Falls are considered the most fascinating and imposing of the world. They are located amidst tropical jungles within the Argentina and Brazil frontier and close to the border with Paraguay.

Excursion 10A, 10B: Tour to Bariloche (Mountains and Lakes)

Start & End: Buenos Aires hotel, travel by plane; **10-A** From Thursday, September 19 (8AM) to Sunday, September 22 (8PM); **10-B** From Saturday, September 28 (8AM) to Tuesday, October 1 (8PM).

Cost: US$410

Venue: Tourist paradise of southern Argentina. The most beautiful views within an environment of snow cladded mountains, blue lakes and ancient forests. Also it is the most important centre of South America for ski and winter sports during the season (June to October).

5.4 Accompanying Members Program

Excursions

11A Monday, September 23 - 9:30AM to 6PM

City Tour - Lunch - visit to the Colón Theatre and shopping at Spinetto Center. Cost: US$30.

12A Tuesday, September 24 - 9:30AM to 6PM

Visit to San Isidro and Tigre - Ship's Tour in the Paraná River - Lunch - Shopping at Unicenter. Cost US$35.

13A Wednesday, September 25 - 10:30AM to 6PM

Gauchos' Party - visit to an Argentine 'ESTANCIA' (Ranch) - Lunch - Horse Taming Show. Cost US$30.

14A Thursday, September 26 - 2:30PM to 6:30PM

Visit to the National Museum of Arts, Recoleta and shopping at Patio Bullrich Center. Cost US$10.

15A Friday, September 27 - 10:30AM to 6PM

Visit to the Luján Cathedral and its Historical Museum - Lunch - Shopping at Soleil Center. Cost US$35.

Social Events

These will include the opening ceremony and cocktail party on the evening of September 22 and the Congress Dinner on September 25.

Every evening some entertainment will be organised by ENOSTUR to help you enjoy your free time. Tickets will be available at the ENOSTUR desk located in the offical Congress Hotel. Events will include Shows, Music-Halls or Folklore Music such as 'Tango', Cabarets, and the special nights at the Colón Theatre (Opera or Ballet).

5.5 Congress Fees

Congress registration, field trips, accompanying member fees, and other activities must be paid in full when submitting the registration forms. Fees listed above are subject to change if necessary.

The last date for the standard payment of all fees is **March 1, 1991**. Late registration fees are given below. All fees must be paid in US dollars.

Registration

	Before March 1,1991	March 1 to June 30,1991	After June 30,1991
Participating member	200	225	250
Accompanying member	125	150	175
Institutional member	1,000	1,000	1,000
Non-attending member	200	200	200
Student member	50	75	100

Field Trips

	Fee per Person US$
1-A, 1-B Sierra de la Ventana	250
2-A, 2-B Mendoza & San Juan	690
3-A, 3-B San Luis, La Rioja, San Juan	690
4-A, 4-B Patagonia	810
5-A Cordillera, San Juan, Mendoza	580
6-A (See Z.Correa da Silva, Porto Alegre, Brazil)	
7-A (See M.Suarez Riglos, Santa Cruz dela Sierra, Bolivia)	
8-A, 8-B Mar del Plata (Sea)	180
9-A, 9-B Iguazu (Falls)	290
10-A, 10-B Bariloche (Mountains)	410

Hotel Costs

The organising Committee of XII ICC-P and the official travel agency ENOSTUR have prepared a special fee, SEVEN DAY (six night) package for Hotel rates with breakfast, tax, and airport-hotel transfers. Rates are given for single, double and triple occupancy. Other meals are excluded.

PACKAGES	Single US$	Double US$	Triple US$
Five Star Hotel	730	480	430
Four Star Hotel	480	290	250
Three Star Hotel	230	170	140
De Luxe Apart-Hotel	470	350	280
Apart-Hotel	340	170	140

The travel agency can find lower cost accommodation if required. Contact them directly.

All payments with the registration form must be in US dollars, payable by cheque to XII ICC-P.

5.6 International Commission of Coal Petrology

by Dr Monica Wolf, Lehrstuhl für Geologie, Geochemie und Lagerstätten des Erdöls und der Kohle, Rheinisch-Westfälische Technische Hochschule, Aachen, Federal Republic of Germany.

The International Commission of Coal Petrology (ICCP) has separated itself from the International Congress on Carboniferous and Permian Stratigraphy and Geology. The reasons for this decision were the limited time for meetings of ICCP during the Congresses and the extremely long interval that elapses before the reports of ICCP activities appear in the *Compte Rendu*.

The next ICCP meeting will take place in Porto Alegre (Brazil) on September 16-22, 1991. Participants who attend the meeting in Brazil will have the opportunity to attend the Carboniferous Congress in Buenos Aires, after the ICCP meeting. The attention of ICCP delegates is drawn to the availability of Excursion 6A which is intended to form a link between the two meetings.

6.0 WORKING GROUP REPORTS

6.1 MID-CARBONIFEROUS BOUNDARY WORKING GROUP MEETING, SEPTEMBER 30, 1989

Apologies were received from both the Chairman, Dr H.R. Lane and the Secretary, Dr A.C. Higgins. In their absence, Dr P. Brenckle was elected as Acting Chairman and Dr B.A. Engel as Acting Secretary.

Voting Members of the Working Group present at the meeting held in the vicinity of Arrow Canyon, Nevada included: P.L. Brenckle, B.A. Engel, W.L. Manger, B. Owens, W.H.C. Ramsbottom, and B. Skipp. All attendees on the field trip were invited to participate in the discussion.

Chairman Brenckle invited Dr Gary Webster, Field Trip Leader, to outline the regional setting of the various stratigraphic sections inspected on this excursion with respect to their location on the carbonate shelf in the Basin and Range province. The sections under consideration included:

- Frenchman Mountain Section (easternmost section);
- Granite Mountain Section (located a little further west on the shelf margin);
- Trough Springs Section (slightly off the shelf margin - under current investigation);
- Arrow Canyon Section (located on the shelf margin, perhaps as far offshore as Granite Mountain Section);
- Las Vegas Range Section (located to the west of Arrow Canyon).

The opinion was expressed by Dr Webster that only two alternatives, the Trough Springs and Arrow Canyon Sections presented viable possibilities for a stratotype section. Other localities visited on the excursion contained gaps in the section, belonged to the wrong facies or lacked an evolving sequence of ***D. noduliferus*** at the critical level.

Dr E. Paproth made the point that there are no recognised platforms in Germany, only shallow to very shallow water, and it was important that the chosen stratotype be accompanied by full sedimentological data in order to permit global comparisons. She expressed the view that the Arrow Canyon Section was an acceptable stratotype with the addition of these sedimentological data.

Dr M. Legrand-Blain considered that the use of conodonts was appropriate for a stratotype section in North America. However, when dealing with the shelf facies, a stratotype based on American conodont species will be quite different to one using Tethyan brachiopods as its basis. It was pointed out that it is only possible to have one stratotype but that we were free to choose as many regional reference sections as was felt necessary since these are not the concern of ICS/IUGS.

Dr Ramsbottom stated that Arrow Canyon was a good section but that it had imperfections at the boundary. In contrast, Dr B. Richards suggested that the sequence at the boundary was continuous but that there could be breaks away from the boundary at the conglomerate, as would be expected in a transgressive/regressive sequence. He also suggested that there was no subaerial evidence below the conglomerate. Chairman Brenckle summarised the discussion by suggesting that the presence of a break at the critical level could be resolved by a detailed sedimentological study. If the sequence was found to be continuous, this would make the Arrow Canyon Section a strong contender for stratotype designation.

Discussion on other sections:

The meeting was informed that there was a lack of data on ***D. noduliferus*** in the Zhelvakovaya Valley Section in the Donets Basin, USSR, since it was not clear if the lowest occurrence had been exposed. There is an apparent reversal of faunas in this section with ***D. noduliferous*** seemingly occurring below ***Homoceras.*** Dr Ramsbottom added that the ammonoid marking the base of the ***Homoceras*** Zone in the Donets section is not a true ***Homoceras*** so that the position of the conodonts relative to ammonoid occurrences does not necessarily conflict with other areas.

Dr Paproth suggested that the Russian section was insufficently known to proceed with at this time and that further work should now be concentrated on Arrow Canyon and previously inspected English sections and that we should not defer a final decision pending the resolution of political difficulties in China and Africa. She suggested that Arrow Canyon was suitable as a stratotype but that the Trough Springs Section may yet prove to be the better section.

Dr Webster added that work in progress will provide new information on carbonate sedimentology plus new foraminiferal data on the Trough Springs and Las Vegas Range Sections. When this becomes available, the Working Group will need to reappraise its assessment of the best available section in the United States.

The meeting endorsed the suggestion that a final decision about the Nevada sections should be deferred pending the outcome of further sedimentological and palaeontological studies now in progress.

7.0 REPORTS BY SCCS MEMBERS

7.1 IGCP 272: LATE PALAEOZOIC AND EARLY MESOZOIC CIRCUM-PACIFIC EVENTS

By Dr J. M. Dickins, Project Leader, Bureau of Mineral Resources, P.O. Box 378, Canberra, ACT 2601 Australia

Newcastle NSW, 30/1/90-2/2/90

This part of the meeting was attended by 10 scientists from Australia, USSR, Japan, China and Thailand. It comprised three days field activities and one day discussion. The field geology was shown to us by Professors B. A. Engel and C. F. K. Diessel and Dr Noreen Morris of the Department of Geology at the University of Newcastle. Examination was made of the Carboniferous sequence in the southern part of the New England Fold Belt. A variety of sedimentary types from shallow to deep water were seen, composed predominantly of intermediate and acidic detritus and including much pyroclastic volcanic material. The rocks are very different in appearance from the Permian. Various Lower and Upper Permian localities were examined and considerable time spent on the Newcastle Coal Measures, illustrating their tectonic and volcanic provenance. Main features of interest to the project were the major regression of the Upper Carboniferous, the difference in sedimentation between the Carboniferous and the Lower Permian, the character of the sedimentary changes and the tectonic activity at the boundary of the Lower and Upper Permian and the Permian-Triassic boundary sequence. Formal papers were held over until the New Zealand meeting.

New Zealand, 9/2/90-14/2/90

The group with the exception of the Newcastle University scientists moved on to New Zealand. A formal scientific and business meeting was held in association with the International Brachiopod Congress, sponsored by the University of Otago on February 9, 1990. This meeting was attended by 18 scientists from twelve countries from different parts of the Circum-Pacific region. Formal papers given at this meeting are to be published. In addition to the meetings already proposed for the project, a meeting in Thailand, probably in 1991, was discussed and plans put in hand. In addition, a meeting in the Soviet Far East is being considered.

IGCP participants then took part in the Southland excursion, September 10-14, 1990, with Drs J. D. Campbell, H. J. Campbell and D. A. B. MacFarlan as leaders. Features of interest to the project included examination of the Upper Permian and its possible relationships with the Lower Permian, the Middle and Upper Triassic sequences and their relationships with the Jurassic. Marked changes, apparently associated with the ophiolites, occur in the mid-Permian. The nature of the Permian to Triassic boundary sequences remains obscure. Important events are associated with the beginning of the Anisian and the Carnian and the Triassic-Jurassic boundary.

7.2 CONTRIBUTIONS TO CARBONIFEROUS GEOLOGY AND PALAEONTOLOGY IN JAPAN 1988-1990

by Professor Hisayoshi Igo, Institute of Geoscience, University of Tsukuba, Ibaraki 305, Japan (submitted March 30, 1990)

Limited progress in Carboniferous geology and palaeontology occurred in Japan in the period from mid 1988 to the present time, when 15 papers were published. In 1990, two international symposia will be held in Sendai City on the campus of Tohoku University in northeast Japan. Discussion topics will include Carboniferous and Permian geology and palaeontology with field trips being arranged to appropriate sections by the organising committees. The symposia are:

SHALLOW TETHYS 3, September 20-23, 1990; **Secretary:** Dr. K. Ogasawara, Institute of Geology and Palaeontology, Faculty of Science, Tohoku University, Aobayama, Sendai 980, Japan.

BENTHOS '90, September 28 - October 2, 1990; **Secretary:** Dr. K. Ishizaki of the same Institute.

The Working Group on the Carboniferous-Permian Boundary (Chairman Prof. Wu Wang-shi) will meet at Akiyoshi-dai after the **BENTHOS '90** excursion. Further information is available from Prof. M. Kato, Department of Geology and Mineralogy, Hokkaido University, Sapporo or Prof. J. Yanagida, Department of Geology, Kyushu University, Fukuoka.

Recent Contributions

The paper by Hasegawa (1988) is a brief discussion on the Carboniferous-Permian Boundary in the Akiyoshi Limestone Group. He placed the boundary between the *Triticites simplex* and *Pseudoschwagerina vulgaris ashensis* subzones. In other words, the base of the Permian is placed at the first appearance of *P. vulgaris ashensis* Scherbovich. He also pointed out the existence of "blackish brown sparry calcite layers" near the boundary of the *Fusulina-Fusulinella* zone and the *Triticites* zone.

Ueno (1989), a graduate student at Chiba University, also discussed this boundary problem in the Akiyoshi Limestone Group. He intensively studied foraminifers in the northeastern corner of the Akiyoshi Limestone Plateau. His informative paper established the following 15 zones (in ascending order) in the upper part of the Lower Carboniferous to Lower Permian sequence:

Endothyra sp. zone, *Mediocris breviscula* zone, *Eostaffella mosquensis* zone, *Eostaffella bigemmicula* zone, *Millerella yowarensis* zone, *Pseudostaffella antiqua* zone, *Akiyoshiella ozawai* zone, *Fusulinella biconica* zone, *Fusulinella taishakuensis* zone, *Beedeina akiyoshiensis* zone, *Protriticites* sp. zone, *Quasifusulinoides toriyamai* zone, *Triticites simplex* zone, *Alpinoschwagerina? fusiformis* zone, and *Pseudofusulina* ex gr. *vulgaris* zone. His paper is written in Japanese but he has included detailed stratigraphic ranges of many foraminiferal species, locality maps, geological sections, and illustration of the important species. He placed the base of the Permian at the first appearance of *Alpinoschwagerina? fusiformis* (Krotow). *A. pavlovi* (Rauser), *A. moelleri* (Rauser), *Eoparafusulina ellipsoidalis* (Toriyama) and others are also present in the base of the zone. Many well preserved foraminiferal species will be described in the near future.

Matsusue (1988) reported the occurrence of uncoiled ozawainellid fusulinids, *Rectomillerella* and *Palaeoreichelina* from the Akiyoshi Limestone Group and proposed two new species.

Ishiga (1988) reviewed the Middle to Late Palaeozoic radiolarian biostratigraphy in Japan, and Ishiga and Suzuki (1988) reported the occurrence of Upper Carboniferous to Middle Permian radiolarians from the Akiyoshi Terrane of southwestern Japan.

Sashida and Tonishi (1988) described several interesting new species of Upper Permian radiolarians from chert exposed at Itsukaichi, west of Tokyo. This fauna is similar to that of the Lamar Limestone of West Texas, USA.

Igo, Igo and Adachi (1988) described two Lower Permian sphinctozoan sponges from the Ichinotani Formation, Hida Massif, central Japan. The occurrence of the genus *Cystauletes* is interesting because this genus was known only from the Middle Pennsylvanian of Oklahoma, USA. It is possible that this sponge-bearing horizon of the Ichinotani Formation belongs to the uppermost Carboniferous rather than the basal Permian.

Kobayashi and Sakagami (1989a, 1989b, 1989c) described a new species of *Brachymetopus* (trilobite) from the Middle Carboniferous and a Permian trilobite, both from northeastern Thailand.

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7.3 RECENT ADVANCES IN ATOKAN BIOSTRATIGRAPHY

by John R. Groves, Amoco Production Company, 1670 Broadway, P.O. Box 800, Denver, CO 80201 and Robert C. Grayson Jr, Department of Geology, Baylor University, Waco, TX 76798, USA.

This paper was compiled for discussion following the symposium: "Recent Advances in Middle Carboniferous Biostratigraphy", South-Central Section, GSA, 24th Annual Meeting, Stillwater, Oklahoma, March 5, 1990

INTRODUCTION

In this summary we have attempted to identify significant recent contributions to Atokan biostratigraphy. Items included are foraminiferal and conodont studies published after the 1984 OGS symposium volume "The Atokan Series (Pennsylvanian) and its Boundaries", as well as a few studies nearing completion.

We did not deliberately exclude contributions on other fossil groups; on the contrary, we sought input from specialists on plant microfossils (L.E. Eames), cephalopods (W.L. Manger; L.L. Lambert), corals and brachiopods (P.K. Sutherland), but no significant papers were identified. Items are keyed numerically to localities on the accompanying Atokan paleogeographic reconstruction.

FORAMINIFERA

1. Douglass, R.C., 1987: Fusulinid biostratigraphy and correlations between the Appalachian and Eastern Interior basins: *U.S. Geological Survey Professional Paper 1451*, 95p., 20 pls. This volume documents fusulinid occurrences from 88 surface and subsurface localities across the Illinois and Appalachian basins. The faunal succession includes all or portions of the zones of *Millerella, Profusulinella, Beedeina,* and *Triticites*, with the latter two zones subdivided into five and three subzones, respectively. Atokan faunas are documented from the Seville Limestone Member in Illinois; the Finnie Sandstone Member through Curlew Limestone Member in western Kentucky; the Magoffin Limestone Member through Stoney Fork Member in eastern Kentucky; and the lower Mercer through Homewood Sandstone Member in Ohio and western Pennsylvania.

2. Verville, G.J., Sanderson, G.A., and Madsen, M.E., 1986: Pennsylvanian fusulinids from the Fra Cristobal Range, Sierra County, New Mexico: *New Mexico Geological Society Guidebook, 37th Field Conference, Truth or Consequences*, 215-223, 7 figs (including 5 columnar sections with illustrated fusulinids). This report contains the first documented biostratigraphic evidence for subdividing Pennsylvanian carbonates in the Fra Cristobal Range. Important fusulinid genera are *Fusulinella, Fusulina, Wedekindellina, Eowaeringella, Triticites*, and *Dunbarinella* from rocks of the upper Atokan through Virgilian Series. Upper Atokan strata directly overly the Cambrian Bliss Sandstone and yield *Fusulinella juncea*. Lower Desmoinesian strata are identified by the appearance of *Fusulina insolita*.

3. Verville, G.J., and Sanderson, G.A., 1988: Early Atokan fusulinids from the lower Antler Overlap sequence, Lander and Humboldt counties, Nevada: *Journal of Paleontology*, **62**(4), 520-529, 5 figs (2 pls). Species of *Profusulinella* are employed to correlate the Highway Limestone, lower Etchart Formation and Battle Formation in Lander and Humboldt counties to portions of the Moleen Formation and Ely Formation near Elko and Ely, respectively. Representatives of four genera are systematically described and illustrated.

4a. Groves, J.R., *in press*: Fusulinacean biostratigraphy of the Marble Falls Limestone (Pennsylvanian), western Llano region, central Texas: *Journal of Foraminiferal Research*, 78 ms pp., 4 figs, 9 pls. Fusulinid correlations permit interpretation of the local depositional history of the Marble Falls Limestone and superadjacent Smithwick Formation. The upper member of the Marble Falls is shown to be highly time-transgressive as a consequence of westward migration across an irregular pre-Atokan paleotopographic surface. The upper Marble Falls in most of the western Llano area is equivalent to the Smithwick along the northern and eastern flanks of the uplift. Species in the following genera are systematically described and illustrated: *Mediocris, Millerella, Eostaffella, Pseudostaffella, Eoschubertella, Profusulinella, Fusulinella, Fusulina, Wedekindellina*, and *Staffella*.

4b. Groves, J.R., *in review*: Stratigraphic distribution of non-fusulinacean foraminifers in the Marble Falls Limestone (Lower-Middle Pennsylvanian), western Llano region, central Texas: *Oklahoma Geological Survey Circular*, 20 ms. pp., 3 figs, 4 pls. This short contribution is prepared as a companion article to that in 4a, above. Twenty-two genus- and species-level taxa of smaller foraminifers are illustrated and their occurrences related to the independently established fusulinacean zonation. Assemblages from the middle and upper Atokan portion of the section are remarkably similar to ones reported from the Moscovian of the Eurasian-Arctic faunal realm, suggesting a greater degree of Middle Carboniferous cosmopolitanism than has been previously recognised.

5. Clopine, W.W., (PhD dissertation nearing completion): This study involves detailed taxonomic and stratigraphic analysis of fusulinacean successions from four measured sections in south-central New Mexico and extreme west Texas (Mud Springs Mountains, Sierra County, NM; type Derryan, Derry Hills, Sierra County, NM; Organ Mountains, Donna Anna County, NM; and Franklin Mountains, El Paso County, TX). Species in the genera *Profusulinella, Fusulinella, Beedeina*, and *Wedekindellina* are used to evaluate the Middle Pennsylvanian lithostratigraphic framework proposed by M.L. Thompson. Fusulinid assemblages bracketing the Atokan-Desmoinesian boundary are best developed at Wiskey Canyon (Mud Springs Mtns) and Vinton Canyon (Franklin Mtns).

6. Groves, J.R. 1984: Foraminifers and biostratigraphy of the Arco Hills, Bluebird Mountain, and lower Snaky Canyon Formations (Mid-Carboniferous) of east-central Idaho: *Journal of Foraminiferal Research*, **14**(4), 282-302, 7 figs, 8 pls. Integrated microfossil biostratigraphy involving smaller foraminifers, fusulinaceans, and conodonts (identified by J.F. Baesemann) enables subdivision of the upper Chesterian through middle Atokan portions of these recently named formations. Detailed foram and conodont occurrence data

are presented from two measured sections in the southern Lemhi Range, Butte County. Forams are illustrated on eight plates. (The systematics and stratigraphic distribution of calcareous algae from coincident samples are documented in: Groves, J.R. 1986, Calcareous algae and associated microfossils from mid-Carboniferous rocks in east-central Idaho: *Journal of Paleontology*, **60**(2), 476-496, 9 figs).

OTHER. Groves, J.R., 1986: Foraminiferal characterization of the Morrowan-Atokan (lower Middle Pennsylvanian) boundary: *Geological Society of America, Bulletin*, **97**, 346-353, 2 figs. This article reiterates the need for establishing a lower Atokan boundary stratotype in light of inadequacies of the traditional type Atokan reference area. Foraminiferal successions from 12 areas throughout the midcontinental and western USA and Alaska are reviewed with respect to their suitability as potential stratotype candidates. The appearances of the primitive fusulinids *Pseudostaffella* and *Eoschubertella*, and possibly staffellids, are recommended as the most useful for identifying the base of the Atokan. Documented, sedimentologically continuous sequences containing these appearances are best developed in southern New Mexico, southeastern Arizona, southern Nevada, and east-central Idaho.

Groves, J.R., 1988: Calcareous foraminifers from the Bashkirian stratotype (Middle Carboniferous, south Urals) and their significance for intercontinental correlation and the evolution of the Fusulinidae: *Journal of Paleontology*, **62**(3), 368-399, 18 figs (9 pls). This report contains the first documentation of foraminifers from the type Bashkirian, including a sequence of species judged to represent the evolutionary origination and early diversification of the Fusulinidae. Intercontinental correlations based on the fusulinid phylogeny, conodonts, and ammonoids suggest the Morrowan-Atokan boundary to fall slightly above the base of the Akavassky Horizon of the Early Bashkirian Substage. This contrasts markedly with previous interpretations which equated most of the Bashkirian with the Morrowan.

Groves, J.R., and Sanderson, G.A., *in press*, Systematics of the North American species of *Profusulinella* (Middle Pennsylvanian Fusulinidae): **Micropaleontology**, 66 ms. pp., 10 figs, 21 tables, 7 pls. The type series of 17 species in *Profusulinella* were re-studied to enable clarification of species concepts. All holotypes and most paratypes are re-illustrated at uniform magnification. Detailed morphometric analysis resulted in identification of statistically significant diagnostic characters for 10 species. The remaining seven species (or approximately 40%) are judged taxonomically deficient as a consequence of inadequacies of their type specimens and/or failure by original authors to properly identify acceptable limits of intraspecific morphologic variation.

CONODONTA

7. Grayson, R.C. Jr, Merrell, G.K., Lambert, L.L., and Turner, J., 1989: Phylogenetic basis for species recognition within the conodont genus *Idiognathodus*: applicability to correlation and boundary placement, p.75-94, *in* D.R. Boardman II, and others, (eds), Middle and Late Pennsylvanian chronostratigraphic boundaries in north-central Texas: glacial-eustatic events, biostratigraphy, and paleoecology, Pt. II, Contributed Papers: *Texas Tech University Studies in Geology* **2**. The authors identified previously overlooked morphologic character states of probable evolutionary significance to serve as a basis for discriminating taxa within the *Idiognathodus - Streptognathodus* transition series. The resulting taxonomy proves useful in recognition and correlation of the Desmoinesian-Missourian boundary in north-central Texas, and also affects the systematics of several Atokan species.

8. Whiteside, J.R., and Grayson, R.C. Jr, 1989: Carboniferous conodont faunas, northern Ouachita Mountains, Oklahoma: *Society of Economic Paleontologists and Mineralogists, Mid-year Meeting, Oklahoma City*. Six conodont assemblages from the Carney through Atoka Formations of the Ouachita Mountains are identified and interpreted with respect to their biostratigraphic and chronostratigraphic significance. The Atokan Series in the northern Ouachitas includes the "Spiro" and Atoka Formations, with the base of the series identified by the appearance of *Diplognathodus coloradoensis* and, in places, the fusulinid *Eoschubertella*. In more southerly exposures, however, paleoenvironments were inimical to these indices and boundary recognition is less certain. An arbitrary placement in the middle portion of the range of *Idiognathodus klapperi* results in the Morrowan-Atokan boundary falling within the "Springer", Atoka, and Johns Valley Formations. Upper Atokan strata failed to yield biostratigraphically diagnostic conodonts.

9. Grayson, R.C. Jr, ***in press*** **1990:** Canyon Creek: a significant exposure of a predominantly mudrock succession recording essentially continuous deposition from the Late Devonian through the Middle Pennsylvanian: *Oklahoma Geological Survey Guidebook (South-central Section, GSA, 24th Annual Meeting. Guidebook to Field Trip No.* **2:** Early to Middle Paleozoic conodont biostratigraphy of the Arbuckle Mountains, Oklahoma, March 3-4, 1990). The Mississippian-Pennsylvanian boundary at Canyon Creek is equated with the internationally defined Mid-Carboniferous Boundary at the transition from the *"Adetognathus" unicornis* Zone to the *Idiognathodus noduliferous - streptognathodus lateralis* Zone of Higgins. The Morrowan-Atokan boundary is less easily located because: 1) paleoenvironmental conditions excluded certain conodonts; and 2) there is no consensus as to the precise faunal definition of the boundary. A boundary at the base of the Atoka Formation would separate occurrences of *Idiognathodus klapperi* (below) and *I. incurvus*.

OTHER. Grayson, R.C. Jr, Merrill, G.K., and Lambert, L.L., ***in press*** **1990:** Carboniferous gnathodontid conodont apparatuses: evidence of a dual origin for Pennsylvanian taxa: *Courier Forschungsinstitut Senckenberg*, **118.** Reconstruction of multielement apparatuses permits identification of two major mid-Carboniferous gnathodontid clades. In clade 1, *Gnathodus bilineatus* gave rise to the Pennsylvanian genera *"Declinognathodus"*, *Idiognathoides*, and *Idiognathodus (Streptognathodus)*. In clade 2, taxa stemmed from *"Gnathodus" girtyi* and include *Neognathodus higginsi*, *N. symmetricus*, and *N. bassleri*.

7.4 THE LOWER CARBONIFEROUS OF EASTERN CALIFORNIA AND SOUTHERN NEVADA

by Dr Calvin Stevens, Department of Geology, San Jose State University, 1 Washington Square, San Jose, CA 95192-0102, USA.

Calvin reports that he and his colleagues have pretty well worked out the general nature of the Lower Carboniferous carbonate shelf and slope in eastern California and southern Nevada. He has advised that the following manuscripts are in various stages of preparation.

Mississippian stratigraphic framework of eastern California and southern Nevada with stratigraphic revision of Mississippian and Devonian units in California: (C.H. Stevens, D.S. Klingman, Paul Belasky, Charles Sandberg & Paul Stone).

Paleogeographic and structural significance of an Upper Mississippian facies boundary in southern Nevada and east-central California: (C.H. Stevens, Paul Stone & Paul Belasky).

Origin and development of the Mississippian carbonate platform in southern Nevada and eastern California: (C.H. Stevens, Paul Belasky & D.S. Klingman).

7.5 PENNSYLVANIAN NOTES

by Robert Kosanke, U.S. Geological Survey, Mail Stop 919, Box 25046, Denver Federal Center, Denver, CO 80225 USA.

C. Blaine Cecil of the USGS in Reston and Bob Kosanke have continued work on late Pennsylvanian climate changes and palynomorph extinctions following a paper presented at the 28th IGS in Washington. Cortland Eble has joined the Kentucky Geological Survey working in the Coal Branch which is under the direction of James C. Cobb. Cobb reports that the Kentucky, Indiana, and Illinois Geological Surveys have reached agreement on Pennsylvanian nomenclature for the Illinois Basin.

7.6 LATE CARBONIFEROUS EARLY PERMIAN, CRANKY CORNER OUTLIER, NORTHERN SYDNEY BASIN

by David Briggs and Neil Archbold, Department of Geology, University of Melbourne, Parkville, Vic. 3052, Australia.

Carboniferous sequences form the basement of the Sydney Basin along its entire northern margin. Throughout much of this region the Carboniferous-Permian contact is concealed by large-scale thrusting of the Carboniferous southwards over the Permian along the Hunter Thrust. The contact is however exposed in the Cranky Corner area, to the north of the Hunter Thrust, where a large structural basin of Permian strata occurs as an outlier on Late Carboniferous sediments and rhyolitic pyroclastics of the Seaham Formation. Other exposures of the Carboniferous-Permian contact are found in the core of the Lochinvar Dome to the south, and in various structural basins further east.

Biostratigraphically the Cranky Corner outlier is the most important of these exposures because of the occurrence in the same sequence of marine macrofaunas, plant megafossils and palynomorphs. Particular importance has been attached to the supposed occurrence of a *Botrichiopsis*-dominated macroflora, completely lacking glossopterids, stratigraphically above a marine fauna containing *Eurydesma* (Runnegar, 1969; Retallack, 1980). The fauna, the oldest marine fauna in the section, forms the basis for the *"Trigonotreta campbelli"* Zone of McClung (1978). Overlying faunas were assigned by Runnegar and McClung (1975) to their *elongata* and *konincki* Zones. Palynomorphs in the sequence were examined by Helby (in Kemp *et al.*, 1977) who assigned the interval spanned by the *"T. campbelli"*, *elongata* and *konincki* Zones to Stage 2, 3a and basal Stage 3b in the EvansPrice terminology.

All of the authors cited above considered that the Cranky Corner sequence appears to show a conformable Carboniferous-Permian transition, and most followed McClung in placing the top of the Seaham Formation at the base of a series of basaltic flows that lie between the faunas of the *"T. campbelli"* Zone and the *elongata* Zone respectively. By this definition, the *"T. campbelli"* fauna and the Stage 2 to basal Stage 3 palynofloras reported by Helby were attributed to the Seaham Formation, even though only a Stage 1 microflora, and no marine faunas, had been recorded from that unit in its type area.

Recent field work by one of us (D.B.) however suggests that the top of the Seaham Formation in the Cranky Corner area should be placed at a considerably lower level, at a boundary marked by the sudden incoming of abundant andesitic and basaltic clasts, in contrast to the dominantly rhyolitic clasts of the upper Seaham Formation. The *"T. campbelli"* fauna and the interval of core from which Helby recorded Stage 2 to basal Stage 3a microfloras both come from above this boundary. The *Botrichyopsis* locality discussed in Runnegar and Retallack, on the other hand, is in true Seaham Formation, and so lies stratigraphically below, not above, the oldest *Eurydesma* in the sequence, as was previously concluded in an unpublished honours thesis by Slee [University of Newcastle, 1968], and by Briggs (1985). This boundary based on clast provenance is thought to mark a significant tectonic change in tectonic setting. It may also be associated with an angular discordance - this possibility is currently being investigated in an honours project by Iain Cathcart (University of Melbourne).

Work on the brachiopod faunas is being carried out jointly by the authors, and has confirmed that *"Trigonotreta campbelli"* of McClung differs from *T. campbelli* Maxwell, and is a distinctive, biostratigraphically useful species providing correlations with other Early Permian units in New South Wales.

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7.7 CARBONIFEROUS STRATIGRAPHY IN THE U.S.S.R.

Dr V.I. Poletaev, Inst. Geol. Nauk an USSR, ul. Chkalova 55b, Kiev, 252054, USSR.

Recently I returned from the Moscow area where there was a plenum of the International Stratigraphic Commission of the Carboniferous System. They discussed the problem of the Tournaisian-Visean boundary in the USSR which, in the scheme confirmed by the Commission, very probably falls below the boundary in the stratotype. They decided to disturb nothing of ours until there is a final establishment of this boundary on palaeontological criteria. At the plenum they chose leaders of the Working Group on this problem in the USSR - V.A. Chermnykh and I.M. Nigmadzhanova. This Working Group shall, until 1992, refine the mutual relationships of zones based on ammonoids, foraminifera, conodonts, spores and other groups in the sections on the Kozhi River (north Urals) and the Chatkal'sk Range (middle Asia).

Simultaneously, leaders were chosen for the Soviet group on boundaries within the Tournaisian and Visean. The Intra-Tournaisian Group will be headed by V.I. Poletaev and O.A. Shcherbakov (Perm Polytechnic Institute). Thus our joint work is continuing. I hope that in the summer of 1991 we will be able to organise joint field work on the Gubakh area and southern Urals in Bashkiria. The results also should be prepared for 1992.

At the plenum, material was presented according to which *Gnathodus bilineatus bilineatus* in middle Asia and Bashkiria appears earlier than in western Europe, i.e. in the opinion of V.N. Pazyhkin and I.M. Nigmadzhanova just at the level V2b. The correlation was done probably with foraminifera.

7.8 SUBDIVISION OF THE CARBONIFEROUS INTO TWO SUBSYSTEMS & THREE SERIES

by Prof. O. L. Einor, Dept. Geol., Vasilkovskaya 42 kv.33, Kiev 252022, USSR.

The boundary between the Mississippian and Pennsylvanian was considered as the "main stratigraphic boundary" within the Carboniferous by A. Bouroz and others in their presentations made during the VIII Carboniferous Congress in Moscow (1975). At that time this boundary was placed between the *Homoceras* and *Reticuloceras* ammonoid zones.

In 1981 the special Biostratigraphic Symposium of SCCS took place in Leeds, Great Britain. Biostratigraphical and evolutionary analyses of different faunal groups across the Mid-Carboniferous Boundary have shown that the most distinct evolutionary changes of most faunal elements took place at the base of the *Homoceras* zone or between the Mississippian and Pennsylvanian. This position of the Mid-Carboniferous Boundary was accepted in China (XI Carboniferous Congress). In Beijing, The Chairman of SCCS, Dr W.H.C. Ramsbottom, raised the question about the division of the Carboniferous (two or three divisions). Members present endorsed the view that there should be two subsystems, a view which was later adopted by a vote of the Titular Membership.

It should be noted that Russian scientists discussed the subdivision of the Carboniferous into two or three divisions during the nineteenth century and a 3-fold subdivision was adopted after the investigations of S. Nikitin (1890;3).

However some Russian specialists during the last 50 years, on the basis of the analysis of biostratigraphic data of different faunal/floral groups and other geological processes, came to the conclusion that there should be two main stages of the Carboniferous. Among these specialists were M.D. Zalessky, A.N. Krishtofovich, D.V. Nalivikin, A.P. Rotai, D.L. Stepanov, V. Ye. Ruzhentsev, M.V. Bogoslovskaya, O.L. Einor and others.

At the beginning of 1990, a three-fold division of the Carboniferous is still generally accepted in the USSR. The boundary between the lower and middle series is still drawn at the base of the *Reticuloceras* zone.

The author defends the three fold division of the Carboniferous with the acceptance of two Subsystems - Mississippian and Pennsylvanian. The lower series corresponds to the Mississippian and includes three global stages (Einor, 1988). The Pennsylvanian includes two series. The lower one is the Soviet Middle Carboniferous, which includes two stages - Bashkirian and Moscovian. The author would suggest that this lower series be called "Atelian" (Atel was the ancient name for the Volga River). Type sections of the Bashkirian

and Moscovian are located within the Volga Basin, and they have a widespread development in the region.

The upper series preserves the name Stephanian (Bouroz *et al.*, 1975) and it contains two global stages - the Kasimovian and Gshelian.

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THE COVER ILLUSTRATION

The diagram on the cover is a hand drawing of a new trilobite species of ***Namuropyge*** which occurs in the Malchi Formation in Malchi Creek, near Rockhampton, Queensland, Australia. The age of the horizon from which the specimens were collected is very close to the Tournaisian - Viséan boundary.

The diagram was prepared by Dr L.N. Morris, Department of Geology, University of Newcastle. It will form part of a forthcoming paper on this fascinating group of very spiny, small trilobites. The approximate magnification of the illustration on the cover is x15.

8.0 CONGRESS ON THE PERMIAN SYSTEM

PERMIAN SYSTEM OF THE GLOBE (1841-1991)

The International Congress on the Permian System of the Globe has been dedicated to the 150th Anniversary of the establishment of the Permian System in Priuralye. It will take place in August 1991 in the city of Perm, the Urals (USSR). Both Russian and English will be the official languages of the congress.

The program envisages a FIVE day session with reports covering the topics of:

- An historic study of the Permian System in the various regions of the world.
- Stratigraphy, paleontology and evolution of the organic kingdoms and paleobiogeography.
- Sedimentology, paleogeography, and mineral resources.
- Magmatic processes.
- Tectonic and paleotectonic reconstructions.

Geological field trips will be arranged during the congress in the Urals and European part of the USSR. The number of participants is limited to 30-50 and the excursions will extend over a period from 3-5 to 12 days. In the event of sufficient demand the trips could be arranged as both a pre- and post-congress event.

The excursions would include:

1. South Uralian Region - Stage boundaries of the Lower division of the Permian System in the southern Urals.

- Paleontological-stratigraphical validation of the Carboniferous-Permian boundary in stratotype localities and to discuss its correlation with other parts of the globe;
- discussion on the principles serving as a basis for dividing the lower part of the Permian System into stages and the possibility of tracing these stage boundaries through various facies and beyond the limits of the stratotype locality;
- Inspection of stratotype and parastratotype sections of the Orenburgian, Asselian, Sakmarian and Kungurian Stages in terrigenous and reefogenic facies.
- Total route would be 600 km with a duration of 12 days.

2. Middle Uralian Region - Permian deposits of Prikamye and Priuralye.

- Inspection of sections in the upper part of the Artinskian Stage in reefogenic facies and of the classical Kungurian Stage in carbonate-sulphate facies near Kungur on the Silva River;
- Inspection of Upper Carboniferous and Lower Permian sections in carbonate facies on the Kosva River near the town of Gubakha;
- Inspection of the Kungurian, Ufimian and Kazanian sections on the Kama River (between the cities of Perm and Berezniki), as well as details of the well known occurrence of Permian vertebrates on the Kama River near the town of Ocher;
- Inspection of a salt-bearing section of the Kungurian Stage in mines of the Berezniki potassium works.

3. Polar - Uralian Region - Permian deposits of the Pripolar Urals.

- Inspection of the transition Carboniferous-Permian deposits in clay facies;
- Inspection of a reefogenic Asselian - Sakmarian section on the Kozhim River;
- Inspection of a complete Sakmarian, Artinskian and Kungurian succession in terrigenous facies, and the Ufimian Stage in coal-bearing facies.

4. The Volga Region - Upper Permian deposits of Povolzhye.

- This trip is planned to show the stratotype sections of the Kazanian and Tartarian Stages in riverside exposures of the Volga River.

The invitation to participate in the Congress in the city of Perm is extended to all interested workers. The organisers would appreciate an early reply to the invitation, particularly indicating the excursion in which you would like to take part.

A second circular formulating the terms of participation and costs involved will be sent out in Summer, 1990 to those who reply to the First Circular.

The Organising Committee is planning to publish a volume of contributions. Manuscripts may be submitted in English or Russian, typewritten doublespaced, and not exceeding two pages. Contributions will be accepted up to DECEMBER 1, 1990. They may be sent to either:

Dr W. Kanes
Earth Sciences and Resources Institute
Columbia, S.C. USA 29208

or

Dr Boris Chuvashov
Institute of Geology and Geochemistry of the Urals Branch of the USSR Academy of Sciences,
Pochtovyi per. 7
620219 Sverdlovsk, USSR

For further information please contact Dr Boris Chuvashov (Phone 44-00-80)

SCCS CORRESPONDING AND TITULAR MEMBERSHIP LIST, 1990

Please check your entry and report any changes to the Secretary

(B) = Bureau Member; (T) = Titular Member; (WGC) = Working Group Chairman

ARGENTINA

Dr. S. Archangelsky (T)
URQUIZA 1132
Vicente Lopez (1638)
Buenos Aires, ARGENTINA

Dr. Carlos Azcuy
Depto. de Ciencias Geologicas
Pabellon 2, Ciudad Universitaria
1428 Buenos Aires, ARGENTINA

Dr. Carlos R. Gonzalez
Fundacion Miguel Lillo
Miguel Lillo 251
4000 Tucuman, ARGENTINA

Dr. M.S. Japas
Depto. de Ciencias Geologicas
Pabellon 2, Ciudad Universitaria
1428 Buenos Aires, ARGENTINA

AUSTRALIA

Dr. N. Armstrong
Department of Geology
University of Melbourne
Parkville, VIC 3052 AUSTRALIA

Dr. J.M. Dickins
Bureau Mineral Resources
P.O. Box 378
Canberra, ACT 2601 AUSTRALIA

Dr. B.A. Engel (B)
Department of Geology
University of Newcastle
Newcastle, NSW 2308 AUSTRALIA

Dr. T.B.H. Jenkins
Dept. of Geology & Geophysics
University of Sydney
Sydney, NSW 2006 AUSTRALIA

Dr. P.J. Jones
Bureau of Mineral Resources
P.O. Box 378
Canberra, ACT 2601 AUSTRALIA

Dr. G. Playford
Dept.Geology & Mineralogy
University of Queensland
St.Lucia, QLD 4067 AUSTRALIA

Dr. J. Roberts (T)
School of Applied Geology
University of NSW, P.O. Box 1
Kensington, NSW 2033 AUSTRALIA

Dr. S. Stojanovic
Dept. Geology & Geophysics
Univ. Adelaide, GPO Box 498
Adelaide South, S.A. 5001 AUSTRALIA

Dr. G.A. Thomas
40 Waterdale Road
Ivanhoe, VIC 3079 AUSTRALIA

Prof. J.B. Waterhouse
Dept. Geology, Univ. Queensland
St.Lucia, QLD 4067 AUSTRALIA

AUSTRIA

Dr. F. Ebner
Institut für Geowissenschaften
Montanuniversität Leoben
A-8700 Loeben, AUSTRIA

Prof. Franz Kahler
Linsengasse 29
A-9020 Klagen, AUSTRIA

BELGIUM

Dr. A. Delmer
Service Geologique de Belgique
16 Av Col Daumerie
B-1160 Bruxelles, BELGIUM

Dr. E. Groessens
Service Geologique de Belgique
13 rue Jenner
B-1160 Bruxelles, BELGIUM

Dr. E. Poty
Lab. Paléont., Univ. Liège
Place du XX Août 7
B-4000 Liège, BELGIUM

Prof. M. Streel
Lab. Paléont., Univ. Liège
Place du XX Août 7
B-4000 Liège, BELGIUM

BRAZIL

Dr. Marleni Marques Toigo
Rua Domingos
José de Almeida 185
Porto Alegre 90410, BRAZIL

Dr. A.C. Rocha-Campos (T)
Instituto de Geociências
Univ.de São Paulo, CP 20899
São Paulo, SP 01498, BRAZIL

BULGARIA

Dr. Y.G. Tenchov
Geol.Inst. ul. Acad.
Bonchev bloc. 24
Sofia 1113, BULGARIA

CANADA

Dr. E. W. Bamber
Inst. of Sed. and Pet. Geol.
3303-33rd Street N.W.
Calgary, AB T2L 2A7, CANADA

Mr. Sedley Barss
506-6095 Coburg Road
Halifax
Nova Scotia B3H 4K1 CANADA

Dr. P.H. von Bitter
Royal Ontario Museum
100 Queen Park
Toronto, ON M5S 2C6 CANADA

Dr. W.R. Danner
University of British Columbia
Dept.Geol., 6339 Stores Rd.
Vancouver, BC V6T 2B4 CANADA

Dr. Martin Gibling
Dalhousie University
Halifax, NS B3H 3J5 CANADA

Prof. Bernard L. Mamet (T)
Department of Geology
University of Montreal
Montreal,PQ H3C 3J7 CANADA

Dr. W. Nassichuk
Geological Survey of Canada
3303-33rd St. N.W.
Calgary, AB T2Z 2A7 CANADA

Dr. B.C. Richards
Geological Survey of Canada
3303 - 33rd St. N.W.
Calgary, AB T2L 2A7 CANADA

Dr. J. Utting
Inst. Sed. Pet., Geol. Surv. Canada
3303-33rd St. N.W.
Calgary, AB T2L 2A7 CANADA

Dr. Erwin L. Zodrow
Univ. College of Cape Breton
Dept. Geology, Glace Bay H'way
Sydney, NS B1P 6L2 CANADA

CZECHOSLOVAKIA

Dr. I. Chlupac
Ustredni ustav geologicky
Post. Schranka 85 PSC, PRAHA 1
118 21 Mala Strana, CZECHOSLOVAKIA

Dr. J. Dvorak
Ustredni ustav geologicky
Leitnerova 22
60200 Brno, CZECHOSLOVAKIA

Dr. Jiří Pešek
Dept. Geol. Min. Depos., Fac. Science
Charles University
128 43 Praha 2, CZECHOSLOVAKIA

Dr.Ing. G. Weiss
Bachmacska 23
Ostrava 1, CZECHOSLOVAKIA

EGYPT

Dr. Mahmond M. Kholief
Egyptian Petroleum Research Inst
Nasr City, 7th Region
Cairo, EGYPT

FED.REP.GERMANY

Dr. Z. Belka
Geol. Inst., Universität Tübingen
Sigwartstr. 10
D-7400 Tübingen, FED. REP. GERMANY

Dr. C.G. Brauckmann
Fuhlrott Museum
Auer Schulstrasse 20
D-5600 Wuppertal 1, FED. REP. GERMANY

Prof. Dr. G. Hahn
Inst. für Geologie und Paläontology
Philipps-Universität Marburg, Lahngerge
D-3550 Marburg, FED. REP. GERMANY

Dr. H.G. Herbig
Inst. Geologie, Freie Universität
Altensteinstrasse 34a
D-1000 Berlin 33, FED. REP. GERMANY

Dr. J. Kullmann
Geol. Inst., Universität Tübingen
Sigwartstr. 10
D-7400 Tübingen, FED. REP. GERMANY

Dr. Eva Paproth (B/T)
Schönwasserstr. 103
D-4150 Krefeld, FED. REP. GERMANY

Dr. A. Rabitz
Geol. Landesamt Nordrh.-Westfalen
Postfach 1080, de Greiff Str.195
D-4150 Krefeld, FED. REP. GERMANY

Dr. M. Von Sperber
WBK Westfal. Berggewerkschaftsk
Postfach 102749
D-4630 Bochum, FED. REP. GERMANY

Dr. D. Stoppel
Bundesanst. f. Geowissenschaften
Stilleweg 2, Postfach 510153
D-3000 Hannover, FED. REP. GERMANY

Prof. W. Ziegler
Senckenbergisches Museum
Senckenberganlage 25
6000 Frankfurt 1, FED. REP. GERMANY

FRANCE

Dr. A. Bouroz (T)
110 Avenue Felix Faure
F-75015 Paris, FRANCE

Dr. J. Coquel
UER Sci. de la Terre
Uni. Sci. Techn. de Lille
F59655 Villeneuve d'Ascq, FRANCE

Dr. J. Doubinger
Université L. Pasteur
1 rue Blessig
F67084 Strasbourg Cedex, FRANCE

Dr. G. Lachkar
Labor. Micropal., Univ.Paris VI
4 Place Jussieu
F-75230 Paris, FRANCE

Prof. J.P. Laveine (T)
Lab. Paléobot. UFR Sci.de la Terre
Univ. Sci. Techn.de Lille
F59655 Villeneuve d'Ascq, FRANCE

Dr. M. Legrand-Blain
Tauzia
Rte de Bayonne
F-33170 Gradigen, FRANCE

Dr. S. Loboziak
Lab. Paléobot, UER Sci. de la Terre
Univ. Sci. Techn. de Lille
F59655 Villeneuve d'Ascq, FRANCE

Dr. M. Lys
Lab. Géol. Historique, Fac. Sciences
Université Paris-Sud
F-91405 Orsay, FRANCE

Ms. M.F. Perret
Lab. Géol. Struct., Univ. Paul Sabatier
38 rue des 36 Ponts
F-31400 Toulouse, FRANCE

Dr. P. Semenof Tian-Chansky
Institut de Paléontolgie
8 Rue de Buffon
F-75005 Paris, FRANCE

Dr. M. Weyant (T)
Dept. Géologie
Univ. Caen Esplanade de la Paix
F-14032 Caen, FRANCE

HUNGARY

Dr. sc. Heinz Kozur
Rézeü u. 83
H-1029 Budapest, HUNGARY

IRELAND

Prof. G.D. Sevastopulo
Department of Geology
Trinity College
Dublin 2, IRELAND

JAPAN

Dr. Shuko Adachi
Institute of Geosciences
University of Tsukuba
Tsukuba, Ibaraki, JAPAN, 305

Dr. Masayuki Ehiro
Dept. Earth Sci, Fac. Gen. Education
Tohoku University
Sendai, JAPAN, 980

Mr. Y. Ezaki
Inst. Geol. & Mineral., Fac. Science
Hokkaido University
Kita-ku, Sapporo, JAPAN, 060

Dr. Y. Fujiwara
Inst .Geol. & Min., Fac. Science
Hokkaido University
Kita-ku, Sapporo, JAPAN, 060

Mr. T. Haikawa
Akiyoshi-dai Sci. Museum Nat. Hist
Akiyoshi, Shuho-cho
Yamaguchi, JAPAN, 754-05

Dr. T. Hamada
College of Arts & Sciences
University of Tokyo, Komaba
Tokyo, JAPAN, 153

Dr. Y. Hasegawa
Department of Earth Sciences
Niigata University
Niigata, JAPAN, 950-21

Dr. Hisaharu Igo
Dept. Earth Sciences
Tokyo Gakugei University
Koganei, Tokyo, JAPAN, 184

Dr. Hisayoshi Igo (B)
Institute of Geoscience
University of Tsukuba
Tsukuba, Ibaraki, JAPAN, 305

Dr. T. Ishibashi
Dept. Geol., Fac. Science
Kyushu University
Fukuoka, JAPAN, 812

Dr. K. Ishida
Dept. Earth Sci., Col. Gen. Educat.
Tokushima University
Tokushima, JAPAN, 770

Dr. H. Ishiga
Dept. Geol., Fac. Science
Shimane University
Matsue, Shimane, JAPAN, 690

Dr. K. Ishii
Inst. Geosci., Col. Liberal Arts
Kobe University
Kobe, JAPAN, 657

Dr. K. Ishizaki
Inst. Geol. & Paleont., Fac .Science
Tohoku University
Sendai, JAPAN, 980

Dr. Y. Isozaki
Dept. Geol. & Mineral., Fac. Science
Yamaguchi University
Yamaguchi, JAPAN, 753

Dr. Naruhhiko Kashima
Dept. Geol., Ehime University
3 Bunkyo-cho, Matsuyama
Ehime Pr., JAPAN, 790

Dr. M Kato
Dept. of Geology & Mineralogy
Fac. Science, Hokkaido University
Sapporo, JAPAN, 060

Dr. T. Kawamura
Department of Earth Sciences
Miyagi Univ. Education
Sendai, JAPAN, 980

Dr. M. Kawamura
Inst. Geol. & Mineral., Fac. Science
Hokkaido University
Kita-ku, Sapporo, JAPAN, 060

Dr. F. Kobayashi
Yanagikubo 2-6-4-1011
Higashikurume
Tokyo, JAPAN, 203

Dr. T. Koike
Dept. Geology
Yokohama National University
Yokohama, JAPAN, 240

Dr. K. Konishi
Dept. Earth Sci., Kanazawa Univ.
Marunouchi
Kanazawa, JAPAN, 920

Dr. N. Minoura
Inst. Geol. & Mineral., Fac. Science
Hokkaido University
Kita-ku Sapporo, JAPAN, 060

Dr. K. Mori
Inst. Geol. Paleont.
Tohoku University
Sendai, JAPAN, 980

Dr. M. Musashino
Dept. Earth Sciences, Kyoto Univ. Education
Kyoto, JAPAN, 612

Dr. K. Nagai
Dept. Geol., Fac. General Education
Kyushu University
Fukuoka, JAPAN, 810

Dr. K. Nakamura
Dept. Geology & Mineralogy
Fac.Sci., Hokkaido University
Sapporo, JAPAN, 060

Mr. T. Nakamura
Geol. Dept., Kokusai-Kogyo Co. Ltd
3-6-1 Asahigaoka, Hino-city
Tokyo, JAPAN, 191

Dr. K. Nakazawa
Koyama Shimouchikawara-cho 28-2
Kita-ku, Kyoto, JAPAN, 603

Dr. I. Niikawa
Dept. Earth Sci., Fac. Gen. Educat.
Niigata University
Niigata, JAPAN, 950-21

Mr. S. Niko
Dept. Earth Sci. & Astronomy
Col. Arts & Sci., Univ. Tokyo
Komaba, Tokyo, JAPAN, 153

Dr. T. Nishida
Dept. Earth Sci., Fac. Education
Saga University
Saga, JAPAN, 840

Dr. Yuji Okimura
Inst.Geol.Miner., Fac. Science
Hiroshima University
Naka-ku, Hiroshi, JAPAN, 730

Dr. M. Ota
Kitakyushu Museum Nat.History
Yahatahigashi-ku
Kitakyushu, JAPAN, 805

Dr. Tomowo Ozawa
Earth Science Inst., Nagoya Univ.
Furo-cho, Chikusa-ku
Nagoya, JAPAN, 464

Dr. Kimiyoshi Sada
Dept. Geol., Fac. Integ. Arts & Sci.
Hiroshima University
Hiroshima, JAPAN, 730

Dr. Y. Saito
National Science Museum
Hyakunin-chou, 3-23-1
Shinjuki-ku, Tok, JAPAN, 160

Dr. S. Sakagami
Dept. Earth Sci., Fac.Science
Chiba University
Chiba, JAPAN, 260

Dr. K. Sashida
Instute of Geosciences
University of Tsukuba
Tsukuba, Ibaraki, JAPAN, 305

Mr. A. Sugimura
Akiyoshi-dai Museum Nat.History
Akiyoshi, Shuho-cho
Yamaguchi, JAPAN, 754-05

Dr. T. Sugiyama
Dept. Geol., Fac. Science.
Fukuoka University
Jonan-ku, Fukuok, JAPAN, 814-01

Dr. K. Suyari
Tokushima University
Manjo-Mishima-chou
Tokushima, JAPAN, 770

Dr. K. Tachibana
Department of Geology
Iwate University
Uyeda 3, Morioka, JAPAN, 020

Dr. J. Tazawa
Dept. Earth Sci., Fac. Gen. Educat.
Niigata University
Niigata, JAPAN, 950-21

Dr. Ryuzo Toriyama
1-4-8 Nishijin, Sawara-ku
Fukuoka, JAPAN, 814

Mr. K. Watanabe
Shinjuki 1-12-12, OSK-601
Shinjuku-ku
Tokyo, JAPAN, 160

Dr. N. Yamagiwa
Dept. Earth Science
Osaka Kyoiku Univ., Tennoji-ku
Osaka, JAPAN, 543

Dr. Juichi Yanagida
Deptartment of Geology
Kyushu University
Fukuoka, JAPAN, 812

MALAYSIA

Dr. I. Metcalfe
Institute of Advanced Studies
University of Malaya
Kuala Lumpur 59100, MALAYSIA

NORWAY

Prof. R. Sinding-Larsen
IUGS Sec.Gen., Geological Survey
Leiv Eirikssons vei 39,POBox3006
N7001 Trondheim, NORWAY

PEOPLES REP.CHINA

Dr. Gao Lianda (T)
Institute of Geology
Chinese Acad. Geological Sciences
Beijing, PEOPLES REP.CHINA

Professor Guo Hongjun (T)
Changchun College of Geology
Changchun
Jilin, PEOPLES REP.CHINA

Dr. Li Xingxue (T)
Nanjing Inst. Geol. Paleont.
Academia Sinica, Chi-Ming-Ssu
Nanjing 210008 PEOPLES REP.CHINA

Dr. Ruan Yiping
Nanjing Inst. Geol. Paleont.
Academia Sinica, Chi-ming-ssu
Nanjing 210008 PEOPLES REP.CHINA

Dr. Yang Jingzhi
Nanjing Inst. Geol. Paleont.
Academia Sinica, Chi-ming-ssu
Nanjing, PEOPLES REP.CHINA

Professor Yang Shipu (T)
China University of Geosciences
Chengfu Lu
Beijing 100083 PEOPLES REP.CHINA

Dr. Yang Xilu (T)
Inst. of Geol. & Exploration
CCMRI, Coal Ministry, Xi'an
Shaanxi PEOPLES REP.CHINA

POLAND

Dr. S. Skompski
Inst. Geol., Warsaw Univ.
Al Zwirki i Wigury 93
PL.02089 Warszawa, POLAND

Dr. H. Zakowa
Panstwowy Inst. Geol., Oddziat
-Swietokrzyski, Slir Poczt.59
PL.25953 Kielce, POLAND

PORTUGAL

Dr. M.J. Lemos de Sousa
Min. Geol. Fac. Ciências
Praça Gomes Teixeira
Porto 4000, PORTUGAL

Dr. J.T. Oliveira
Servicos Geologicos de Portugal
rua da Academia d. Ciências 19,2
Lisboa 1200, PORTUGAL

SPAIN

Dr. A. Garcia Loygorri
Inst. Geol. y Minero de España
Rio Rosas 23
Madrid 3, SPAIN

L.F. Granados
EN ADARO Invest.Min.
Doctor Esquerdo 138
Madrid 28007, SPAIN

Dr. L.C. Sanchez de Posada
Depto. Geología, Univ. Oviedo
Arias de Velasco, s/n
Oviedo, SPAIN

Dr. E. Villa
Unidad de Geología
Facultad de Biología
Leon 24071, SPAIN

Dr. R.H. Wagner (T)
ENCASUR
Peñarroya-Pueblonuevo
(Córdoba), SPAIN

SWITZERLAND

Prof.Dr. J. Remane
Inst.de Geol.,Univ.de Neuchatel
11 rue Emile-Argand
Neuchatel 7 CH2000 SWITZERLAND

THE NETHERLANDS

Dr. M.J.M. Bless
Natuurhistorisch Museum
Bosquetplein 6-7, MAASTRICHT
6211 KJ, THE NETHERLANDS

Dr. M. Boersma
Lab. Palaeobotany & Palynology
Rijksuniversit., Heidelberglaan 2
3508 TC Utrech, THE NETHERLANDS

Dr. M. van den Boogaard
Nationaal Natuurhistorisch Museum
Postbus 9517
2300 RA Leiden, THE NETHERLANDS

Rijks Geologische Dienst
Geologisch Bureau
Postbus 126
6400 AC Heerlen, THE NETHERLANDS

Dr. G.E. de Groot
Nationaal Natuurhistorisch Museum
Postbus 9517
2300 RA Leiden, THE NETHERLANDS

Bibliotheek Palaeobot. Inst.
Lab. Palaeobotany & Palynology
Rijksuniversit., Heidelberglaan 2
3508 TC Utrech, THE NETHERLANDS

Subcommissie Stratig. Nederland
Nationaal Natuurhistorisch Museum
Postbus 9517
2300 RA Leiden, THE NETHERLANDS

Dr. C.F. Winkler Prins (T)
Nationaal Natuurhistorisch Museum
Postbus 9517
2300 RA Leiden, THE NETHERLANDS

UNITED KINGDOM

Dr. R.L. Austin
Department of Geology
University of Southampton
Southampton SO9 5NH, U.K.

Dr. C.J. Cleal
37 Lipscombe Close
Newbury
Berkshire RG14 5JW UNITED KINGDOM

Dr. J.W. Cowie
Chairman ICS, Dept.Geology
University of Bristol
Bristol BS8 1RJ UNITED KINGDOM

Acquisitions, Dept.Library Service
British Museum (Nat.Hist.)
Cromwell Road
London SW7 5BD UNITED KINGDOM

Dr. R.M.C. Eagar
23 High Bond End
Knaresborough
North Yorks HG5 9BT UNITED KINGDOM

Dr. A.C. Higgins
British Petroleum Res. Centre
Chertsey Rd, Sunbury-on-Thames
Middlesex TW16 7LN UNITED KINGDOM

Dr. G.A.L. Johnson
Department of Geology
University of Durham
Durham DH1 3LE UNITED KINGDOM

Mr. M. Mitchell
11 Ryder Gardens
Leeds, W.Yorks LS8 1JS
UNITED KINGDOM

Dr. B. Owens
British Geological Survey
Keyworth, Nottingham
NG12 5GG UNITED KINGDOM

Dr. W.H.C. Ramsbottom (T)
Brow Cottage
Kirkby Malzeard, RIPON
N.Yorks HG4 3RY UNITED KINGDOM

Dr. N. J. Riley
British Geological Survey
Keyworth, Nottingham
NG12 5GG, UNITED KINGDOM

Dr. A.R.E. Strank
British Petroleum Res. Centre
Chertsey Rd, Sunbury-on-Thames
Middlesex TW16 7LN UNITED KINGDOM

Dr. W.J. Varker
Department of Earth Sciences
The University of Leeds
Leeds LS2 9JT UNITED KINGDOM

U.S.A.

Dr John Aaron
Editor, Episodes
P.O. Box 919
Herndon, VA 22070, U.S.A.

Dr. John Baesemann
Amoco Research Center
P.O. Box 3385
Tulsa, OK 74102 U.S.A.

Dr. James W. Baxter
Illinois State Geological Survey
615 E. Peabody Drive
Champaign,IL 61820 U.S.A.

Dr. Paul Brenckle
Amoco Research Center
P.O. Box 3385
Tulsa,OK 74102 U.S.A.

Dr. D.K. Brezinski
Maryland Geological Survey
2300 St.Paul Street
Baltimore,MD 21218 U.S.A.

Dr. J.L. Carter
Carnegie Museum
4400 Forbes Ave.
Pittsburgh, PA 15213 U.S.A.

Dr. William C. Darrah
2235 Baltimore Pike
Gettysburg, PA 17325 U.S.A.

Serials Department
Univ. of Illinois Library
1408 West Gregory Drive
Urbana,IL 61801 U.S.A.

Dr. J.T. Dutro Jr (T)
U.S. Geological Survey
Rm E-311, Museum Natural History
Washington, DC 20560 U.S.A.

Dr. Kenneth J. Englund
U.S. Geological Survey
956 National Center
Reston,VA 22092 U.S.A.

Prof. F.R. Ettensohn
Department of Geology
University of Kentucky
Lexington, KY 40506 U.S.A.

Dr. Robert Gastaldo
Dept Geology, Auburn University
210 Petrie Hall
Auburn, AL 36849-530 U.S.A.

Mr. William H. Gillespie
US Geological Survey
916 Churchill Circle
Charleston, WV 25314 U.S.A.

Dr. Brian F. Glenister
Department of Geology
University of Iowa
Iowa City, IA 52242 U.S.A.

Dr. Mackenzie Gordon Jr. (T)
U.S. Geological Survey
Rm E-501, Museum Natural History
Washington, DC 20560 U.S.A.

Dr. J. R. Groves
Amoco Production Company
P. O. Box 800
Denver, CO 80201 U.S.A.

Dr. Thomas W. Henry
U.S. Geological Survey
Denver Federal Center, MS 919
Denver, CO 80225 U.S.A.

Dr. A.S. Horowitz
Department of Geology
Indiana University
Bloomington, IN 47405 U.S.A.

Dr. R.M. Kosanke (T)
U.S. Geol. Survey, Fed.Center
Bldg 25, Box 25046 M.S. 919
Denver, CO 80225 U.S.A.

Dr. Lance Lambert
Department of Geology
University of Iowa
Iowa City, IA 52242 U.S.A.

Dr. H. Richard Lane (WGC)
Amoco Production Co.USA
501 Westlake Park Blvd,Rm 16.162
Houston, TX 77079 U.S.A.

Dr. Ralph L. Langenheim
Dept. Geol., Univ. of Illinois
254 N.B.H., 1301 W. Green St.
Urbana, IL 61801 U.S.A.

Dr. Richard Lund
Department of Biology
Adelphi University
Garden City, NY 11530 U.S.A.

Dr. W.L. Manger
Department of Geology
Univ. of Arkansas
Fayetteville, AR 72701 U.S.A.

Dr. Gene Mapes
Department of Botany
Ohio University
Athens, OH 45701 U.S.A.

Dr. Hermann W. Pfefferkorn
Dept. Geol., Univ. Pennsylvania
240 S 33rd St.
Philadelphia, PA 19104-631 U.S.A.

Dr. Carl B. Rexroad
Indiana Geological Survey
611 N. Walnut Grove
Bloomington, IN 47405 U.S.A.

Dr. C.A. Ross
Chrevon U.S.A. Inc., P. O. Box 1635
Houston, TX 77251 U.S.A.

Dr. June R.P. Ross
Department of Biology
Western Washington University
Bellingham, WA 98225 U.S.A.

Dr. C.A. Sandberg
U.S. Geological Survey
Box 25046, MS 940,Federal Center
Denver, CO 80225 U.S.A.

Dr. W.J. Sando
U.S.Geological Survey
Rm E-501, Museum Natural History
Washington, DC 20560 U.S.A.

Alexander Sartwell, Librarian
Geological Survey of Alabama
P.O.Drawer 0, University Station
Tuscaloosa, AL 35486 U.S.A.

Dr. W. Bruce Saunders
Geology Department
Bryn Mawr College
Bryn Mawr, PA 19010 U.S.A.

Dr. B. Skipp
U.S. Geol. Survey, Box 25046,
M.S. 913, Denver Fed.Center
Denver, CO 80225-004 U.S.A.

Dr. C.H. Stevens
Dept. Geology, School of Science
San Jose State University
San Jose, CA 95192-010 U.S.A.

Prof. P.K. Sutherland (T)
School of Geology & Geophysics
University of Oklahoma
Norman, OK 73069 U.S.A.

Prof. T.N. Taylor
Botany, Ohio State Univ.
1735 Neil Ave.
Columbus, OH 43210 U.S.A.

Dr. T.L. Thompson
Missouri Geological Survey
Box 250
Rolla, MO 65401 U.S.A.

Dr. Keith Watts
Dept. Geol. & Geophysics
University of Alaska
Fairbanks, AK 99775 U.S.A.

Dr. Gary Webster
Department of Geology
Washington State University
Pullman, WA 66506 U.S.A.

Prof. R.R. West
Dept.Geol., Thompson Hall
Kansas State University
Manhattan, KA 66506 U.S.A.

U.S.S.R.

Dr. K.A. Astafieva
Museum Zemlevedenya, Moskovsk.-
Gosud.Univ., Leninskie Gory
117234 Moskva, U.S.S.R.

Prof. I.S. Barskov
Moskovsk. Gosud. Univ.
Leninskie Gory
117234 Moskva, U.S.S.R.

Dr. T.N. Belskaja
Paleont. Inst. AN USSR
Profsoyuznaya ul. 113
117321 Moskva, U.S.S.R.

Dr. F.R. Bensh
Inst. Geol. Geokhim
ul. Sulejmanovoj 33
700087 Tashkent, U.S.S.R.

Dr. O.I. Berchenko
Inst. Geol. Nauk AN USSR
ul. Chkalova 55b
252054 Kiev, U.S.S.R.

Dr. O.A. Betekhtina
Inst. Geol. Geofiz. Sib. Otdel.
AN SSSR
630090 Novosibirsk, U.S.S.R.

Dr. B.I. Bogoslovskaya
Paleont. Inst. AN USSR
Profsoyuznaya ul. 113
117321 Moskva, U.S.S.R.

Mrs. O.I. Bogush
Inst. Geol. Geofiz. Sib. Otdel.
AN SSSR
630090 Novosibirsk, U.S.S.R.

Dr. T.V. Byvsheva
V.N.I.G.N.I.
Shosse Entusiastov 36
105275 Moskva, U.S.S.R.

Dr. V.A. Chernnykh
Inst. Geol., Komi Scientif. Centre
ul. Kommunisticheskaya 24
167610 Syktyvkar, U.S.S.R.

Dr. G.E. Chernyak
Sev. Mor. Geol.
nab. Mojki 120
190121 Leningrad, U.S.S.R.

Dr. V.A. Chigova
V.N.I.I.
I Dmitrovskij proezd 10
125422 Moskva, U.S.S.R.

Dr. Marina Durante
Geol. Inst. AN USSR
Pyzhevsky per. 7
109017 Moskva, U.S.S.R.

Dr. A.V. Durkina
Ukhtim. Temat. Eksp.
ul. Pushkina 2
169400 Uchta, K.ASSR, U.S.S.R.

Prof. O.L. Einor (T)
Geol. Dept., Kiev Univ.
Vasilkovskaya Str., 42-33
252022 Kiev, U.S.S.R.

Dr. O.P. Fissunenko
Pedagog. Inst.
Oboronnaja 2
348011 Voroshilovgrad, U.S.S.R.

Dr. V.G. Ganelin
V.S.E.G.E.I.
Sredni pr. 74
199026 Leningrad, U.S.S.R.

Mrs. S.G. Gorelova
S.N.I.I.G.G.I.M.S.
Krasny pr. 67
630104 Novosibirsk, U.S.S.R.

Dr. M.I. Graiser
Geol. Inst. AN USSR
Pyzhevsky per. 7
109017 Moskva, U.S.S.R.

Dr. V.S. Gubareva
V.N.I.G.N.I.
Shosse Entusiastov 36
105275 Moskva, U.S.S.R.

Dr. N.P. Ilyukhina
V.S.E.G.E.I.
V.O. Sredny pr. 74
199026 Leningrad, U.S.S.R.

Dr. R.M. Ivanova
Inst. Geol.., Pochtovyj per. 7
Sverdlovsk, U.S.S.R.

Dr. N.V. Kalashnikov
Inst.Geol.,Komi Scientific Cent.
Uralian Branch,Acad.Science USSR
167610 Syktyvkar, U.S.S.R.

Dr. L.I. Kononova
V.N.I.G.N.I.
Shosse Entusiastov 124
105275 Moskva, U.S.S.R.

Dr. M.V. Konovalova
VNIGRI TPO
ul. Pushkina 2
169400 Ukhta, U.S.S.R.

Dr. R.I. Kozitskaya
Inst. Geol. Nauk AN USSR
ul. Chkalova 55b
252054 Kiev, U.S.S.R.

Dr. S.S. Lazarev
Paleontol. Inst.
Profsoyuznaya ul. 123
117321 Moskva, U.S.S.R.

Dr. M.K. Makhlina
T.G.U.Ts.R.
2 Roshchinskaya ul. 10
M 191 Moskva, U.S.S.R.

Mrs. M.M. Marfenkova
Inst. Geol. Nauk
Kalinina 69A
480100 Alma Ata, U.S.S.R.

Dr. Ye. V. Movshovich
P.O. Box 1462
344091 Rostovna Donu 91, U.S.S.R.

Dr. T.I. Nemirovskaya
Inst. Geol., Ukrainian Acad. Sci.
ul. Chkalova 55b
252054 Kiev 54, U.S.S.R.

Mrs. M.V. Oshurkova
V.S.E.G.E.I.
Sredni pr. 74
199026 Leningrad, U.S.S.R.

Dr. V.I. Poletaev
Inst. Geol. Nauk AN USSR
ul. Chkalova 55b
252054 Kiev, U.S.S.R.

Prof. A.V. Popov
Leningrad University
16 Linia, 29
199178 Leningrad, U.S.S.R.

Prof. M.V. Postoyalko
Geol. Upravl. U.K.S.E.
ul. Vajnera 55
Sverdlovsk, U.S.S.R.

Dr. B.V. Poyarkov
Yaroslavl Pedagogic Institute
ul. Respublikanskaja 108
150000 Yazoslavl, U.S.S.R.

Dr. M.I. Radchenko
Inst. Geol. Nauk
Kalinina 69a, Alma Ata
480100 Alma Ata, K.SSR, U.S.S.R.

Dr. E.A. Reitlinger (T)
Geological Inst. AN USSR
Pyzhevsky per. 7
109017 Moskva, U.S.S.R.

Dr. Z.S. Rumyantseva
Geol. Fak. Kafedra Paleont
ul. Vasilovskaja 90
252022 Kiev, U.S.S.R.

Mrs. M.F. Schestakova
Politechnical Institute
Komsomolskiy Avenue 29a
614600 Perm, U.S.S.R.

Dr. A.K. Shchegolev
Inst. Geol. Nauk AN USSR
ul. Chkalova 55b
252054 Kiev, U.S.S.R.

Dr. O.A. Shcherbakov
Polytechnical Institute
Komsomolskiy Avenue 29a
614600 Perm, U.S.S.R.

Dr. M.V. Shcherbakova
Polytechnical Institute
Komsomolskiy Avenue 29a
614600 Perm, U.S.S.R.

Dr. K.V. Simakov
N.E .Inter. Sci. Res. Inst., Far East
USSR Acad. Sciences, Portovajy 16
685005 Madagan, U.S.S.R.

Dr. M.N. Solovieva (T)
Geological Inst. AN USSR
Pyzhevsky per. 7
109017 Moskva, U.S.S.R.

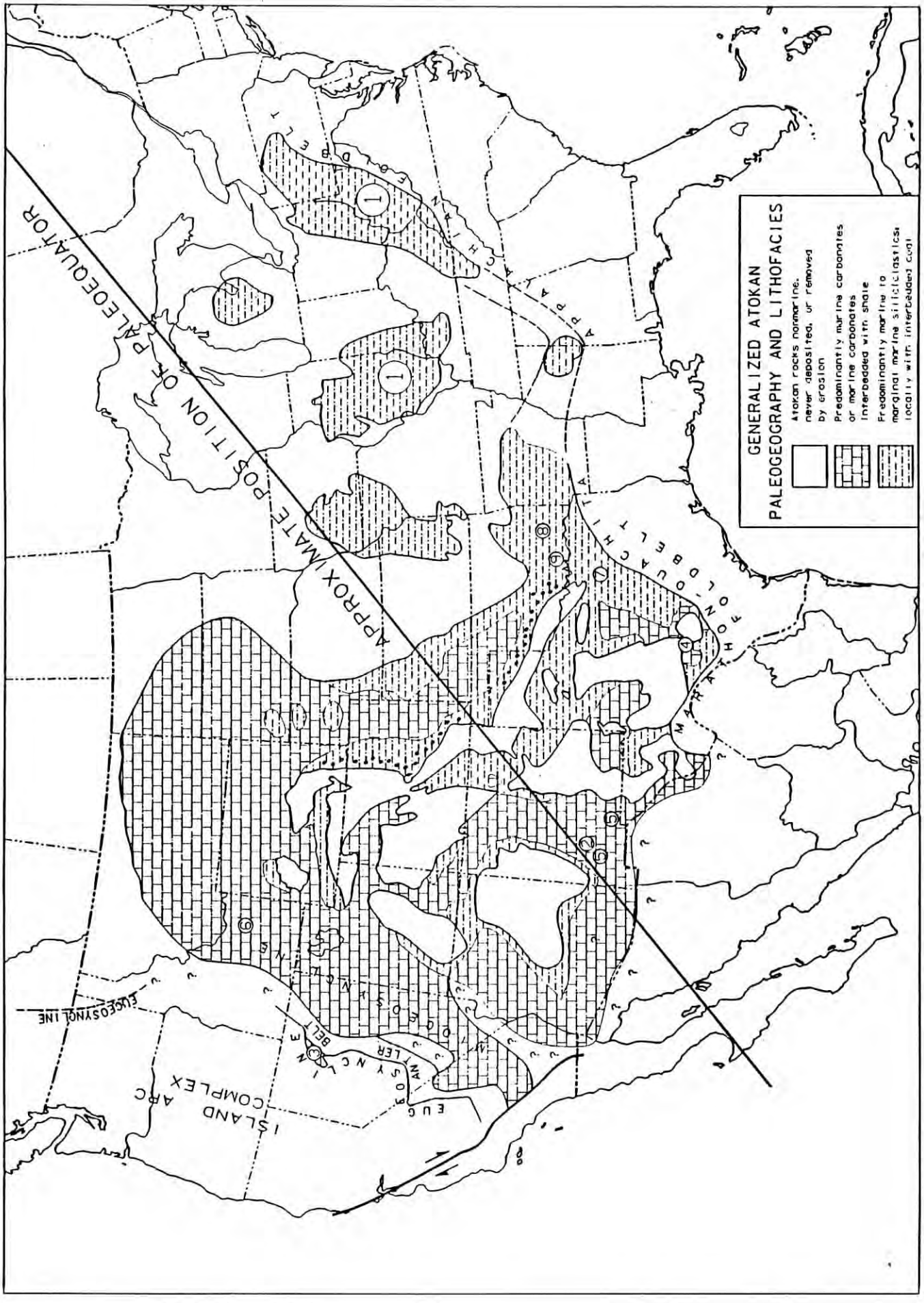
Dr. V.K. Teteryuk
Tehern. Otd. Urz. Nigri
ul. Tehozsa, 8
250000 Tchezmgol, U.S.S.R.

Dr. N.P. Vassiljuk
Donetskij Politekhn. Inst.
ul. Artema 58
Donets, U.S.S.R.
Mrs. M.V. Vdovenko
Inst. Geol. Nauk AN USSR
ul. Chkalova 55b
252054 Kiev, U.S.S.R.

Mrs. N.G. Verbitskaya
V.S.E.G.E.I.
V.O. Sredny pr. 72b
199026 Leningrad, U.S.S.R.

Mrs. G.P. Zolotukhina
V.N.I.I.N.G.
ul. Lenina 96
400085 Volgograd, U.S.S.R.

YUGOSLAVIA

Prof. A. Ramovs
Askerceva 12
YU-610 Ljubljana, YUGOSLAVIA

Atokan paleogeographic reconstruction to accompany the paper "Recent Advances in Atokan Biostratigraphy" by John R. Groves (See page 15).