



SCCS

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

Dr. Eva Paproth, Chairman

Dr. B. A. Engel, Secretary & Vice-Chairman

Dr. Hisayoshi Igo, Associate Secretary

Newsletter on Carboniferous Stratigraphy Number 7 (October, 1989)

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

Table of Contents

1.0 Messages from the Chair	1
2.0 Annual Report of the Subcommittee on Carboniferous Stratigraphy, 1988	2
2.1 Subcommittee Objectives	2
2.2 Membership and Officers	2
2.3 National, Regional, Global Support	2
2.4 Interface with Other International Projects	3
2.5 Accomplishments of 1987-88	3
2.6 Publications 1987-88	3
2.7 Work Plan For 1989	4
2.8 Donations by S.C.C.S. Members	4
2.9 Progress Report on Volume III of "The Carboniferous of the World"	4
3.0 Subcommittee Financial Report	
Statement of Income and Expenditure 1987-88	5
Budget estimates and Grant for 1989	5
4.0 S.C.C.S. Ballot Results	6
4.1 Titular Ballot 1: Subdivision of the Carboniferous System	6
4.2 Titular Ballot 2: West European Regional Stratigraphic Classification	7
5.0 An Outline History of the I.U.G.S. Subcommittee on Carboniferous Stratigraphy: Achievements & Objectives (Wagner)	9
6.0 S.C.C.S. Field and General Meeting, Utah-Nevada, September 1989	13
General Meeting, Provo, Utah, September 25-26, 1989	13
Field Meeting, Utah and Nevada, September 27-30, 1989	14
7.0 XII International Carboniferous Congress - Buenos Aires, 1991	17
Congress Program	17
Excursions	17
Response to the First Circular	17
List of Provisional Registrants (to August 6, 1989)	17
International Commission of Coal Petrology: 43rd Annual Meeting	8
Meeting of the I.C.C. Permanent Committee	12
8.0 Working Group Reports	18
8.1 Working Group on the Devonian-Carboniferous Boundary (Paproth)	18
8.2 Working Group on the Mid-Carboniferous Boundary (Lane & Higgins)	19
8.3 Working Group on the Middle Pennsylvanian of North America (Sutherland)	20
8.4 Working Group on the Upper Pennsylvanian (Kosanke)	21
8.5 Working Group on Carboniferous Studies in China (Yang Shipu)	21
8.6 Carboniferous Geology and Paleontology of Brazil (Rocha-Campos)	21
9.0 I.G.C.P. Project Reports	23
9.1 Project 211: Late Paleozoic of South America - Activities, 1983-1988 (Amos)	23
9.2 Project 211: Late Paleozoic of South America - 5th Meeting in Chile (Archangelsky)	26
9.3 Project 211: Late Paleozoic of South America - 6th Meeting in Brazil (Archangelsky)	26
9.4 Project 272: Late Paleozoic and Early Mesozoic Circum-Pacific events (Dickins)	27
National Committee of Geology in Colombia (Valdiri)	12
10.0 Contributions by S.C.C.S. Members	28
10.1 Australian Studies	28
10.1.1 Possible younger Carboniferous rocks and faunas in eastern Australia (Waterhouse)	28
10.1.2 Zircon dating of the Late Palaeozoic of Australia (Roberts)	28
10.2 Canadian Studies	29
10.2.1 Carboniferous floral studies (Zodrow)	29
10.2.2 Canadian palynological studies (Utting)	30
10.2.3 Carboniferous-Permian basin analysis in the Canadian Arctic (Beauchamp)	30
10.2.4 Larger foraminifera from the Canadian Arctic (Mamet)	30
10.2.5 Small foraminifera of the Carboniferous and Lower Permian, Sverdrup Basin (Pinard)	30
10.2.6 Foraminiferal studies (Danner)	31
11.0 Service Announcements	32
Coal-bearing formations of Czechoslovakia (book for sale)	31
11.1 European maps for sale	32
11.2 Upper Palaeozoic Palaeobotanical Meeting Notice	32
APPENDIX: S.C.C.S. Membership mailing list	1-1 to 1-6

NEWSLETTER ON CARBONIFEROUS STRATIGRAPHY

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

VOLUME 7 OCTOBER 1989

1.0 MESSAGES FROM THE CHAIR

Retiring Chairman - Dr. W.H.C. Ramsbottom

The years since 1981, when I first became Chairman have been active ones for the Subcommittee. Because of the cooperation of many colleagues we have made a little progress, but there is need to maintain this momentum if we are to achieve our aims (see this Newsletter, p.2) within a reasonable time.

My last duty as Chairman was to attend the meeting of the Commission on Stratigraphy held in Washington, D.C., during the International Geological Congress in July 1989 (the membership of the Commission comprises the Chairmen of each of the Subcommittees, but the meetings are open to others). I gave a brief account of the Carboniferous Subcommittee and its activities since 1981. A few interesting points emerged in the discussion afterwards. There seemed to be no worries about our proposal to categorise the two halves of the Carboniferous as Subsystems. With regard to the names we give to the new "upper" and "lower" Carboniferous divisions, the view was expressed that we should call them simply Upper and Lower Carboniferous rather than using such geographical terms as Pennsylvanian and Mississippian, and this opinion received some support. The matter is only one of those passed to our new Chairman. I would like to congratulate her on her election, and to hope that she enjoys the same enthusiastic support that I have had.

W. H. C. Ramsbottom

Editor's note: This issue was held back from the usual mid-year publication date in order to incorporate a short report on the Field and General Meeting which was held in Utah and Nevada in September/October 1989.

Incoming Chairman - Dr. Eva Paproth

First of all - my sincere thanks to the Subcommittee members for entrusting me with the office of Chairman. I shall try my best to follow the example set by my eminent predecessors in serving the Subcommittee's aims.

The ultimate object of all stratigraphic research is correlation. Only with experience can a distinction be made between "good" and "bad" correlation features and characters, and it is not unusual that ones which are "good" at first sight turn out to be the really "bad" ones in the long run and vice-versa. Thus correlation must govern all our scientific endeavours.

Most importantly, stratigraphy is a discipline designed to serve the needs of all sectors of our profession. It therefore must be both precise and unambiguous.

Carboniferous rocks are distinguished from those of many other systems by their richness in minerals, in particular both coal and hydrocarbon resources. For local and regional exploration and exploitation purposes biostratigraphic, seismostratigraphic, lithostratigraphic, chronostratigraphic and other subdivisions have been devised. It is not the office of the Subcommittee to interfere with these excellent local and regional subdivisions which are marked by particular facies influences, but it is the already demonstrated role of the Subcommittee to draw upon this local knowledge and experience and apply it to the global chronostratigraphic framework in which the local and regional stratigraphic subdivisions may find their place.

Since its foundation in Heerlen in 1958, this Subcommittee has tried to improve both stratigraphic correlation and subdivision and to establish a global chronostratigraphic framework. Over a long period of positive and negative experiences we should have learnt to be prudent. All of us, I am sure, are determined to come to a practical global scheme in the near future; work is now in progress, as has been demonstrated at the recent Provo/Las Vegas Field and General Meeting. It may be a good omen that, at last, the base of the Carboniferous System has now been formally defined.

Eva Paproth

2.0 ANNUAL REPORT OF THE SUBCOMMISSION ON CARBONIFEROUS STRATIGRAPHY, 1988

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 Subcommittee 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 Subcommittee forms an integral part of the statutory objective of ICS to develop a standard global stratigraphic scale, including its subdivisions, major boundaries and correlation criteria.

2.2 MEMBERSHIP AND OFFICERS

Membership in 1988 consisted of four Bureau Officers, 27 Titular Members of which three are Working Group Chairmen, and a Corresponding Membership of 340. The Subcommittee has recently revised its membership list with all those on the 1988 list being requested to confirm in writing if they wished to continue their membership. Based on returns received, the total Corresponding Membership has now been reduced to approximately 200 although this may rise when this Newsletter is released.

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 Subcommittee midway between Congresses.

Officers to June 1989

CHAIRMAN - Dr. W.H.C. Ramsbottom, Brow Cottage, Kirkby Malzeard, Ripon, N.Yorks HG4 3RY England, U.K.

VICE-CHAIRMAN - Dr. R.H. Wagner, ENCASUR, Peñaroya-Pueblonuevo, (Córdoba), Spain.

SECRETARY - Dr. B.A. Engel, Department of Geology, University of Newcastle, N.S.W. 2308 Australia.

ASSOCIATE SECRETARY - Dr. Hisayoshi Igo, Institute of Geoscience, University of Tsukuba, Ibaraki 305 Japan.

Elections

Dr. Ramsbottom and Dr. Wagner will step down from their respective offices in July 1989, coincident with the International Geological Congress in Washington, DC. As a result, nominations for the position of Chairman were called for and a secret ballot of Titular/Bureau Members took place in January 1989, when Dr. Eva Paproth was chosen as Chair-elect from a field of three candidates. Subject to the formal ratification of this election, Dr. Paproth will initially serve for a four year term from July 1989. The current Secretary and Associate Secretary, having been in office for less than a full term, will continue in those positions. With this election, the Subcommittee will revert to its former practice of having the Secretary act as Vice-Chairman for those meetings which the Chairman is unable to attend.

The membership wishes to place on record its sincere appreciation of the major contribution made by Dr. Ramsbottom and Dr. Wagner, both of whom have provided strong leadership to the Subcommittee over a very long period. It is expected that their support will remain undiminished in their continuing role as Titular Members.

2.3 NATIONAL, REGIONAL, GLOBAL SUPPORT

The Subcommittee has an international membership in which national allegiances are not stressed. Titular Membership including Chairmen of Working Groups is drawn from the following regions:

- Eastern Europe/Siberia (4);
- Western & Central Europe (7);
- North Africa (1);
- North America (7);
- South America (2);
- Peoples Republic of China (5);
- Japan (-), (+Assoc.Secretary);
- Australia (1), (+Secretary).

Vacancies currently exist for representatives from Japan and Angola to replace the late Prof. Minato and late Dr. Meyen. Elections will be held later this year to fill these vacancies.

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

2.4 INTERFACE WITH OTHER INTERNATIONAL PROJECTS

SCCS has an interface with IGCP Project 211: Late Palaeozoic of South America. The 1986 Field and General Meeting was held in Argentina in conjunction with this Project. Close cooperation also exists with the Devonian-Carboniferous and Carboniferous-Permian Boundary Working Groups. Informal contact is also maintained with a number of other IGCP Projects.

2.5 ACCOMPLISHMENTS OF 1987-88

The Carboniferous Newsletter (No.6, July 1988) was re-established after a break of some years. It documents the principal achievements of the Subcommittee during the period 1987-88. Important developments included:

(I) XI Carboniferous Congress, Beijing, 1987 (Newsletter 6, p.8-10).

The Subcommittee would like to record its sincere thanks to the Chinese Organizing Committee for presenting a most successful XI Carboniferous Congress during which we were given the opportunity to examine many excellent exposures of the Carboniferous sequence in China. Publications associated with the Congress have added materially to the literature dealing with this vast region.

(II) Restructuring Of Subcommittee Working Groups (Newsletter 6, P.3-4,13).

Reorganisation of the Working Groups was achieved by Chairman Ramsbottom by shifting the focus from numerous regional groups to three major categories, namely the mid-Carboniferous Boundary Working Group, and two new as yet *ad hoc* International Groups dealing with "lower" and "upper" Carboniferous Subdivision. Chairmen of previous regional groups have the choice to continue or disband their groups as they wish. Further details of the re-structuring are given in the work plan for 1989.

(III) Decisions taken by the Titular Membership (Newsletter 6, p.11-15).

At the General Meeting of SCCS held on September 1, 1987 at the Carboniferous Congress in Beijing, Chairman Ramsbottom raised the question of the subdivision of the Carboniferous. He reviewed briefly the history of the consensus which had been reached on the selection of a mid-Carboniferous Boundary and the activity of the current Working Party under the Chairmanship of Dr. H.R. Lane to designate a stratotype section.

Discussion then ensued on the desirability of bipartite or tripartite subdivision of the Carboniferous System, using the mid-Carboniferous Boundary as one of the datum horizons. All written and oral responses at the meeting supported the bipartite division, resulting in the acceptance of the motion that "primary subdivision of the Carboniferous be into two and not three divisions and that the boundary between the two divisions be taken at the level selected at Madrid for the mid-Carboniferous Boundary". After ex-

tensive favourable discussion the non-binding vote of those members present resulted in 36 For; none Against; with 2 Abstentions.

A subsequent meeting of the Titular Membership of SCCS was held on September 3, 1987 at which there were 16 of the 29 voting members present. Chairman Ramsbottom reviewed the events of the previous meeting of SCCS members and opened discussion on the matter noting that the final disposition of the subdivision question would be based on a postal ballot of all voting members. Discussion followed on the desirability of a bipartite system comprised of two Subsystems and the appropriate naming of such units. With the naming matter being set aside, the vote for a bipartite subdivision was taken with 13 in favour and 3 abstentions. A consequential motion from the floor that the two subdivisions be called Subsystems was passed 16 in favour and 0 against.

By postal ballot, the Titular/Bureau membership subsequently cast definitive votes on the issues involved, the details of which are documented in this Newsletter. With the substantial vote in favour of these proposals, it is expected that ratification of the decisions by ICS/IUGS will follow shortly. The Subcommittee will then need to press on with the definition of boundary stratotypes, with the matter of global stratotype sections and points (GSSP) to be considered.

2.6 PUBLICATIONS 1987-88

Principal publications sponsored by the Subcommittee and the XIth Carboniferous Congress are listed in Newsletter 6 (p.5-6,8-10).

Of special note was "*Carboniferous of the World*", Volume 2, a copy of which was presented to the Official Congress Ceremony. SCCS is most indebted to the editorial team who have produced the first two volumes and who are progressing as fast as possible with the remainder of the five volume series. Members who have not yet expressed their support in a tangible way are reminded that Volumes 1 and 2 can be obtained from EPISODES SECRETARIAT, 601 Booth St., Room 177, Ottawa, Ontario K1A 0E8, Canada. Individual requests may also be directed to Mr. L.F. Granados, ENADIMSA, Doctor Esquerdo 138, 28007 Madrid, Spain. The moderate price of these volumes makes it possible for members to have copies on their personal and institutional library shelves.

- Volume 1 (China, Korea, Japan, SE Asia) US\$30 (incl.post)
- Volume 2 (Gondwana countries, North Africa) US\$50 (incl.post)

Papers issued by the mid-Carboniferous Boundary Group and those arising from the Field and General Meeting in Argentina, 1986 form valuable additions to our knowledge of the Carboniferous.

2.7 WORK PLAN FOR 1989

Consequent upon the restructuring of the Subcommittee in Beijing, two new Working Groups were formed - one each on International "lower" and "upper" Carboniferous subdivision, for which the respective Chairmen elected were Dr. Paul Brenckle and Dr. C.F. Winkler Prins. Each was charged with the responsibility of organising a Working Group to evaluate potential boundaries which could provide further subdivision of their respective subsystems. Once suitable boundaries were identified, these committees would be dissolved and new Working Groups formed to investigate each particular boundary (see Chairmen's reports, Newsletter 6, p.16,19).

It is expected that the Field and General Meeting to be held in Provo, Utah and Nevada on September 24-30, 1989 will provide a forum for progress reports from each of the Working Groups as well as the field inspection of a potential North American mid-Carboniferous boundary stratotype. (Newsletter 6, p.2-3). This meeting will draw a large group of interested members and will represent the major event for SCCS in 1989. This Newsletter (7) has been held back from release until the report of this meeting could be included.

2.8 DONATIONS BY S.C.C.S. MEMBERS

The following donations have been received from SCCS Members in 1988 and 1989:

Dr. J. W. Baxter, U.S.A.	US \$100.00
Dr. P. Brenckle, U.S.A.	US \$ 25.00
Dr. J. L. Carter, U.S.A.	US \$ 50.00
Dr. K. J. Englund, U.S.A.	US \$ 25.00
Dr. Hisayoshi Igo, Japan	US \$ 71.55
Dr. K. Ishizaki, Japan	AUS \$ 40.00
Dr. T. B. H. Jenkins, Australia	AUS \$ 10.00
Dr. P. J. Jones, Australia	AUS \$ 20.00
Dr. N. Kashima, Japan	US \$ 20.32
Dr. H. W. Pfefferkorn, U.S.A.	US \$ 20.00
Drs. C.A. & J.R.P. Ross, U.S.A.	US \$ 22.00
Dr. S. Sakagami, Japan	US \$ 8.13
Dr. R. R. West, U.S.A.	US \$ 10.00
Dr. E. L. Zedrow, U.S.A.	US \$ 50.00
Anonymous, Argentina	US \$ 10.00
Anonymous, Fed. Rep. of Germany	US \$ 20.00
Anonymous, France	US \$100.00
Anonymous, France	US \$ 12.00
Anonymous, United Kingdom	AUS \$240.00
Anonymous, U.S.A.	US \$ 25.00

In the Newsletter 6, July 1988, a general request was made to members of SCCS to consider making donations to the Subcommittee in order to expand the limited support which ICS is able to provide by way of subsidy. To date, the above members have responded to this request by giving generously (US\$742 - US\$323 in 1988 and a further US\$494 in 1989). Without this support, the Subcommittee would have been in deficit on its operations for both years. It is hoped that more members will respond to the plea for financial assistance during 1990.

At present we are fortunate to have a small cash surplus which accrued mainly during the lengthy interval between the last two Newsletters. With recent increases in both postal and printing charges in Australia this buffer will not support us for more than about two years after which further donations will become mandatory. As Secretary, may I extend my personal thanks to those donors who have kept the organisation financial.

2.9 PROGRESS REPORT ON VOLUME III of *The Carboniferous of the World*

The editors have used the northern summer holidays to get together in congenial surroundings and continue the onerous task of coordinating the various chapters handed in over the years by the different (and quite numerous) contributors. Most of the effort has been devoted to the large amount of material provided by the contributors from the USSR. The hundreds of pages of text, figures and plate explanations have been checked and corrected with regard to the English language which has posed many problems, probably because the original papers in Russian were translated by non-geologists. Editing has therefore become more arduous than is normally the case. The redrafting of text figures also required a major effort, particularly when large size tables had to be reorganised for publication in several different parts, more suited to the format of double pages.

However, the end of this part of the editing is getting closer and the editors hope to have Volume III at the printers before the end of 1989. The contributors have been requested to give urgent attention to the queries raised by the editors so that the last details may be dealt with during the next few months. The contents of Volume III include:

- Introduction
- Introduction to USSR
- European part of USSR
- Tianshan and Pamirs
- Kazakhstan
- Angaraland & surrounding marine basins
- Mongolia
- Turkey
- Stable Middle Eastern Platform
- Iran
- Afghanistan

3.0 SUBCOMMISSION FINANCIAL REPORT

STATEMENT OF INCOME AND EXPENDITURE 1987-88

INCOME (US\$)

Balance brought forward from 1987	1077.30
IUGS Allocation for 1988 (US\$)	450.00
Donations of members	323.00
TOTAL INCOME	1850.30

EXPENDITURE (US\$)

Stationery Expenditure

Envelopes	24.96
Computer/A4 paper	29.04
Computer Labels	9.60
	63.60

Printing Costs

Letterheads	9.60
Photocopies	6.88
Laserprint Proofs	6.40
Newsletter (400 copies)	195.68
Computer disks/ribbon	40.00
	258.56

Postal Charges

Nov., 1987	15.44
Dec., 1987	1.60
Mch., 1988	24.38
May, 1988	2.40
Jun., 1988	0.80
Jul., 1988	30.02
Aug., 1988	167.72
Sep., 1988	2.19
Oct., 1988	14.72
	259.27

Secretarial Expenses

Part-time typing costs (15 hours @ AUS\$10)	120.00
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Miscellaneous Expenses

Cheque Book	2.40
Bank Charges	0.58
	2.98

TOTAL EXPENDITURE	704.41
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BALANCE SHEET:

Balance brought forward from 1987	\$ 1077.30
PLUS Total Income 1987-1988	\$ 773.00
LESS Expenditure 1985-88	\$ 704.41
CREDIT balance carr. forward to 1989	\$1145.89

EXPLANATORY NOTES:

(a) All AUS\$ income and expenditure has been converted where appropriate to US\$ at a standard exchange rate of AUS\$1.00=US\$0.80.

(b) The operating surplus for 1987-88 operations of US\$68.59 (\$773.00 - \$704.41) would have been a deficit without generous donations from members of the Subcommittee. In addition the cost of postage for the Newsletter has been subsidised with some postal costs being absorbed by various National organisations.

BUDGET ESTIMATES FOR 1989

ITEM	COST (US\$)
1. Printing	
Letterheads (1 ream)	\$ 18
Circular (350 copies)	\$ 20
Newsletter (250 x 20 pages)	\$ 96
2. Stationery	
Paper, computer address labels	\$ 72
Envelopes for circular, reports	\$ 36
3. Postage Costs	
Bureau letters (20g air @ \$1)	\$ 45
Postal ballot Tit. Mem. (30g @ \$1.50)	\$ 34
Circular (250 x 20g surface @ 0.64)	\$ 123
Newsletter (250 x 250g surface @ \$1.50)	\$ 300
4. Part-Time Typing Assistance	
Bureau typing (15 hours @ AUS\$10)	\$ 120
Secretarial support for "Carboniferous of The World", Vol. 3	\$ 200
Secretarial support for the Mid-Carboniferous Working Group	\$ 200
Secretarial expenses required to organize the Biennial Meeting of SCCS in Provo, Utah & Nevada, Sept. 24-30, 1989 (incl. circulars, editorial preparation for <i>Cour. Forschung. Senckenbergiana</i>)	\$ 320
TOTAL BUDGET EXPENSES	\$1584

GRANT FOR 1989:

In March 1989, Professor J. Remane, Secretary-General of ICS has advised the Secretary that the sum of US\$700 had been granted to the Subcommittee for 1989 to be distributed as follows:

- SCCS Administration \$300;
- Mid-Carboniferous Working Group \$100;
- Biennial Meeting organization in Utah/Nevada \$200;
- "Carboniferous of the World" - preparation \$100.

This grant represents less than half of the anticipated expenditure for 1988-89 and hence support from member donations will continue to be of major significance to our viability.

4.0 S.C.C.S. BALLOT RESULTS

4.1 BALLOT 1: SUBDIVISION OF THE CARBONIFEROUS SYSTEM

EXPLANATION: The General and Titular Meetings held at the 11th Carboniferous Congress in Beijing, September 1987, strongly endorsed the concept that the "primary division of the Carboniferous be into two and not three divisions and that the boundary between the two divisions be taken at the level selected at Madrid for the mid-Carboniferous boundary". This endorsement was followed by a postal ballot of Bureau/Titular Members, the results of which, after formal ratification of ICS/IUGS, will become binding decisions of the Subcommittee.

4.1.1 Proposal 1: SINGLE SYSTEM

"THAT THE CARBONIFEROUS COMPRISE A SINGLE SYSTEM"

Voting Result:

• (For - 15; Against - 4; Abstain - 2; No vote - 8)
The proposal was therefore adopted by 71% (15/21) of the voting members.

4.1.2 Proposal 2: BIPARTITE SUBDIVISION

"THAT THE PRIMARY DIVISION 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".

Voting Result:

• (For - 21; Against - 0; Abstain - 0; No vote - 8)
The proposal was therefore adopted by 100% (21/21) of the voting members.

4.1.3 Proposal 3: SUBSYSTEMS

"THAT EACH OF THE TWO DIVISIONS OF THE CARBONIFEROUS BE RECOGNISED AS A SUBSYSTEM".

Voting Result:

• (For - 18; Against - 3; Abstain - 0; No vote - 8)
The proposal was therefore adopted by 86% (18/21) of the voting members.

Details of votes cast by Titular and Bureau Members:

	PROP.1	PROP.2	PROP.3
Executive Bureau			
Dr. W.H.C. Ramsbottom	YES	YES	YES
Dr. R.H. Wagner	NO	YES	YES
Dr. B.A. Engel	YES	YES	YES
Dr. Hisayoshi Igo	YES	YES	YES
<i>Past Chairman</i>			
Dr. A. Bouroz (France)	YES	YES	YES
Titular Members			
<i>East Europe/Siberia</i>			
Dr. O.L. Einor	NORESP	NORESP	NORESP
Dr. A.D. Grigorieva	NORESP	NORESP	NORESP
Dr. E.A. Reidinger	NORESP	NORESP	NORESP
Dr. M.N. Solovieva*	NORESP	NORESP	NORESP
<i>West/Central Europe</i>			
Dr. J. Doubinger	NORESP	NORESP	NORESP
Dr. J.P. Laveine	YES	YES	YES
Dr. E. Paproth	YES	YES	YES
Dr. C.F. Winkler Prins	YES	YES	YES
<i>North America</i>			
Dr. T. Dutro Jr	YES	YES	YES
Dr. M. Gordon Jr	NORESP	NORESP	NORESP
Dr. R.M. Kosanke	NO	YES	NO
Dr. B.L. Marnet	NORESP	NORESP	NORESP
Dr. P.K. Sutherland	YES	YES	YES
<i>South America</i>			
Dr. S. Archangelsky	YES	YES	YES
Dr. A.C. Rocha Campos	YES	YES	YES
<i>Peoples Republic of China</i>			
Dr. Li Xingxue	ABS	YES	YES
Dr. Gao Lianda	YES	YES	YES
Dr. Guo Hongzun	ABS	YES	YES
Dr. Yang Shipu	YES	YES	YES
Dr. Yang Xilu	NORESP	NORESP	NORESP
<i>North Africa</i>			
Dr. M. Weyant	YES	YES	YES
<i>Australia</i>			
Dr. J. Roberts	YES	YES	YES
<i>Working Group Chairmen</i>			
Dr. P.L. Brenckle	NO	YES	NO
Dr. H.R. Lane	NO	YES	NO
TOTAL	15 YES	21 YES	18 YES
	4 NO	0 NO	3 NO
	2 ABS	0 ABS	0 ABS
	8 NORESP	8 NORESP	8 NORESP

DECLARATION OF POLL

Declared as a true record of the SCCS Bureau/Titular Members' Poll which closed on October 31, 1988.

* A voting paper was received from Dr. M.N. Solovieva after the ballot had closed and the results had been forwarded to ICS for ratification.

(Dated November 3, 1988) Brian A. Engel, Sec. SCCS

4.2 BALLOT 2: WEST EUROPEAN REGIONAL STRATIGRAPHIC CLASSIFICATION

EXPLANATION: In compliance with the recommendation made during the General Assembly of the Subcommittee in Krefeld, 1971 (George & Wagner, 1972), formal names have been proposed to replace the Westphalian A, B, C, and Stephanian A Stages. In addition, new information on the Cantabrian type area has resulted in the need to modify the position of its boundary and its stratotype.

As required by Subcommittee regulations, the proposed names and stratotypes have been discussed during official meetings of SCCS (Carboniferous Congresses in Madrid, 1983 and Beijing, 1987). In addition, the full details of the biostratigraphy and correlations in regard to these stratotypes have been published in the references listed below. Bureau and Titular Members of SCCS were asked to consider five proposals outlined below and vote upon the substantive issues involved. The results of this postal ballot, which closed on February 28, 1989, constitute binding decisions of the Subcommittee which have now been sent to ICS/IUGS for formal ratification.

Voting Members of the Subcommittee were individually advised by letter of the voting procedures as outlined in the Guidelines and Statutes of ICS (Clause A.II.(5)), namely that any member who does not return the voting paper will be deemed to have cast a "YES" vote for the purpose of the ballot. Each non-voting member received a further personal reminder letter two weeks before the close of the postal ballot. Of the total of 29 Titular/Bureau Members, 21 cast a vote with the remaining 8 members who failed to reply being counted in the affirmative.

4.2.1 Proposal 1: NAME CHANGE & STRATOTYPE DESIGNATION

Name Change: Langsettian Stage to replace Westphalian A Stage.

Stratotype: Located on the waterworks property on the south bank of the River Little Don, South Yorkshire, England, 1 km east of Langsett, adjacent to the A616 Sheffield-Manchester road [National Grid Reference SE 2215 0041].

Reference: Owens, Riley & Calver, 1985, p.463(fig.2), 466-467, plate 1.

Voting Result:

19 Yes (11 Yes + 8 No Response);
3 No; 7 Abstained.

This proposal has therefore been adopted by 86% (19/22) of the voting membership.

4.2.2 Proposal 2: NAME CHANGE & STRATOTYPE DESIGNATION

Name Change: Duckmantian Stage to replace Westphalian B Stage.

Stratotype: Located on the north side of a disused railway cutting at Duckmanton near Arkwright Town, 4 km east of Chesterfield, north Derbyshire [National Grid Reference SK 4237 7040].

Reference: Owens, Riley & Calver, 1985, p.464(fig.3), 468-469, plate 2.

Voting Result:

19 Yes (11 Yes + 8 No Response);
3 No; 7 Abstained.

This proposal was therefore adopted by 86% (19/22) of the voting membership.

4.2.3 Proposal 3: NAME CHANGE & STRATOTYPE DESIGNATION

Name Change: Bolssovian Stage to replace Westphalian C Stage.

Stratotype: Located on the east bank of the River Doe Lea near Palterton, north Derbyshire [National Grid SK 4590 6930].

Reference: Owens, Riley & Calver, 1985, p.465(fig.4), 469-471, plate 3.

Voting Result:

19 Yes (11 Yes + 8 No Response);
3 No; 7 Abstained.

This proposal was therefore adopted by 86% (19/22) of the voting membership.

4.2.4 Proposal 4: CHANGE OF STRATOTYPE

Stratotype: Approval to change the position of the base of the Cantabrian Stage and its stratotype from the base of the Lores Limestone in the Ojosa Section (as approved in Krefeld, 1971) to a higher position at the base of the Villanueva Marine Formation in the section at Velilla de Tarilonte, N.W. Palencia, Spain.

References: George & Wagner, 1972; Wagner & Winkler Prins, 1985a; Wagner & Winkler Prins, 1985b.

Voting Result:

19 Yes (11 Yes + 8 No Response);
2 No; 8 Abstained.

This proposal was therefore adopted by 90% (19/21) of the voting membership.

4.2.5 Proposal 5: CHANGE OF NAME

Name Change: Barruelian Stage to replace Stephanian A Stage.

Stratotype: To remain unchanged from the decision taken at Krefeld, 1971.

References: George & Wagner, 1972; Wagner & Winkler Prins, 1985a; Wagner & Winkler Prins, 1985b.

Voting Result:

19 Yes (11 Yes + 8 No Response);
2 No; 8 Abstained.

This proposal was therefore adopted by 90% (19/21) of the voting membership.

REFERENCES:

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Owens, B., Riley, N. & Calver, M.A. 1985. Boundary stratotypes and new stage names for the lower and middle Westphalian sequences in Britain. *Compte Rendu 10ème Congrès International de Stratigraphie et de Géologie du Carbonifère, Madrid 1983*, 4:461-472.

Wagner R.H. & Winkler Prins, C.F. 1985a. Stratotypes of the two lower Stephanian stages, Cantabrian and Barruelian. *Compte Rendu 10ème Congrès International de Stratigraphie et de Géologie du Carbonifère, Madrid 1983*, 4:473-483.

Wagner R.H. & Winkler Prins, C.F. 1985b. The Cantabrian and Barruelian stratotypes: a summary of basin development and biostratigraphic information. In Papers on the Carboniferous of the Iberian Peninsula. *Anais Fac. Ciênc., Porto, Suppl. 64*: (1983), 359-410.

INTERNATIONAL COMMISSION OF COAL PETROLOGY

President Monica Wolf has advised that ICCP will hold its 43rd Annual Meeting in September 1991 in Porto Alegre, Brazil, just prior to the Carboniferous Congress. An excursion is planned which may well combine with one of our pre-Congress trips. Dr. Z. Correia da Silva is organising the meeting.

Dr Wolf also drew attention to the fact some confusion has arisen because of the use of XII ICCP on the first Carboniferous Congress circular. In future the abbreviation will appear as XII ICC-P and members of both organisations are asked to take note of the difference.

Details of votes cast by Titular and Bureau Members:

Executive Bureau	1	2	3	4	5
Dr. W.H.C. Ramsbottom	YES	YES	YES	YES	YES
Dr. R.H. Wagner	YES	YES	YES	YES	YES
Dr. B.A. Engel	YES	YES	YES	YES	YES
Dr. Hisayoshi Igo	NOR	NOR	NOR	NOR	NOR
<i>Past Chairman</i>					
Dr A. Bouroz (France)	YES	YES	YES	YES	YES
Titular Members					
<i>East Europe/Siberia</i>					
Dr. O.L. Einor	ABS	ABS	ABS	NO	ABS
Dr. A.D. Grigorieva	NOR	NOR	NOR	NOR	NOR
Dr. E.A. Reillinger	ABS	ABS	ABS	ABS	ABS
Dr. M.N. Soloviev	ABS	ABS	ABS	ABS	ABS
<i>West/Central Europe</i>					
Dr. J. Doubinger	NOR	NOR	NOR	NOR	NOR
Dr. J.P. Laveine	YES	YES	YES	ABS	ABS
Dr. E. Paproth	NO	NO	NO	NO	NO
Dr. C.F. Winkler Prins	YES	YES	YES	YES	YES
<i>North America</i>					
Dr. T. Dutro Jr	NO	NO	NO	YES	YES
Dr. M. Gordon Jr	NOR	NOR	NOR	NOR	NOR
Dr. R.M. Kosanke	NO	NO	NO	YES	NO
Dr. B.L. Mamet	NOR	NOR	NOR	NOR	NOR
Dr. P.K. Sutherland	YES	YES	YES	YES	YES
<i>South America</i>					
Dr. S. Archangelsky	ABS	ABS	ABS	ABS	ABS
Dr. A.C. Rocha Campos	ABS	ABS	ABS	ABS	ABS
<i>Peoples Republic of China</i>					
Dr. Li Xingxue	NOR	NOR	NOR	NOR	NOR
Dr. Gao Lianda	YES	YES	YES	YES	YES
Dr. Guo Hongzun	YES	YES	YES	YES	YES
Dr. Yang Shipu*	NOR	NOR	NOR	NOR	NOR
Dr. Yang Xilu	NOR	NOR	NOR	NOR	NOR
<i>North Africa</i>					
Dr. M. Weyant	YES	YES	YES	ABS	YES
<i>Australia</i>					
Dr. J. Roberts	YES	YES	YES	YES	YES
Working Group Chairmen					
Dr. P.L. Brenckle	ABS	ABS	ABS	ABS	ABS
Dr. H.R. Lane	ABS	ABS	ABS	ABS	ABS

TOTAL	11 YES	11 YES	11 YES	11 YES	11 YES
	3 NO	3 NO	3 NO	2 NO	2 NO
(NOR = NO RESPONSE)	8NOR	8NOR	8NOR	8NOR	8NOR
(ABS = ABSTAIN)	7 ABS	7 ABS	7 ABS	8 ABS	8 ABS

DECLARATION OF POLL

Declared as a true record of the SCCS Bureau/Titular Members' Poll which closed on February 28, 1989.

* A voting paper was received from Professor Yang Shipu after the ballot had closed and the results forwarded to ICS for ratification.

(Dated March 10, 1989) Brian A. Engel, Sec. SCCS

5.0 AN OUTLINE HISTORY OF THE I.U.G.S. SUBCOMMISSION ON CARBONIFEROUS STRATIGRAPHY: ACHIEVEMENTS & OBJECTIVES

by R.H. Wagner, ENCASUR, Peñarroya-Pueblonuevo, (Córdoba), Spain.

Foreword by B.A. Engel, Secretary: Dr Wagner has been an active member of SCCS for a very long time having served his 'apprenticeship' as Secretary from 1963-76 with Professor W.P. van Leckwijck, Professor T.N. George and Dr. A. Bouroz, and then in the position of Chairman from 1982-86. While he was on a research visit to Australia in late 1988, I expressed my disappointment to him that, on taking over as Secretary, I found there were no comprehensive archival records of the activities of the Subcommission. Apart from an excellent historical summary by A. Bouroz, C.F. Winkler Prins and W.B. Saunders in Newsletter No.1 (1980), it was apparent that many activities of the Subcommission had been documented in a variety of publications (including the 'Compte Rendu'), many of which are known only by the long serving members of the Subcommission.

In response, Dr. Wagner has since mailed to me a large number of reprints which I will endeavour to catalogue and pass on to my successors, and in this way the historical record of the organisation will have some measure of continuity. To this end, I would ask others who have had a long association with the Subcommission to send me any relevant reprints/photocopies or even lists of publications which could form part of that record.

Also while in Australia, Dr. Wagner was prevailed upon to write the following article on the activities of the Subcommission. Being isolated in the antipodes, he did not have access to his extensive library but had to depend upon his fantastic memory for most of the information. While he may be horrified to see the result appear in print without further revision, I felt it was timely that it should be presented in this Newsletter. I hope it will form the foundation of a published record of the Commission and if other members have any comments, additions, corrections, etc. both Dr. Wagner and I would be most grateful for your cooperation.

Anyone familiar with the history of the classification of Carboniferous strata will recognise the First Heerlen Congress (Congrès pour l'avancement des Etudes de la Stratigraphie du Carbonifère), held in 1927, as a milestone. Organised on the initiative of the Dutch, German and Belgian palaeobotanists W.J. Jongmans, W. Gothan and A. Renier, it marked the first occasion on which Carboniferous stratigraphers and palaeontologists of various West European countries met to work out a common scheme for the correlation and nomenclature of the Carboniferous strata in their respective areas. If this was still a long way from being a truly international stratigraphic classification, it broke through the barriers of local, national interests, and promoted an international cooperation that has spread ever wider in successive meetings, right up to the present day. The so-called Heerlen Classification (in honour of the mining town in the southeastern corner of the Netherlands, right up against the German and Belgian borders) became a well known and widely used scheme, despite several drawbacks inherent to the special conditions of sedimentation and basin history in the different parts of northwestern Europe.

The original classification arrived at in Heerlen, 1927, was modified and elaborated in more detail in successive Heerlen congresses (1935, 1951).

In 1952, during the XIX International Geological Congress held in Algiers, the Commission on the Subdivision of the Carboniferous was constituted as part of the IGC. This was later incorporated with IUGS in 1963. The establishment of this Commission marked a certain duality of organisation since it had been the International Congress of Carboniferous Stratigraphy and Geology that concerned itself with the stratigraphic classification of the Carboniferous System. It is noted that the Carboniferous Congress is unaffiliated with IGC or IUGS. This duality was resolved, to a certain extent, at the 4th Heerlen Congress (1958) when the "Commission on the Subdivision of the Carboniferous" was merged with the "Subcommission on Carboniferous Stratigraphy" of the Commission on Stratigraphy of the IGC (van Leckwijck, 1960).

During the 1958 Heerlen Congress (the last one held in the Dutch mining town) a first attempt was made to widen the scope of the purely Northwest European stratigraphic classification by means of a circular which Jongmans sent out to canvas opinion on whether the Carboniferous should be regarded as a single system or as two different systems or subsystems to be called Mississippian and Pennsylvanian on the American pattern. Although the response to this question went against the latter proposal, it marked the first instance in which the American classification of Carboniferous stratigraphy was considered by the Heerlen Congress. At the same congress the All-Union Stratigraphic Committee of the USSR proposed a correlation between their classification of the Carboniferous and that elaborated at Heerlen. Although some elements of the proposed correlation gave rise to serious doubts as expressed in the later literature, it showed the interest taken by Carboniferous stratigraphers in the Soviet Union to arrive at an international consensus on chronostratigraphic units.

It does not come amiss here to observe that the circular sent out by Jongmans prior to the 1958 Heerlen Congress marked the final attempt by one of the original organisers of the Carboniferous Congress to increase the international scope of the stratigraphic classification promoted by this congress. Jongmans passed away in 1957 and thus failed to see the response generated by his circular raising a question that is still the subject of current debate.

In 1960, at the IGC held in Copenhagen, the Chairman of the IUGS Subcommission on Carboniferous Stratigraphy, W.P. van Leckwijck, reported on progress made during the Heerlen Congress of 1958 (van Leckwijck, 1964a). This set a pattern which persists to the present day. Carboniferous stratigraphers meeting at an International Congress of Carboniferous Stratigraphy and Geology were to make recommendations which would be passed on to the International Commission of Stratigraphy at an International Geological Congress. This made the Carboniferous Subcommission atypical since it would meet at Carboniferous Congresses

and not at the IGC, as would other Subcommissions. Its origins were acknowledged by the Commission and the Statutes incorporated a reference to Subcommissions with long established practices which could continue. Indeed, Carboniferous stratigraphers, meeting at Carboniferous Congresses, would not be likely to congregate again in large numbers on the occasion of an International Geological Congress.

The size and scope of the Carboniferous Congresses had steadily grown over the years and had, consequently, strained the resources of Heerlen as a Congress venue. The 5th Congress was therefore held in Paris (in 1963). At this congress the IUGS Subcommission on Carboniferous Stratigraphy met as a general gathering of Carboniferous stratigraphers without a formal membership, but with W.P. van Leckwijck as Chairman. The recommendations made in Paris were passed on by the Chairman in 1964 at the XXII IGC held in India.

The first stirrings of an independent existence of the Subcommission on Carboniferous Stratigraphy (SCCS) came with a meeting called specially for SCCS at Sheffield 1965, with invited contributions which were distributed in 1967 (reprinted in 1979).

In the subsequent Carboniferous Congress, held in Sheffield, 1967, the SCCS was accorded the privilege of a separate meeting, and its proceedings were published as a special section of the *Compte rendu* of this Congress. The same pattern was repeated in Krefeld, 1971, at the 7th Carboniferous Congress. Meanwhile, the Subcommission had met, now under the Chairmanship of T.N. George (Van Leckwijck had become Secretary General of IUGS), at Liège (1969). This meeting which was held conjointly with the Commission Internationale de Microflore du Paléozoïque, gave rise to the publication of a book edited by Streel and Wagner (1970). The meeting at Liège saw the formal institution of Field Meetings (to be called Field and General Meetings) intercalated between the General Assemblies at Carboniferous Congresses, to be advertised and promoted by the SCCS Secretary. The first meeting of this kind (1970) was held in Northwest Spain, an area of western Europe that had only recently become well known geologically and that had not played a role in the original Heerlen Classification. This area was written up as a special publication issued in 1971. The subsequent Field and General Meeting was held in Czechoslovakia in a conscious effort to expand first hand information beyond the original area of northwestern Europe considered for the Heerlen Classification. The Geological Survey of Prague

published a field guide in 1973 and issued a comprehensive publication in 1977.

The organisation of SCCS also changed in order to reflect an increasing worldwide interest in its operations. It is noted that a representation on a national basis has been avoided from the start, since this would have placed undue emphasis on the relatively small west European countries that provided the original stimulus for the Heerlen Classification but which were largely segments of a single depositional area, stretching from Ireland in the West to Poland in the East. Titular membership was therefore allocated on the basis of stratigraphic intervals within certain major areas in the world, without regard to national boundaries and the nationality of the people charged with collating the information on the interval and area involved.

The Titular Members were chairmen of Working Groups organised on this pattern, and the idea was that reports of progress would be given at General Assemblies and publications generated by these Working Groups, so as to build up a body of information reaching across national boundaries and language barriers. This organisation has worked only up to a point. Few members were able to encompass areas much beyond their own national boundaries and this proved a severe hindrance in the much fragmented west and Central European area.

Voting procedures had been informal up to the meeting at Prague in 1973; quite simply everybody who bothered to turn up at a meeting could have his or her vote

registered. This changed as a result of guidance from the Commission on Stratigraphy of IUGS, limiting the vote to Titular Members. The Executive Bureau was also formalised at this meeting; the Secretary became also Vice-Chairman and an Associate Secretary was appointed to assist the Secretary and take over as such when the Secretary had to act as Chairman in the absence of the SCCS Chairman. It was agreed that the Associate Secretary would take over from the Secretary when the latter retired at the end of his term. The Titular Membership, heavily tilted towards western Europe as a result of historical precedence (the Heerlen Classification), was also expanded to give representation to the various major areas of Carboniferous rocks in different parts of the world.

Prior to the meeting at Prague, at the 7th Carboniferous Congress held in Krefeld, 1971, the Heerlen Classification was modified to reach its present form with two subsystems, the Dinantian and Silesian, comprising five series, the Tournaisian, Viséan, Namurian, Westphalian and Stephanian,

ADDENDUM 1: A Chronology of International Carboniferous Congresses and the alternating Field and General Meetings of the Subcommission

Carboniferous Congresses

- 1. Heerlen 1927
- 2. Heerlen 1935
- 3. Heerlen 1951
- 4. Heerlen 1958
- 5. Paris 1963
- 6. Sheffield 1967
- 7. Krefeld 1971
- 8. Moscow 1975
- 9. Urbana 1979
- 10. Madrid 1983
- 11. Beijing 1987
- 12. (Argentina 1991)

SCCS Field and General Meetings

- Sheffield 1965 (SCCS CIMP Meeting)
- Liège 1969 (as above)
- Cantabrian Mts 1970
- Czechoslovakia 1973
- Turkey 1978
- Leeds 1981
- Argentina 1986
- Utah/Nevada 1989

with subordinate stages. No formal stages were recognised for the Tournaisian and Viséan series traditionally subdivided on the basis of goniatite and coral-brachiopod zones, the goniatite zonation for the Namurian was converted into a set of stages based on stratotypes in the British Isles (although some of the names employed for these stages tend to suggest other areas in western Europe), the four stages of the Westphalian Series retained their informal connotations A, B, C and D, and the Stephanian Series was subdivided into the Cantabrian, and A, B, C stages. It was agreed at Krefeld that the informal connotations A, B, C, D would be replaced by formal stage names as soon as stratotypes could be erected for these stages. Proposals to this effect were only made as late as 1983.

A major step was taken in 1975 with the 8th Carboniferous Congress held in Moscow. During this congress the Chairman and Secretary of the Subcommittee, together with three Titular Members representing different parts of the world (Western Europe, USSR, North America) proposed an integrated scheme of major chronostratigraphic units applicable throughout the Palaeoequatorial Belt. The Heerlen Classification was regarded as a regional stratigraphic classification with equal rights to that used in the Soviet Union and those applied in different parts of North America. Elements of the different schemes were used to produce a general subdivision into two subsystems, called the Mississippian and the Pennsylvanian but with a boundary not necessarily equivalent but approximating to that found in North America, and three series approximating to the Lower, Middle and Upper Carboniferous of the USSR. This proposal was debated extensively, but no decisions were reached (people needed time to think about it all) beyond an official recommendation to use lower, middle and upper Carboniferous as informal units worldwide. At this time the titular membership of SCCS was expanded to give representation to all the major areas of the world where Carboniferous strata were found in quantity.

The program of field meetings was continued with a very successful meeting in Turkey (1978), organised through the Mineral Research and Exploration Institute of Turkey (Maden Tetkik ve Arama Enstitüsü). MTA printed a field guide and the proceedings of this meeting were edited but not published, although there is still a formal commitment to do so. Turkey is an area which combines Tethys with European Plate in the north and Gondwana Plate in the south,

and is obviously of interest for world Carboniferous stratigraphy and tectonic development.

Further internationalisation occurred with the General Assembly on the occasion of the 9th Carboniferous Congress held at Washington and Champaign/Urbana in Illinois, USA (1979). Although few decisions were taken by SCCS during this meeting (its program was less ambitious than that carried out in Moscow where SCCS functioned as one of the major sections of the Congress), it marked the increased involvement of North American geologists.

A change in approach commenced in 1981, under the chairmanship of W.H.C. Ramsbottom, who organised a very successful symposium in Leeds, England, on the faunal and floral changes at a mid-Carboniferous boundary roughly equivalent to the Mississippian Pennsylvanian boundary of the North Americans and the Lower - Middle Carboniferous boundary of the USSR. Bouroz et al. (1978), during the Moscow Congress (1975), had pointed out the importance of this boundary which they suggested may have coincided with the start of the Gondwana Ice Age, and the Leeds meeting confirmed that noticeable changes occurred in major faunal and floral groups at or near this boundary. The proceedings of the Leeds meeting were handed out to participants but were unfortunately not published.

At this meeting an *ad hoc* committee was created under the chairmanship of H. R. Lane who was charged with a full analysis of the biostratigraphic information and the selection of a proper horizon at which the international (major) mid-Carboniferous Boundary should be placed. This approach is that followed by the various systemic boundary committees in the Commission on Stratigraphy and has its precedent in the Silurian/Devonian boundary. By focusing upon this part of the Carboniferous there was a tacit admission that this system divides naturally into two parts, be they called Mississippian and Pennsylvanian or otherwise, and that one should try to pinpoint the position of the boundary between these two parts.

The mid-Carboniferous Boundary Committee duly reported during the SCCS General Assembly at Madrid, 1983 (10th Carboniferous Congress) and a decision was reached to place this boundary at a level coincident with the incoming of the conodont *Declinognathus nodulifera*. The committee chaired by Lane has had a number of meetings and has published a special issue of the *Senckenberg Courier* in 1985 as well as a number of papers in the *Compte rendu* of the 10th Car-

ADDENDUM 2: Officer Bearers of S.C.C.S. 1954-1989

CHAIRMAN	TERM OF OFFICE
Professor Willem J. Jongmans	1954-1957
Professor William P. van Leckwijck	1957-1965
Professor T. Neville George	1965-1974
Dr. Alexis Bouroz	1974-June 1980
Dr. W.H.C. Ramsbottom	July 1980-June 1982
Dr. R.H. Wagner	July 1982-June 1986
Dr. W.H.C. Ramsbottom	July 1986-June 1989
Dr. Eva Paproth	July 1989-
SECRETARY	
Dr. R.H. Wagner	1963-1976
Dr. C.F. Winkler Prins	1976-June 1982
Dr. B. Saunders	July 1982-June 1986
Dr. W.L. Manger	July 1986-Sept 1987
Dr. B.A. Engel	Sept. 1987-
ASSOCIATE SECRETARY	
Dr. C.F. Winkler Prins	1973-1976
Dr. B. Saunders	1976-June 1982
Dr. W.L. Manger	July 1982-June 1986
Dr. B. Engel (Acting)	Oct. 1986-Sept. 1987
Dr. Hisayoshi Igo	Sept. 1987-

boniferous Congress. Currently, this committee is preparing to select a suitable stratotype for the mid-Carboniferous Boundary.

Bouroz et al. (1978) pointed out that the various chronostratigraphic classifications in use were applicable only for the Palaeoequatorial Belt of Carboniferous times, and that the southern and northern hemisphere areas (Gondwana and Angara Realms) posed different problems. Generally speaking, the biostratigraphic zonations developed for the Palaeoequatorial Belt areas can be applied with certain modifications in lower Carboniferous (Mississippian) strata but are inapplicable for middle and upper (Pennsylvanian) strata. In fact, Gondwana stratigraphy has to combine biostratigraphic information with radiometric dating and palaeomagnetic reversal stratigraphy to produce correlations with other parts of the world. It is felt that climatic changes in the Pennsylvanian may supply the boundaries to major chronostratigraphic units worldwide, i.e. including the Gondwana and Angara areas. This requires an approach that is not wholly biostratigraphic and stratotypic with faunal and floral controls. The Gondwana representatives on the Subcommittee highlighted the special problems with regard to their area.

In view of these problems the SCCS requested a Field and General Meeting in Argentina which took place in 1986. This allowed members of the Subcommittee not personally familiar with the Carboniferous of Gondwanaland to see for themselves the relative paucity of biostratigraphic elements in middle to upper Carboniferous (Pennsylvanian) strata and to think about ways and means of integrating major chronostratigraphic units of the Carboniferous in the Palaeoequatorial Belt with those that may be recognised in the Gondwana and Angara areas. These problems will be further examined in 1991 when the International Congress of Carboniferous and Permian Stratigraphy and Geology meets in Argentina. The organisers of the Field Meeting produced a useful field guide and a book summarising information on the Carboniferous (and some Permian) in the Argentine Republic.

A General Assembly of SCCS was held in Beijing in 1987, for which the Chinese organisers produced a book with proposed boundary stratotypes in China, and provided a special field trip to Gansu in order to examine a possible mid-Carboniferous Boundary stratotype. Further candidates for a boundary stratotype will be examined in 1989 when the Field and General Meeting of SCCS is due to visit localities in Utah and other parts of the mid-western United States of America.

The Chairmen of inactive Working Groups on stages and series in different parts of the world were formally invited to deactivate by the Chairman of SCCS, who appointed two *ad hoc* committees, chaired by P. Brenckle and C. F. Winkler Prins, who were given the task of preparing proposals on the subdivision of lower (Mississippian) and upper (Pennsylvanian) parts of the Carboniferous, worldwide. This followed upon a vote to subdivide the Carboniferous into these two major units, and is a natural follow-up on the selection of the mid-Carboniferous Boundary separating these major chronostratigraphic units.

Finally, there is an ongoing program of compilation of stratigraphic information for the IUGS Publication series entitled "*The Carboniferous of the World*". This represents a major effort of international cooperation with two volumes

published on China and the Far East (Vol.I) and the Gondwana countries including North Africa (Vol.II). A third volume comprising the USSR and the Middle East is in an advanced stage of editing and large parts of Volume IV (North America and Europe outside the USSR) are available in manuscript. A final volume (Vol.V) should contain plate tectonic reconstructions and an integration of the published information with worldwide correlation charts.

MEETING OF THE I.C.C. PERMANENT COMMITTEE

The Permanent Committee of ICC has arranged to meet in Buenos Aires on October 9-11, 1989. Members will be briefed on all activities to date, excursion plans, and other managerial matters including potential hosts for the next Congress. About half of the 20 members have indicated their intention to be present.

NATIONAL COMMITTEE OF GEOLOGY IN COLOMBIA

by Jorge E. Valdírri W., Instituto Nacional de Investigaciones Geológico-Mineras (INGEOMINAS), Diagonal 53 No.34-53, Bogotá, Colombia, South America.

Following earlier suggestions presented at a meeting held in Bogotá, a committee entitled "Comité Colombiano de Minería" was formed during sessions of the VII Congreso Colombiano de Minería, at Medellín, on July 17, 1987.

Alberto Lobo-Guerrero Uscátegui (INGEOMINAS) President

Jorge E. Valdírri W. (INGEOMINAS) Secretary

Dr. Jorge Brieve B., Univ. Nacional de Colombia, Depto Geociencias, Bogotá.

Dr. Jorge Julián Restrepo, Univ. Nacional de Colombia, Depto de Geociencias, Medellín.

Dr. Eduardo Gómez Reyes, Univ. Nacional de Colombia, Fac. de Minas, Medellín.

Dr. Luis Albino León, Univ. Indust. de Santander, Fac. de Geol., Bucaramanga.

Dr. Jorge E. López, Univ. EAFIT, Depto de Geol., Medellín.

Dr. Laureano Hernán Pinzón B., Univ. Pedag. y Tecnol. de Colombia, Fac. de Minas, Sogamosa.

Dr. Alberto Quevedo, Escuela de Ing. de Antioquia, Depto Geol., Medellín.

Dr. Antonio Rivera, Universidad de Caldas, Fac. de Geol., Manizales.

Dr. Rubén Llinás, Soc. Colombiana de Geología, Bogotá.

Dr. Jorge E. Valdírri W., Asoc. de Geól. Egresados de la Univ. Nacional.

Dr. Rafael Velásquez, Asoc. Colombiana de Geólogos, Ingen. Geól. de Minas, Metal. y Petról., AGEMPET.

Dr. Rafael Valderrama, Asoc. Colombiana de Geol. y Geof. del Petróleo ACGGP.

At the same event a National Committee for the IGCP was named:

Jorge Julián Restrepo, Univ. Nacional de Medellín, Carrera de Geol., President

Jairo Mojica, Univ. Nacional de Colombia, Depto de Geociencias, Bogotá, Vice President

Víctor Eduardo Pérez, ECOPEPETROL, Bogotá, Secretary

Albino León (Univ. Industrial de Santander)

Antonio Rivera, Univ. de Caldas

Carlos Ulloa, INGEOMINAS

Fernando Etayo, Univ. Nacional, Bogotá

Alberto Forero, Univ. Nacional, Bogotá

Herman Duque, INGEOMINAS

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

GENERAL MEETING

The biennial General Meeting of the Subcommittee was convened in Provo, Utah on September 25-26, 1989 with the new chairman Dr. Eva Paproth presiding. The central focus of the meeting concerned the identification of potential horizons suitable for further subdivision of the Carboniferous. Following decisions taken in Beijing, two *ad-hoc* committees had been formed on the Lower and Upper Carboniferous, chaired respectively by Dr. P. Brenckle (USA) and Dr. C.F. Winkler Prins (Netherlands). These committees were charged with the evaluation of biostratigraphic horizons which might be of value for series/stage level subdivisions of the Carboniferous on an intercontinental basis. Identification of these potential horizons will direct SCCS research efforts towards meeting the IUGS mandate to develop an intercontinental classification of the Carboniferous.

The outcome of the deliberations of these two committees was presented to the meeting, with one day being provided for each time division. During the morning sessions, each chairman provided a summary of the contributions of his committee, followed by an extended discussion period. Afternoon sessions were devoted to the presentation of individual papers by members who attended the meeting.

The Subcommittee was privileged to hold this meeting in the Conference Center (Harman Building) on the campus of Brigham Young University, Provo, Utah. Both the meeting and excursion facilities were organised by our gracious host Dr. Morris S. Petersen, Head of the Department of Geology at the University. All members present would like to place on record our sincere thanks for the warm reception we received both on the campus and at the dinner to which we were invited in the home of Morris and his wife Donna.

Papers presented on September 25 included:

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

P.L. Brenckle - Foraminiferal Division of the Lower Carboniferous in North America.

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

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

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

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

G. Hahn - Palaeobiogeographic distribution and biostratigraphic significance of Lower Carboniferous trilobites, a review (presented by B.A. Engel).

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

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

Papers presented on September 26 included:

C.F. Winkler Prins (Chairman) - Upper Carboniferous (Pennsylvanian) Boundaries Working Group Report.

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

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

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

W.H. Gillespie & K.J. Englund - New observations on the Mississippian - Pennsylvanian boundary in the Appalachian Basin, U.S.A.

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

L.L. Lambert & P.H. Heckel - The Atokan-Desmoinesian Boundary: considerations for locating a boundary stratotype.

R.M.C. Eagar - 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*).

As a result of the presentations, six stratigraphic levels were nominated as being worthy of further detailed investigation. Three of these are located between the Devonian-Carboniferous and Mid-Carboniferous boundaries and a further three between the Mid-Carboniferous and Carboniferous-Permian boundaries. Details of these horizons and the proposed mode of future operations are described below.

Papers presented at the meeting were issued in abstract form to those in attendance and the full manuscripts will be printed in the meeting volume to be published in the *Courier Forschungsinstitut Senckenberg* as soon as possible.

Attendance: P. Brenckle, J. Carter, C. Collom, R.M.C. Eagar, B.A. Engel, K.J. Englund, M. Gordon, J. Kullmann, L. Lambert, M. Legrand Blain, W.L. Manger, B. Owens, E. Paproth (Chairman), M.S. Petersen, E. Poty, W.H.C. Ramsbottom, C.B. Rexroad, B.C. Richards, C.A. Sandberg, G. Sevastopulo, B. Skipp, P.K. Sutherland, W.J. Varker, K. Watts, G. Webster, C.F. Winkler Prins.

FIELD MEETING

On September 27, most members left Provo on a four day field excursion which was ably led by Dr Gary Webster (Washington State University). The excursion visited a number of important exposures and potential Mid-Carboniferous boundary stratotype sections in Utah and Nevada, paying particular attention to the section in Arrow Canyon, Nevada.

Detailed logs of the following sections were provided by the excursion leader, some of which were not visited during the excursion, due to the limited time available:

- Lake Point Section, Utah
- Granite Mountain Section, Nevada
- Frenchmans Mountain Section, Nevada
- Trough Springs Section, Nevada
- Skunk Spring - Willow Wash Section, Nevada
- Arrow Canyon and Dry Lake Sections, Nevada
- Las Vegas Range Section, Nevada

In their depositional setting, *Frenchmans Mountain Section* developed furthest to the east with the *Granite Mountain Section* being located westwards, off the carbonate shelf. The *Trough Springs Section* is also a little further off the shelf with *Arrow Canyon Section* being perhaps as far west as *Granite Mountain Section*. The *Las Vegas Section* is located the greatest distance west of the platform and shelf.

Of the alternatives for a boundary stratotype, only two were considered potential candidates namely *Arrow Canyon* and *Trough Springs Sections*. In the latter case, work is currently in progress by Dr Webster but it is not far enough advanced to make any final conclusions as to its suitability. Amongst the other sections visited, *Lake Point* represents the wrong facies with no evidence of an evolutionary sequence of conodonts at the boundary level; *Frenchmans Mountain Section* contains numerous gaps; and *Granite Mountain* is a good section but again lacks evidence of an evolving sequence across the boundary.

For the *Arrow Canyon Section*, members expressed a desire to see greater emphasis placed on a sedimentological study of the beds in the vicinity of the boundary beds where it was considered by some that there were potential imperfections in the continuity of deposition. In the case of the *Trough Springs Section*, Dr Webster informed us that there are more shales present and that with work in progress on conodonts, foraminifera and carbonate sedimentology, it may well turn out to be the better of the two sections.

Sincere thanks are extended to Gary Webster for the time and effort he put in to making this excursion a highly successful venture.

FUTURE PLANS

Having identified within the Carboniferous six potential levels at which it may be possible to place intercontinental boundaries for series/stages, the Subcommission has resolved to pursue the following action:

1. Six projects will now be initiated by the appointment of project leaders who will be asked to investigate the levels identified in Provo as being of possible interest. These

leaders will be asked to produce a report for the next Carboniferous Congress in Argentina (1991) setting out the diagnostic faunal/floral elements at their chosen level together with an assessment of the potential of that level for global correlation. The project leaders would be expected to gather around them a consultative group who can advise on possible sections which are worthy of further investigation.

- **Project 1:** A boundary at late Middle to early Late Tournaisian (Upper Tn2-Lower Tn3) (Kinderhookian-Osage boundary).
- **Project 2:** A boundary at the Latest Tournaisian - Earliest Viséan (Tn3c-V1a) (Mid Osage).
- **Project 3:** A boundary at the Middle Late Viséan (V3b approx.) (late Meramecian).
- **Project 4:** A boundary at the base of G2; *Branneroceras branneri* Zone.
- **Project 5:** A boundary at the base of *Fusulina* / *Beedeina* occurrence (Atokan-Desmoinesian boundary; mid-Moscovian).
- **Project 6:** A boundary at the base of the Kasimovian; base of the Missourian; mid Cantabrian.

Any members willing to take part in a project either as a project leader, or as a member of the advisory group which each leader will form, should contact Paul Brenckle in respect of Projects 1 to 3; or Cor Winkler Prins for Projects 4 to 6. Correlation charts indicating the chosen levels are illustrated on the next two pages.

Specifications for Potential Sections

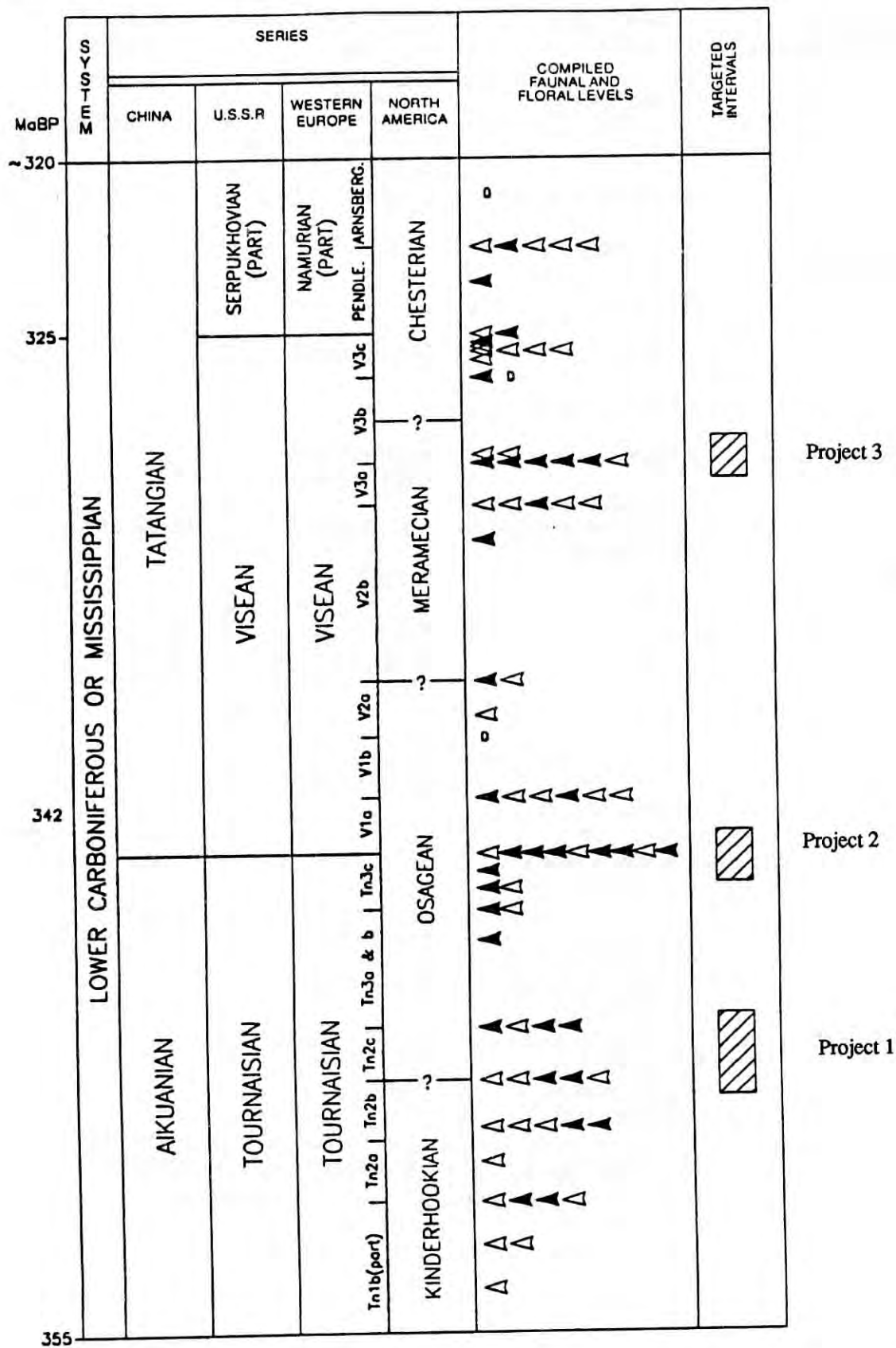
The following minimal aspects should be taken into account in the selection of potential boundary sections for the above projects:

- The chosen potential localities should be fully accessible without logistical or other restrictions.
- The section should be continuous (or composite).
- Faunal work should be completed or in progress; at least studies on evolving foraminifera, conodonts, ammonoids or spores (as appropriate) should be available.
- The chosen faunal succession should be based on specific first occurrences.
- Details of the geological setting, including tectonics and sedimentology need to have been documented or at least be under active investigation.

Reports on these projects will be presented for evaluation in Argentina and, if appropriate, short-term Working Groups will be formed to undertake an investigation of a short list of potential stratotype sections for each level.

Summary chart of biostratigraphic levels proposed for intercontinental correlation of the Lower Carboniferous (Mississippian) by P.L. Brenckle

Arrows indicate taxonomic appearances (evolutionary or otherwise) with the relatively more important events being shown in black. Stratigraphic intervals targeted for further study were chosen from those with the greatest number of more important events rather than just the total number of events



Summary chart of biostratigraphic levels proposed for intercontinental correlation of the Upper Carboniferous (Pennsylvanian) by C.F. Winkler Prins

STAGES (North America)	HORIZONS (U.S.S.R.)	STAGES (Europe)	PROJECT NUMBER	
	Sokoljegorsky	Autunian	C-P Boundary	
Virgilian	Noginsky Pavlovo-Posadsky Amerevsky Rechitsky	Stephanian C		
	Missourian	Yauzsky Dorogomilovsky Khamovnichesky Krevyakinsky		Stephanian B Stephanian A (Barruelian) Cantabrian
		Desmoinesian		Myachovsky Podolsky
Atokan			Kashirsky Tsninsky Vereisky Melekessky (Asatausky) Cheremshansky (Tashastinsky)	Westphalian A (Langsettian)
	Morrowan		Prikamsky (Askynbashsky) Severokeltmensky (Akavassky) Krasnopolyansky (Syuransky) Voznesensky (Bogdanovsky)	Yeadonian Marsdenian Kinderscoutian Alportian
			Zapaltyubinsky	Chokierian

7.0 XII INTERNATIONAL CARBONIFEROUS CONGRESS - BUENOS AIRES, 1991

by Dr. Sergio Archangelsky, URQUIZA 1132, Vincente Lopez (1638), Buenos Aires, Argentina.

CONGRESS PROGRAM

Planning is proceeding on schedule with some ten symposia being proposed for the Congress including:

- Late Palaeozoic Palynology (Playford, Owens, and Azcuy with the CIMP meeting)
- Palaeoclimates & Glaciation (O.Lopez Gamundi,...)
- Palaeomagnetism (J. Vilas, D. Tarling)
- Diastrophism and Tectonics (V. Ramos,...)
- Brachiopods (N. Sabbatini, C. Winkler Prins), and
- Palaeobotany & Palaeoecology (T. Taylor, R. Wagner)

There is also active correspondence on other subjects: Organic Material in Late Palaeozoic; Mineral Resources; IGCP Projects, etc. It is envisaged that as in previous congresses, about half will be devoted to symposia and the rest to Congress sections.

EXCURSIONS

Four pre- and post-Congress excursions (max.25 participants) are being organised: (1) Patagonia; (2) Sierras Australes of Buenos Aires; (3) Calingasta-Uspallata Basin; and (4) Paganzo Basin. There is a possibility of a fifth as well as one post-Congress excursion in Bolivia and a short pre-Congress trip in Brazil.

RESPONSE TO THE FIRST CIRCULAR

Response has been slower than expected and if you are considering attending the Congress please forward the notice of intent which was enclosed with Newsletter 6. To cover the possible need for a replacement, a duplicate slip is enclosed for mailing to Argentina. Dr. Archangelsky reports that mail strikes in Argentina could well have caused the non-delivery of some preliminary registrations and has therefore provided the following list of names of those who have registered. If you expected your name to appear and it does not then please get in touch with Sergio as soon as possible. The list includes names received up to August 6, 1989. Additional opportunities to register will be provided at the SCCS Meeting (Provo, Utah); and the II Palaeobotanical European Conference (Madrid).

The Permanent Committee will meet in Buenos Aires, after the Provo Meeting, to finalise the program and it is expected that the SECOND CIRCULAR will be ready for distribution in January, 1990.

LIST OF PROVISIONAL REGISTRANTS (TO AUGUST 6, 1989)

ARGENTINA: Andreis,R., Archangelsky,S.&A., Azcuy,C.L., Bercowski,F., Cingolani,R.N., Cuneo,N.R., Garcia,G.B., Gonzalez,C.R., Herbst,R., Hunicken,M.A., Jalfin,G.A., Lech,R.R., Melchor,R.N., Ottone,E.G., Spalletti,L., Vilas,J.F., Villar,H.J.

AUSTRALIA: Dickins,J.M., Engel,B.A., Jell, J.S., Playford,G., Roberts,J., Waterhouse,J.B.

BELGIUM: Bouckaert,J., Groessens,E., Pierart,P.

BOLIVIA: Merino Rovo,D., Sempere,T.

BRAZIL: Castro Paula,C.de, Fulfaro,V.J., Guimarães Simões,M., Lavina,E.L., Pereira Pinto,A.D., Perinotto,J.A. de J., Rocha Campos,A.C., Rosler,O.

CANADA: Bitter,P.von, Brookfield,M. Danner,W.R., Kukalova-Peck,J., Martini,I.P., Nambudiri,V., Zodrow,E.L.

CHILE: Sepulveda,H.P.J.

CZECHOSLOVAKIA: Holub,V.M.

EGYPT: Abed,M., Kholief,M.M.

FRANCE: Broutin,J., Doubinger,J.M.T., Fournier-Vinas,C.

GERMANY (WEST): Belka,Z., Breitreuz,C., Josten,K.H., Mosbrugger,V., Paproth,E., Wolf,M.

GERMANY (EAST): Schneider,J.

GREAT BRITAIN: Chaloner,W.G., Cowie,J.W., Richter,M.

HUNGARY: Kozur,H.

INDIA: Chakrabarti,N.C., Chauhan,D.K., Gupta,V.J., Kapoor,H.M., Nautiyal,D.D., Pant,D.D., Sen,S., Shah,S.C., Srivastava,P.C., Tiwari,R.S.

IRELAND: Gardiner,P.R.R.

ITALY: Grignani,D.

JAPAN: Kato,M., Kimura,T., Nakamura,K., Nakazawa,K., Ozawa,T.

MALAYASIA: Metcalfe,I.

PEOPLES REPUBLIC OF CHINA: Hu Yu Fan, Jin Yugan, Yang Jingzhi, Yang Shipu.

PERU: Alleman,V.

PORTUGAL: Oliveira,J.T., Lemos de Sousa,M.J.

SOUTH AFRICA: Visser,J.N.J.

SOUTH KOREA: Lee,C.Z.

SPAIN: Alvarez Ramis,M.C., Alvarez-Vazquez,C., Fernandez Marron,T., Wagner,R.H.

SWEDEN: Larsson,K.

THE NETHERLANDS: Krans,T.F., Schuurman,W.M.L., Winkler Prins,C.F.

UNITED ARAB EMIRATES: Alsharhan,A.S.

USA: Brenckle,P., Carter,J.L., Collinson,J.W., Dutro,J.T.Jr, Elliot,D.H., Englund,K.J., Gastaldo,R.A., Gillespie,W.H., Gilmour,E.H., Grant,R.E., Isaacson,P.E., Ling,H.Y., Pfefferkorn,H.W., Pigg,K., Ross,J.R.P., Saunders,W.B., Skipp,B.A., Spletstoesser,J., Stevens,C.H., Stidd,B.M., Taylor,T.N., Traverse,A.

USSR: Babkina,L.A., Bogomasov,V.M., Chuvashov,B.I., Gurevich,A.B., Ivanova,R.M., Kotlyar,G.V., Mogilev,A.E., Movshovich,E.V., Novikov,V.P., Oshurkova,M.V., Sal-tovskaja,V.D., Solovjeva,M.F., Vassilieva,G.N.

URUGUAY: Ferrando,L.A., Gomez Rifas,C.

8.0 WORKING GROUP REPORTS

8.1 WORKING GROUP ON THE DEVONIAN-CARBONIFEROUS BOUNDARY

by Eva Paproth, Geol. Landes. Nordrhein-Westfalen, Postfach 1080, D-4150, Krefeld, Federal Republic of Germany.

The proposal of the La Serre section (Montagne Noire, south France) as the Global Stratotype Section and Point (GSSP) for the Devonian Carboniferous boundary has been sent by the Working Group on January 27, 1989 to the International Commission on Stratigraphy of IUGS for acceptance and ratification.

A "package" of sections was proposed by the "conclave" meeting of the Working Group in Ireland, May 1988 (see Newsletter 6: 22) namely:

- La Serre as the GSSP;
- Hasselbachtal (Germany) and Nanbiancun (China) for auxiliary boundary stratotypes.

In a postal ballot, this "package" was accepted by a 70% majority of the Titular Members. Since ICS concentrates only on GSSPs and is not concerned with auxiliary stratotypes, only the La Serre Section has been forwarded to ICS/ IUGS for formal approval. Auxiliary stratotypes lie within the competence of the Working Group and need no further confirmation.

After acceptance and ratification of the GSSP, publication of a final report with descriptions of the GSSP and auxiliary stratotypes will be prepared, including comments by both Titular Members and collaborating specialists.

The publication "Devonian-Carboniferous Boundary - Results of recent studies" *Cour. Forsch.-Inst Senckenberg* 100: 1-245. Frankfurt a.M. 2.5.1988 contains the following relevant papers

Paproth, E. & Sevastopulo, G. The search for a strato-type for the base of the Carboniferous, 1-2.

Bless, M.J.M., Simakov, K.V. & Streel, M. Advantages and disadvantages of a conodont-based or event-stratigraphic Devonian-Carboniferous Boundary, 3-14.

Ziegler, W., Ji Qiang & Wang Chengyuan. Devonian-Carboniferous Boundary - Final candidates for a stratotype section, 15-20.

Garcia-Alcalde, J.L. & Menendez-Alvarez, J.R. The Devonian-Carboniferous Boundary in the Asturo-Leonese Domain (Cantabrian Mountains, NW Spain), 21-38.

Perret, M.F. Le passage du Dévonien au Carbonifère dans les Pyrénées. Zonation par conodontes, 39-52.

Flajs, G. & Feist, R. Index conodonts, trilobites and environment of the Devonian-Carboniferous Boundary beds at La Serre (Montagne Noire, France), 53-108.

Galtier, J., Meyer-Berthaud, B. & Rowe, N.P. Tournaisian plants from the "Lydiennes" Formation of the Montagne Noire, 109-118.

Legrand-Blain, M. & Martinez Chacon, M.-L. Brachiopods at the Devonian-Carboniferous Boundary, La Serre (Montagne Noire; Hérault, France): Preliminary report, 119-128.

Semenoff-Tian-Chansky, P. Corals from the Devonian-Carboniferous Boundary at La Serre (Montagne Noire, France), 129-138.

Vachard, D. Calcareous microfossils (Algae, Pseudo-Algae and Foraminifera) from La Serre, Montagne Noire, France, 139-148.

Schönlaub, H.P., Feist, R. & Korn, D. The Devonian-Carboniferous Boundary at the section "Grüne Schneid" (Carnic Alps, Austria): A preliminary report, 149-168.

Avchimovitch, V.I., Byvscheva, T.V., Higgs, K., Streel, M. & Umnova, V.T. Miospore systematics and stratigraphic correlation of Devonian-Carboniferous Boundary deposits in the European part of the USSR and western Europe, 169-192.

Becker, T. Ammonoids from the Devonian-Carboniferous Boundary in the Hasselbach Valley (Northern Rhenish Slate Mountains), 193-214.

Korn, D. On the stratigraphical occurrence of *Cymaclymenia evoluta* (H. Schmidt, 1924) at the type locality, 215-216.

Korn, D. Goniatites from the *Gattendorfia* Stufe of Hoppecke (Lower Carboniferous, Northeastern Rhenish Massif), 217-218.

Korn, D. & Thomas, E. Ammonoids from the Devonian-Carboniferous Boundary of Aprath (Velbert Anticline, Northern Rhenish Massif), 219-220.

Weissbrod, T. & Gvirtzman, G. The Late Devonian event in the Near East, 221-234.

Weyant, M. Relationship between Devonian and Carboniferous strata near the northern confines of the Bechar basin, Algeria, 235-245.

8.2 WORKING GROUP ON THE MID-CARBONIFEROUS BOUNDARY

by H.R. Lane, Amoco Production Co.USA, 501 Westlake Park Blvd, Rm 16.162, Houston, Texas 77079, USA and A.C. Higgins, BP Research, Chertsey Road, Sunbury on Thames, Middlesex, TW16 7LN, UK

On the invitation of the USSR National Committee of Geologists, the Working Group held a meeting in Kiev which was organised by the Institute of Geological Sciences of the Ukrainian Academy of Sciences and the Ukrainian Coordinating Department for Geology.

The primary objective was to visit potential stratotype sections in the Donetsk Basin. The program was as follows:

- Sept.17 - Arrival in Kiev.
- Sept.18 - Welcome to the meeting and workshop at the Institute attended by Soviet and western specialists.
- Sept.19-22 - Field meeting in Donetsk.
- Sept.23 - Final meeting at the Institute, Kiev.

The meeting was extremely well organised and very productive. The workshop sessions allowed Soviet and western specialists to compare faunas and at least to appreciate the difficulties of interpretation. The field meeting was also successful with the participants joining in the excavation of a trench to expose a particularly crucial part of the section. Joint samples, for conodont, foraminiferal and palynological study, were taken both from the trench and the outcrop sections.

A meeting of the Working Group produced a set of recommendations which would allow the Soviet geologists to improve the sections. Thanks were expressed on behalf of the Working Group to the Chairman of the USSR National Committee of Geologists, the Director of the Institute of Geological Sciences of the Ukrainian Academy of Sciences, and the staff of the Institute who ran the meeting, for the organisation of a very successful meeting,

Those attending included:

- Igor Barskov, Moscow State University, USSR
- Tatiana Belskaya, Moscow Palaeont. Inst., Acad. Sci., USSR
- P.L. Brenckle, Amoco Research Centre, Tulsa, OK, USA
- Vladimir Chermnykh, Inst. Geol., Komi Sci. Centre, USSR
- Niljifer Gilshman, Moscow Oil & Gas Inst., USSR
- Eric Groessens, Geol. Surv., Bruxelles, Belgium
- Alan Higgins, BP Research Centre, Sunbury on Thames, UK
- Rimma Ivanova, Sverdlovsk, Inst. Geol. & Geochem., Acad. Sci., USSR
- Maslo A. Kier, USSR
- Zoja Kossenko, Donbassgeologia Production, USSR
- Helena Kulagina, Geol. Inst. Bashkirian Centre, Urals Branch, Acad. of Sciences, Ufa, USSR
- R.H. Lane, Amoco Production Co., Houston Texas, USA
- Maria Makheina, Moscow Geol. Surv. & Geol. Centre, USSR
- Walter L. Manger, University of Arkansas, USA

- Natasha Maslo, Kiev Inst. Geol. Sciences, USSR
- Tamara Nemirovskaya, Kiev Inst. Geology, USSR
- Tskander Nigmatzhanov, Tashkent, USSR
- Zinoz Olyezul, USSR
- Olga Ozlova, Taskkent Inst. Geol. & Geophys., Acad. Sci., USSR
- Eva Paproth, Geol. Landesamt. Nordrh.-Westfalen, Krefeld, W.Germany
- Vladimir Pazukhin, Geol. Inst. Bashkirian Centre, Urals Branch, Acad. Sciences, Ufa, USSR
- W.H.C. Ramsbottom, University of Sheffield, UK
- Ruan Yipin, Nanjing Inst. Geol. & Palaeont., Acad. Sinica, China
- Oleg Shcherbakov, Perm Institute, USSR
- Betty Skipp, USGS, Denver, USA
- W. John Varker, University of Leeds, England
- Tatjana Vorontzova, Moscow State University, USSR
- Gary Webster, Washington State University, USA
- Yang Jingzhi, Nanjing Inst. Palaeont. & Geol., Acad. Sciences, China
- Alla Ystchenko, Kiev Inst. Geol. Sciences, USSR

A formal meeting of the Working Group was held in Donetsk and later in Kiev. The following Voting Members were in attendance: H.R. Lane (Chairman), A.C. Higgins (Secretary), P. Brenckle, O.L. Einor, W. Manger, T. Nemirovskaya, Ruan Yipin, W.H.C. Ramsbottom, B.J. Skipp, Yang Jingzhi. Chairman Lane opened the Kiev meeting by outlining the functions of the Working Group, reading the ratified proposal for a mid-Carboniferous Boundary. The previously examined potential stratotype candidates at Stonehead Beck, UK, and the Jingyuan section, China were briefly described by W.H.C. Ramsbottom and H.R. Lane respectively. H.R. Lane remarked that the detailed description and fossil group coverage given for the Stonehead Beck Section was a good model for other stratotype candidates.

The report of the Working Group's conclusions and recommendations on the Donetsk Basin stratotype candidate was then given.

The Working Group appreciates the amount of work which has been done to present these sections as a mid-Carboniferous Boundary stratotype candidate. We agree with our Soviet colleagues that the boundary lies between D lower and D upper and consider that these are important sections meriting further study. With that in mind, we present the following recommendations:

1. The precise position of the boundary needs confirmation in one or more continuously exposed, excavated and well sampled sections.
2. Confirmation by more detailed studies is needed of the correlation between the two sections Zhelvakovaya Valley and Bezmyannaya Valley.
3. Detailed examination at closely sampled intervals is needed from the base of D lower to the top of D upper, including the use of newly devised techniques for the extraction of fossils from shales, of the conodont, foraminiferal, palynomorph, plant megafossil, ammonoid, brachiopod, crinoid and ostracod distribution.
4. The significance of the sandstone units near the mid-Carboniferous Boundary needs to be assessed sedimentologically. A detailed study between D lower and D upper is needed.

5. It was recommended that the work should be completed by 1991, before the 12th International Carboniferous Congress in Argentina.

A unanimous vote to accept these recommendations was taken.

Discussion:

1. Professor Einor suggested that the presence of foraminifera in the Belgian Namurian allowed easier correlation with the USSR than with the UK. Would the Belgian sequence be a more useful succession for comparison? Eric Groessens (Belgium) stated that the foraminifera in Belgium were not present as a continuous record and that a good stratotype section did not exist at this level in the Belgian Namurian.

2. Professor Einor stated that the efforts of the Working Group were very useful but wished to suggest a different direction for progress. In the Tethyan realm, foraminifera provided the main means of correlation and can be used to recognise the mid-Carboniferous Boundary. Foraminifera will provide the major means of correlating between the USA and USSR but more work needs to be done on faunas from the USA. Paul Brenkle replied that the foraminiferal faunas of the USSR needed to be related to the proposed boundary because this was not the boundary between the currently defined Lower/Middle Carboniferous of the USSR. He suggested that the next step was to combine the faunas from the USA and USSR to pinpoint the similarities and differences. However, he felt it was up to the Soviet geologists to propose species which could be used to recognise the proposed mid-Carboniferous Boundary.

Future Plans:

1. 1989 (Sept.24-30) SCCS Meeting in Provo, Utah, visiting sections in Utah and Nevada.
2. 1990 ?Algeria, Bechar Basin.
3. 1992 ?South China, Guichau Province.

8.3 WORKING GROUP ON THE MIDDLE PENNSYLVANIAN OF NORTH AMERICA

by P.K. Sutherland, School of Geology & Geophysics, University of Oklahoma, Norman OK 73019, USA.

The Middle Pennsylvanian Working Group has now been in existence for five years, having been organized in September, 1984. The Working Group has met each year at the Annual Meeting of the Geological Society of America.

Goals have been from the beginning to foster research work of all kinds on the stratigraphy and biostratigraphy of Atokan and Desmoinesian strata in North America. In addition, we have worked towards the selection of boundary stratotypes, anywhere in North America, for the Morrowan-Atokan, Atokan-Desmoinesian and Desmoinesian-Missourian boundaries. As a part of this latter goal, members of the Working Group have taken part in field trips to examine Pennsyl-

vanian sequences in such varied areas as Arrow Canyon in southern Nevada, the type Morrowan area in northwestern Arkansas, the type Atokan area in southeastern Oklahoma and the type Desmoinesian area in Iowa.

The intentions of the Working Group are to work towards the preparation of specific proposals for formal boundary stratotypes for the above listed boundaries, to be forwarded to the Carboniferous Subcommittee.

The Working Group was diverted from the above listed goals concerning boundary stratotypes by new directions taken by the Carboniferous Subcommittee at its meeting in Beijing, China in August 1987. The item in question was the request for recommendations of possible biostratigraphic horizons in the Upper Carboniferous that might be recognisable in other parts of the world. The main discussions by the Working Group at its meetings in November 1987 and in November 1988 were concerned with this question. In February 1989, on behalf of the Working Group, I sent to Cor Winkler Prins, Chairman of the committee gathering information on Upper Carboniferous, a list of three horizons within the Pennsylvanian of North America that we believe have potential international significance. Those horizons are as follows:

1. Lowest occurrence of *Branneroceras*, *Idiognathodus* and *Pseudostafella* (within the Morrowan).
2. Lowest occurrence of *Beedeina* (= *Fusulina*) (=base of Desmoinesian).
3. Desmoinesian - Missourian boundary; somewhat below lowest occurrence of *Triticites*; at highest occurrence of *Beedeina*, *Mesolobus*, *Neognathodus* and *Gonioglyphioceras*.

On a separate matter, seven members of the Working Group, with Dr. Walter Nassichuk, Director of the Institute of Sedimentary and Petroleum Geology in Calgary, as leader, will spend nine days in July 1990 on northern Ellesmere Island, in the Canadian Arctic, examining the spectacular exposures of Lower and Middle Pennsylvanian strata. Many of the rocks are highly fossiliferous. The main emphasis will be on the examination of Middle Pennsylvanian reefs and Pennsylvanian carbonate-evaporite relations.

Members of the Middle Pennsylvanian Working Group:

- Dr. P.K. Sutherland, Univ. Oklahoma, Norman Oklahoma (Chairman)
- Mr. D.R. Boardman, Texas Tech. Univ., Lubbock, Texas
- Dr. R.C. Douglass, U.S. Geol. Survey, Washington DC
- Dr. R.C. Grayson Jr, Baylor Univ., Waco, Texas
- Dr. M. Gordon Jr, U.S. Geol. Survey, Washington DC
- Dr. J.R. Groves, Amoco Prod. Co., Denver, Colorado
- Dr. P.H. Heckel, Univ. Iowa, Iowa City, Iowa
- Dr. T.W. Henry, U.S. Geol. Survey, Denver, Colorado
- Dr. R.L. Langenheim Jr, University, Urbana, Illinois
- Dr. W.L. Manger, University, Fayetteville, Arkansas
- Dr. W.W. Nassichuk, Geol. Survey, Calgary, Alberta, Canada
- Dr. R.A. Peppers, State Geol. Survey, Champaign, Illinois
- Dr. G.D. Webster, Washington State Univ., Pullman, Washington

8.4 WORKING GROUP ON THE UPPER PENNSYLVANIAN

by Robert Kosanke, U.S. Geological Survey, Denver Federal Center, Bldg 25, Box 25046 M.S.919, Denver, CO 80225, USA

Dr. Kosanke reports that three separate palynological studies of the proposed Pennsylvanian System stratotype in West Virginia and Virginia have been published as USGS Professional Papers 1455 (Middle Pennsylvanian), 1479 (Lower Pennsylvanian) and 1486 (Upper Pennsylvanian).

8.5 WORKING GROUP ON CARBONIFEROUS STUDIES IN CHINA

by Prof. Yang Shipu, China University of Geosciences, Chengfu Road, Beijing 100083, Peoples Republic of China.

1. "The study of Early Carboniferous Stratigraphy and Brachiopods (esp. on the study of gigantoproductidae from Viséan to Early Namurian) from Western Qilianshan, Gansu, Northwestern China" was completed in May 1989 in a Masters Thesis by Mr. Li Daqing under the supervision of Professor Yang Shipu.

2. A study of Early Carboniferous Community Paleocology from Southern Guizhou, China has been completed by Mr. Zhang Jianping (PhD dissertation supervised by Professor Yang Shipu). The Carboniferous System, with abundant benthic assemblages and various lithofacies, is extremely well developed in the southern Guizhou. Based on rich field collections and previous studies, an analysis has been made of the distribution and changing patterns of these Early Carboniferous communities. Environmental reconstructions have been made in terms of community paleoecology (including autoecological studies, taphonomy, trophic analysis, sedimentological studies, organism-organism and organism-sediment relationships).

3. The group has commenced work on the compilation of a book entitled "Carboniferous System of China", in which will be included type sections, a fossil atlas, and other features. The work is expected to be completed in three years.

4. Current studies are underway on Carboniferous brachiopods from Western Yunnan, Eastern Tibet.

8.6 CARBONIFEROUS GEOLOGY AND PALEONTOLOGY OF BRAZIL

by A.C. Rocha-Campos, Instituto de Geociências, University of São Paulo, São Paulo, Brazil.

Carboniferous Conodonts. Carboniferous sediments of the Amazon (Lower - Middle) and Solimões (Upper Amazon) Basins in northern Brazil have been investigated by Lemos (in press) for their conodont faunas. Carboniferous beds in the two basins encompassing the Monte Alegre, Itaituba and Nova Olinda and equivalent formations record transgression and regression cycles with evidence of increasing aridity towards the end of the interval.

Relatively well diversified conodont faunas have been obtained from subsurface samples of carbonate rocks of 19 wells drilled in the Amazon and Solimões basins by Petrobrás (Brazilian State Oil Agency) belonging to sequences starting with widespread transgressive shales, followed up by carbonates and/or evaporites, mainly anhydrite and halite. The shales are generally radioactive, providing very useful stratigraphic markers. More abundant conodont assemblages have their occurrence associated with well developed shale sections during the Morrowan and Atokan characterised respectively by *Rachistognathus muricatus*, *Neognathodus symmetricus*, *Neognathodus bassleri* and *Adetognathus lautus*, and *Diplognathodus coloradoensis* and *Diplognathodus orphanus*.

Conodonts become scarce at the end of the Atokan in response to the accentuation of the arid conditions. Marine transgressions are less frequent in the Late Carboniferous associated with a progressive isolation and stabilisation of the basins.

CAI of Carboniferous Conodonts. The Color Alteration Index (CAI) was determined on conodonts of the Monte Alegre, Itaituba and Nova Olinda (Pennsylvanian) from 18 subsurface and outcrop samples from the Amazon Basin (Middle-Lower Amazon) and the Solimões Basin (=Upper Amazon), Northern Brazil (Rocha-Campos et al., 1988).

A generalised CAI map obtained shows values varying from 1 to >5 increasing from the margins towards the center of the basins. Corresponding isograds are in general concordant with isopachs of overburden except locally, but this seems inadequate to account entirely for thermal levels indicated by the CAI values.

The divergence may be explained either by the present deficiency in thickness due to erosion or, more probably, by heating associated with the emplacement of Mesozoic intrusives. A wide range of CAI values within a sample or along a section due to the proximity of basic intrusives could also be demonstrated.

Distribution of CAI values is consistent with known occurrences of gas and/or oil in the Paleozoic section of the Amazon Basin.

Carboniferous of the Solimões Basin, Northern Brazil. Recent discovery of gas and oil in Carboniferous sandstones of the Juruá (late Devonian - early Carboniferous) (= Monte Alegre Formation in the Middle-Lower Amazon Basin, *pro parte*) and Carauari (= Itaituba and Nova Olinda Formations) has stimulated research on the paleontology, stratigraphy and facies of the formations. The following summary is based mostly on recent papers by Apoluceno Neto & Tsubone, 1988), Silva (1988) and Cunha *et al.* (1988).

The Brazilian Paleozoic basins (Amazonas, Parnaíba and Paraná) occupy more than three million square kilometers and have challenged the oil explorationists of Petrobrás throughout the decades. Among them, the Amazonas Basin is highlighted due to its size (>1.2 million square kilometers) and physiographic peculiarities (rivers and forests). This large sedimentary area may be, from the geologic viewpoint, subdivided into two sub-basins: the Solimões and Amazonas (Middle and Lower) Basins, separated by a prominent positive feature, the Purus arch. As far as the tectonic-sedimentary evolution is concerned, the Solimões Basin shows notable differences when compared with the Amazonas Basin, mainly in structural aspects. In the Jurassic and Early Cretaceous time, the Solimões Basin was affected by a strong compressional tectonism which generated a series of NE-SW oriented thrust fault trends, with associated "en échelon" structures which have been excellent oil exploration guides.

The systematic exploration effort for petroleum and natural gas has been underway since the early 1970s, encouraged by both logistic facilities (helicopter-transported drilling rigs and support seismic crews) and excellent quality seismic data. This huge effort led to the Juruá gas-field discovery in 1978, and in 1986, to the Urucu River oil-field discovery, which constitutes the first commercial oil discovery within Brazilian Paleozoic basins.

The stratigraphic framework of the Solimões Basin was controlled by three tectono-morphological features: the Juruá Sub-basin, the Carauari High and the Jandiatuba Sub-basin. The marine incursions and coastal onlaps occurred in a west-to-east sense. The Paleozoic sedimentary section may be divided into three major depositional sequences with eight fundamental units:

Sequence I: Benjamin Constant Formation (Ordovician).

Sequence II: Jandiatuba Formation, Biá Formation, Uerê Formation, Jaráqui Formation (Devonian).

Sequence III: Juruá Formation, Carauari Formation and Fonte Boa Formation (Upper Devonian and Carboniferous - Permian).

The main reservoirs in the rio Urucu area lie in the lower portion of the Carauari Formation (Pennsylvanian) and in the upper portion of the Juruá Formation (Devonian- Early Carboniferous).

The sandstone reservoirs in the rio Urucu area are classified as subarkose and sublithoarenite, composed of quartz (72%-90%), feldspar (6%-18%), and rock fragments (1%-4%), cemented mainly by anhydrite, calcite, and dolomite. Secondary deposits include clay minerals, quartz overgrowth and pyrite.

Primary porosity was almost entirely damaged by early and late diagenetic cementation. Secondary porosity depends on the cementing process distribution (diagenetic history), composition of the rock framework, and grain size. The porosity is essentially secondary in origin, due to the dissolution of the anhydritic and dolomitic cements, feldspars and chert. Organic acids performed an important role in generating secondary porosity.

Paleoenvironmental analyses followed by the identification of at least five sedimentary facies: aeolian dune, sand sheet, interdune, sand-wave, and shoreface deposits. The best reservoirs are found in the aeolian dune facies.

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9.0 I.G.C.P PROJECT REPORTS

9.1 PROJECT 211 : LATE PALEOZOIC OF SOUTH AMERICA - REPORT OF ACTIVITIES, 1983-1988

by Arturo J. Amos, HIDRENED, Esmeralda 320 2 piso, Buenos Aires, Argentina and Sergio Archangelsky, URQUIZA 1132, Vincente Lopez (1638), Buenos Aires, Argentina.

Description

1. *Paleogeography*. Delimit the northern margins of Gondwana and Southern South America (Patagonia).

2. *Paleoclimatology*. During the Late Paleozoic South America had a wide period of glaciation in several parts. The apparent polar wandering curve must be confirmed with other evidences, as faunal and floral diversities.

3. *Paleomagnetism*. Comparison of data for Paleozoic sequences from Patagonia and the shield areas to explain some anomalous floral and faunal distributions.

4. *Tectonics*. Emphasis on the deformation events with the correlated magmatism studied from a multidisciplinary point of view, with types and recurrence of magmatic events, including geochronology. The evolution of the Late Paleozoic basins of South America, within a geotectonic framework has been included, plus the paleontological, magmatic and tectonic events at the southwest margin of Gondwana.

Summary of achievements.

During the last six years intensive research has been carried out in several Late Paleozoic basins of South America. This subcontinent is now subdivided latitudinally in three main areas, viz. Tethyan (in the north), Gondwana (in the middle) and Patagonia (the southern appendix). On the other hand, to the west is the Andean area and to the east the intracratonic area. Studies were mainly concentrated on biostratigraphy and correlations in Project 42, while tectonic, magmatic and paleogeographical aspects are being developed in Project 211, along with new researches in biostratigraphy.

Tethyan area. Recent advances have been made in the Garzon Massif, Oriental Cordillera of Colombia, where several sections 600 m (or more) thick yielded a marine Carboniferous fauna (now under study) and plant fragments (Mojica *et al.*, 1985). The early Permian may be represented in one of the sections. Also in the Oriental Cordillera, fossil ostracods (*Welleria*) and plants (*Psilophyton*, *Ginkgophyton*) have been found in Cucho Fm. (Mojica & Villaroel, 1984), suggesting a mid Devonian to early Carboniferous age. All stratigraphical data from this area (Venezuela, Colombia, Ecuador and northern Brazil) were recently summarized (Rocha Campos & Archangelsky, 1985) showing the presence of rich Carboniferous to early Permian warm water faunas, composed of about 130 species, and floral assemblages of late Carboniferous and early Permian age from Venezuela, of undoubted Amerosinian affinity. Some advances were made in northern Brazil where at least six basins

are known to occur, viz. Amazon, Alto Tapajos, Paranaíba, Jatobá and Sergipe-Alagoas (also Bahia, Matto Grosso and Rondônia areas). Previous stratigraphic schemes remain, being based on marine faunas, plant megafossils and palynomorphs (Corrêa da Silva, 1986).

Central Andean area. A long basin stretches from Perú in the north to northern Argentina in the south, crossing Bolivia. In Perú, stratigraphic studies have been recently summarized (Cadenas Aleman, 1985, V. Alleman, 1985). Litho- and biostratigraphy of the Carboniferous Ambo and Tarma Groups, and the Permian Copacabana and Mitu Groups are now better understood. Plant assemblages (mega and microfossils) seem to show close relations with the Gondwana area of South America, though doubts still exist about the precise chronology of the lower part of the sequences (Ambo Group) that may be either late lower Carboniferous or middle Carboniferous. The floristic assemblage of the Ambo Group has several common taxa with the NBG (*Nothorhacopteris-Botrychiopsis-Ginkgophyllum*) Zone of Argentina, dated in the middle to upper Carboniferous. A new stratigraphic scheme for Bolivian formations has been presented, including marine and continental biozones (Suárez Soruco, 1986). Palynozones and plant megafossil associations characterize the lower and early middle Carboniferous. However, *Nothorhacopteris szajnochai*, reported from Kasa Fm. (Azcuy & Suárez Soruco, 1984), suggests a slightly younger age. A gap seems to exist during part of the middle Carboniferous. Pollen zones *Potonieisporites-Ancistrospora-Florinites*, and the marine invertebrate *Levipustula levis* Zone are found in southeastern Cordillera (Mandiy-uti and Machareti Groups). Similar pollen assemblages were reported in northern Argentina (Azcuy & Laffitte, 1981). The finding of conodonts in the Copacabana Group allowed a detailed zonation. At the base the late Carboniferous *Idiognathodus ellisoni* - *Streptognathodus elongatus* assemblages are equivalent to the fusulinid *Triticites nitens* Zone. *Neogonolella biselli* - *Sweetognathus whitei* and *Neostreptognathodus pequopensis* - *Sweetognathus behnkeni* conodont assemblages are of early Permian age, correlated respectively with the fusulinid zones *Pseudoschwagerina texana* and *Eoparafusulina gracilis*.

Gondwana Southern Andean area.. It has been intensively surveyed. The Huentelauquén Formation in Chile (31-32° S) yielded foraminifera (*Tetrataxis*, *Eorlandinites*, *Eoschubertella* etc.), brachiopoda, bivalvia and plant fragments, suggesting a late Carboniferous to early Permian age (Nasi & Sepúlveda, 1986). In northern Chile marine sequences with invertebrates have been recently discovered, being comparable to early Permian deposits from the Argentine Puna.

In Argentina, detailed studies have been carried out in the Paganzo, Rio Blanco, Calingasta-Uspallata and San Rafael basins (Archangelsky *et al.*, 1986). Correlations between marine and continental deposits were advanced on the basis of newly proposed biozonations. Marine biozones include the *Protocanites* fauna (lower Carboniferous), and after a hiatus the *Levipustula* Zone (middle Carboniferous), the Intermediate and *Cancrinella* Zones (late Carboniferous to early Permian). Paleobotanical zones are: *Archaeosigillaria* (lower Carboniferous), the *Lepidodendropsis* flora and NBG

Zone of middle Carboniferous to early late Carboniferous and the *Gangamopteris* Zone (late upper Carboniferous to early Permian). Palynological zones *Ancystrospora-Potoniisporites* and Zone III are correlated with the NBG and *Gangamopteris* floral zones. Several research teams are now working in most units in order to establish suitable stratotypes. Depositional models in the pericratonic basins for the diamictites of the *Levipustula* Zone of the Andean Late Paleozoic from southern Bolivia to the Patagonian Basin (including the Malvinas Lafonian diamictites) are now placed in a broader model embracing several types of complex interactions between glaciomarine, nearshore and gravity flows dominated environments, pointing to a shallow paleobathymetric location, according to Lopez Gamundi (1985). Models for the diamictite bearing rocks of the Itararé were suggested by Rocha Campos (1985).

Intracratonic basins of the Gondwana area. Known paleobotanical and palynological zonations have been improved during the last years on the basis of new data (Rocha Campos & Archangelsky, 1985; Archangelsky *et al.*, 1986). The large Paraná Basin (southern Brazil, Uruguay and Paraguay), the Chaco-Paraná Basin (subsurface of central-eastern Argentina) were possibly connected with the Sierras Australes of Buenos Aires and the off-shore Colorado Basin, as suggested by palynological studies. Paleobotanical data, on the other hand, suggest a close relation between the Malvinas (Falkland) islands and the Sierras Australes of Buenos Aires.

Patagonian area. Traditionally related to the Gondwana, new paleobotanical studies suggest that Patagonian paleofloras, though having some common elements with other Gondwanan regions, were different. A new biozonation has been proposed (Archangelsky & Cúneo, 1984), based on field studies in the Tepuel-Genoa Basin and La Golondrina area. Lycophyte forests, abundant tree ferns, sphenophyllales, etc., suggest warmer conditions than those presented in paleogeographic reconstructions. Taxa of paleoequatorial affinities, suggest their migration from lower latitudes. There is a high content of endemic taxa in these associations. Marine faunas have been found in all the Tepuel Group, and correlated with the *Levipustula* - *Cancrinella* biozones, suggesting similar conditions to those found in other Argentinian basins (González 1984).

Magmatism and Diastrophism.

Late Paleozoic magmatism is very important in the Andean western basins, specially north of latitude 43° in the Macizo Norpatagónico, Sierras Pampeanas, Cordillera Frontal, Pre-cordillera of San Juan and Mendoza, Bloque de San Rafael and Puna of Argentina (Caminos, 1985). Two cycles of magmatic activity can be distinguished: a) Lower Carboniferous and b) Permo - Triassic. The former are plutons intruding well deformed Lower Paleozoic rocks in the Cordillera Frontal of Mendoza (337 to 341 m.y.; K-Ar). The Permo-Triassic cycle intruded Late Paleozoic rocks, and volcanics (Choiyoi Group) with thick flows covering the Late Paleozoic (with ages between 252-219 m.y.). Two principal NNW trending belts are distinguished in Chile: a fore-arc and a magmatic arc. The first, within coastal meridional domain formed of schists, marble, cherts and ultrabasic bodies, was affected by a polyphase deformation. An intermediate domain within this belt, of sandy-shaly sequences slightly deformed are found. On the other hand, the magmatic arc is the continuation of the plutonic volcanic complex (Choiyoi)

of the Argentine Cordillera Frontal. Sandy limestones and limestones of an intra-arc zone are part of this belt. The petrotectonic association of the coastal and intermediate domains of Chile can be interpreted as a subduction complex accreted to the Pacific border of Gondwana during the Late Paleozoic (Parada and Hervé, 1985).

Intrusive igneous rocks to the north, in Perú, are large bodies of granitic rocks of 260 to 238 m.y., according to Rocha Campos *et al.* (1978) and Lancelot *et al.* (1978). Rhyolites, dacites and andesites in the Mitú Formation of the Cordillera Oriental of Perú to Northern Bolivia, are perhaps middle Permian to lower Triassic (Alleman, 1985). In Colombia, granodiorites and andesites intrude Late Paleozoic to Triassic rocks (Saldaña Formation), perhaps corresponding to a late magmatic phase producing contact metamorphism (Mojica *et al.*, 1985).

From paleomagnetic data the position of South America during the Late Paleozoic is now better determined as suggested by Valencio, Vilas and Oviedo. From Tournaisian to Viséan, South America moved from about present latitudes toward higher ones; in late Viséan, southern Africa was near the South Pole, and then Gondwana moved to lower latitudes so that South America was situated in latitudes similar to the present. Climate, therefore, changed progressively from cold to warmer.

Further ideas concerning probable allochthonous terrains and the southwest margin of Gondwana have had strong support from various lines of research.

Plans for future investigations.

Biostratigraphic work has to be developed in several critical areas, where fossils have only been mentioned but never described. Old schemes have to be revised. This situation is true for most of the Tethyan area and the ecotonal region of Gondwana. Here, taxonomy is better known, though improvement in biozonations, both in marine and continental sequences are needed. A strong effort has to be made with the Patagonian faunas and floras that seem to be somewhat different from traditionally known biota in other areas of South America.

New paleomagnetic evidences are needed in critical areas to confirm the nature of probably mobile plates that existed around the southern margin of South America. In this context, studies on the intensive magmatic activities that characterize parts of the central and southern Andes have to be developed in order to understand the different phases, their precise chronology and bearing on the plate tectonics.

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9.2 PROJECT 211: LATE PALEOZOIC OF SOUTH AMERICA - REPORT OF 5th MEETING IN CHILE

by S. Archangelsky, URQUIZA 1132, Vicente Lopez (1638), Buenos Aires, Argentina.

Date : August 11, 1988

Place : Santiago de Chile, CHILE (V Congreso Geológico Chileno)

Scope of Meeting : This 5th meeting of the Working Group, organized by the Chilean representative of the 211 Project (Dr. Patricio Sepúlveda), was devoted to a discussion of paleogeographic aspects (and related tectonism - magmatism) of SW South America and related biostratigraphic aspects, in order to achieve a better chronological precision of events. A brief administrative section with a report on the Project achievements was also on the agenda.

Achievements of Meeting. Six talks on paleogeography, paleomagnetism and magmatism-tectonics in Chile, NW - W Argentina, Patagonia and Antarctica were presented by specialists from Chile, USA and Argentina. After each talk there were discussions, partly centered on the probable allochthonous terrains and the SW margin of Gondwana. Paleontological data were also included in the discussion. Two talks on regional geology of Chile and Colombia and a new biostratigraphic scheme for the marine sequences in Argentina were also presented. The meeting was attended by 20 participants from Chile, Argentina, Colombia, Bolivia, France, USA and Germany who actively participated in the discussions. The meeting lasted four hours, with ten minutes being devoted to an administrative report by the co-leader (S. Archangelsky).

Outcome of Meeting. Abstracts of presentations will be published together with the contributions for the next meeting (Belem do Pará, Brazil, November 1988).

Other data. The Meeting was presided by S. Archangelsky (co-leader of Project 211) and the Chilean delegates, Patricio Sepúlveda and Humberto Padilla. The co-leader gave a brief report that included the IGCP Board considerations about the Project, cooperation with IGCP Projects 237 and 272, organization of the next XII International Congress on the Carboniferous - Permian Stratigraphy and Geology (Buenos Aires, 1991), and the next meeting to be held in Belem do Pará, Brazil.

The next block was devoted to the SW Pacific margin of Gondwana, during the Late Paleozoic, regional geology and biostratigraphy in the following order :

J. Davidson: Devonian, Carboniferous and Permian of northern Chile. Present knowledge about the paleogeography.

V. Ramos: The Neopaleozoic of Patagonia and Antarctic Peninsula.

C. Mpodozis: Neopaleozoic magmatism in Chile.

R. Forsythe: Paleomagnetic constraints of the Late Paleozoic in Chile.

J. Vilas: Late Paleozoic geodynamic evolution of the Southern Andes on the basis of paleomagnetic studies.

H. Padilla: The Late Paleozoic sedimentation in the Sierra de Vares, Cordillera de Domeyko.

C. González: Late Paleozoic biochronology of marine strata in the Argentine Pre-cordillera.

O.G. Arrondo and A. Cuerdo: The first continental event in the Gondwana of the Argentine Pre-cordillera.

J. Mojica: Late Paleozoic geology of Colombia.

Apart from the speakers, the following people attended the meeting : E. Morel, D. Ganuza, C. Rapela, N. Ramos from Argentina, V. Covacevich from Chile, T. Sempère from Bolivia, R. Marocco from France and C. Breitreutz from Germany.

9.3 PROJECT 211: LATE PALEOZOIC OF SOUTH AMERICA - REPORT OF 6th MEETING IN BRAZIL

by S. Archangelsky, URQUIZA 1132, Vicente Lopez (1638), Buenos Aires, Argentina.

Date : November 8, 1988.

Place: Belem do Pará, BRAZIL

Scope of Meeting: The 6th meeting of the Working Group, organized by Dr. Zuleika C. Corrêa da Silva and Dr. Marleni M. Toigo (National Leaders of the Brazilian Working Group of Project 211) took place at the Centro de Conveções. The meeting was mainly devoted to stratigraphic, coal and uranium problems.

Achievements of Meeting: Papers concerning the stratigraphy of Argentina, Brazil and Perú, coal geochemistry of Brazil and finally Argentine uranium deposits during the Late Paleozoic were presented. The meeting was very fruitful due to the participation of Brazilian, Equatorial and Peruvian delegates. The importance of the restudy of the classical Paracas coal-bearing area in Perú was demonstrated in the revision of the paleoflora performed by V. Alleman. These assemblages, located in ecotonal areas between Gondwanan and equatorial paleofloras, show warm-temperate conditions. Another important contribution was a diagnosis of the Late Paleozoic uranium deposits of Argentina presented by S.A. Gorustovich. The geochemical studies of Gondwanan coals in the Parana Basin of Brazil, using modern techniques are showing important differences with the components that characterize equatorial coals; this new line of investigation is directly related to economic considerations in regard to the coals of other Gondwanan components. Finally, a new palynological biozonation for the Permian, responding to the Code rules was proposed for the southern area of the Brazilian Parana Basin by M.M. Toigo.

Outcome of Meeting: During both administrative and scientific sessions, the possibility of a Workshop at the site of Paracas (Perú) was recommended. This meeting will take place next year. However, as field conditions due to political

problems in Perú are difficult to overcome, a second alternative was suggested: a field meeting in Loja, Ecuador, during the 2nd Geological Congress organised by the Colegio de Geólogos (November 14-18, 1989).

The program for the scientific sessions at Belem do Pará contained the following:

H.Sessarego, A.J.Amos, W.Teixeira, K.Kawas-hita & M.Remesal: Indicios de magmatismo hipabisal Eocarbónico en la Precordillera de San Juan y La Rioja, Argentina.

M. Zamora: Los terrenos magmáticos tectónicos del Paleozoico Superior de Ecuador.

S.A. Gorustovich: Depósitos uraníferos del Neopaleozoico de Argentina.

V. Alleman: Advance report of the Paracas Carboniferous paleofloristic studies in the Southern Coast of Perú.

M.M.Toigo: Palynobiostatigraphy of the South-ern Brazilian Neopaleozoic Gondwana sequence.

Z.C.Corrêa da Silva: (a) The rank evolution of South Brazilian Gondwana coals on the base of different chemical and physical parameters, (b) The formation of coal deposits in South Brazil.

Z.C.Corrêa da Silva et al.: (a) The problem of rank determination of some southern Brazilian coal seams, (b) Petrografia das frases de beneficiamento dos carves da Jazida do Faxinal, RGS, Brazil.

Other data. Abstracts of the papers presented at both the Chile and Brazil meetings will be published in December 1988 in the usual form, for distribution to the members of the IGCP 211 Project and several other interested scientists. It should be noted that research conducted with-in this Project is directly related to the XII International Congress on the Carboniferous and Permian Stratigraphy and Geology to be held in Buenos Aires, Argentina, in September 1991.

9.4 PROJECT 272 - LATE PALAEOZOIC AND EARLY MESOZOIC CIRCUM-PACIFIC EVENTS

by J.M. Dickins, Project Leader, Bureau of Mineral Resources, P.O. Box 378, Canberra, A.C.T. 2601, Australia.

Scope of Project. In view of the possible wide scope of this project, and taking into account that the project has followed on from IGCP 203 Permo-Triassic Events of the Eastern Tethys, some brief planning comments follow on how it is intended to obtain practical, concrete results within the limits of the time and resources available.

Further work on the Permo-Triassic boundary is clearly desirable, particularly in connection with establishing a boundary stratotype, but since this matter is not likely to be resolved shortly, more specific targets have been set on the tectonic and magmatic-volcanic activity which is connected with the boundary.

Other striking boundaries already reflected in the traditional World Stratigraphic Scale are the Carboniferous-Permian Boundary, the mid-Permian Boundary and the lower bound-

aries of the Middle and Upper Triassic. All these boundaries are associated with widespread regressive-transgressive events and important tectonic and, in some or perhaps all cases, magmatic events. To obtain more extensive and reliable information on these events would offer a framework for understanding associated mineral development as well as geochemical changes in the sea, on the land and in the atmosphere. Possibly geomagnetic changes are also related.

Although study of events at other times are not precluded, concentration on these major events is warranted. Precise information, for example, is lagging behind the data available on the scope and nature of the events associated with the beginning of the Middle and Upper Triassic. Even if the Project allows some advance on this alone, it will have served a very useful purpose.

Overall study of the climate of the Permian and Triassic is meagre, and the integration of climatic work with other information from the Project could prove most interesting.

Meeting Schedule.

1). A business and organizational meeting will have been held in association with the IGC in Washington, D.C. in July 1989 by the time this Newsletter is published.

2). A scientific meeting will be held at the University of Newcastle, NSW, Australia on Friday, February 2, 1990 preceded by a three day field trip to examine Carboniferous, Permian and Triassic sections in the northern Sydney Basin and the southern part of the New England Fold Belt. Costs are not expected to exceed A\$400, including six nights accommodation.

3). Immediately following, a meeting will be held at the University of Otago, Dunedin, New Zealand in association with the 2nd International Brachiopod Congress (February 5-9, 1990). The meeting will be held on the evening of Friday, February 9 and on the morning of Saturday, February 10, followed by participation in the Southland Excursion which will leave in mid-afternoon. For this New Zealand part it will be necessary to register DIRECTLY with the 2nd International Brachiopod Congress as soon as possible.

The Australian meeting will concentrate on the Carboniferous and Permian, and the New Zealand session on the Triassic although the program will not be mutually exclusive.

4). An invitation has been accepted to hold a meeting in association with the XII International Congress on Carboniferous-Permian Stratigraphy and Geology, Buenos Aires, Argentina, September 22-27, 1991. Preparations are also underway to hold meetings on the NW and NE Pacific and Professor Giuseppe Cassinis has invited the Project to hold a meeting in Italy. These activities offer the likelihood of a busy program before the Project is due to finish at the end of 1992. Comments on these plans and the program are invited and should be sent directly to the Project Leader.

10.0 CONTRIBUTIONS BY S.C.C.S. MEMBERS

10.1 AUSTRALIAN STUDIES

10.1.1 POSSIBLE YOUNGER CARBONIFEROUS ROCKS AND FAUNAS IN EASTERN AUSTRALIA

by J.B. Waterhouse, Department of Geology & Mineralogy, University of Queensland, St. Lucia 4067, Australia.

The youngest fauna of indisputable age in eastern Australia is the widespread *Levipustula levis* fauna; some stratigraphic distance higher, there occurs a productid dominated complex of faunas, with genera regarded as typically Permian, such as *Echinalosia*, *Costatumulus*, *Magniplicatina*, and *Terrakea*, accompanied by Gondwanan bivalves such as *Eurydesma*, *Deltopecten*, *Etheripecten* and *Vacunella*. The *Levipustula* fauna is no older than Bashkirian, the Permian fauna no older than Sakmarian. Waterhouse (1987, 1988) has argued that the intervening faunas, found for example in the Rands-Burnett beds of the Yarrol Basin, and the Fairyland-Dresden beds of the southeastern Bowen Basin, are mostly Late Carboniferous, based on affinities with Siberian brachiopods, and bryozoans (Engel, 1975). The intervening faunas are, with meagre exceptions, mostly of "Permian" aspect, and so are readily confused with later Permian forms. A similar arrangement is found in the Northern Hemisphere, where Late Carboniferous faunas, especially amongst brachiopods and bivalvia, are difficult to distinguish from basal Permian (Asselian, Sakmarian) faunas. The actual Carboniferous-Permian boundary placement depends very much on how the World Permian is defined. Palynologists generally argue for a position higher than that favoured by invertebrate palaeontologists, and so would now incorporate the well known "Allandale" *Eurydesma* faunule in the Carboniferous, rather than Permian as favoured by bivalve-brachiopod workers. This position would also agree with Chinese studies, in which the Maping-Asselian is regarded as Late Carboniferous. The Chinese now name their basal Permian "Longyinian", with a distinctive fauna traced through China into Tibet. A new, moderately well developed fauna allied to the Tibet Longyinian is now found in the gold-bearing slates of the upper Rammutt Formation at Gympie. The level is widespread in northeastern Gondwana and is characterised by members of the *Cancrielloides* - *Bandoproductus* - *Lyonia* productid brachiopod suite which also occurs in Tibet, Thailand, Western Australia and the Yarrol Basin.

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tonics and Metallogenesis, Dept Geol. Geophys. Uni. New England, Armidale, NSW Australia 86-92.

10.1.2 ZIRCON DATING OF THE LATE PALAEOZOIC OF AUSTRALIA

by John Roberts, Department of Applied Geology, University of New South Wales, PO Box 1, Kensington, NSW 2033, Australia.

A joint project between John Roberts, University of New South Wales, Dr. John Claoue-Long, BMR Post-doctoral Fellow at the Australian National University, Dr. Peter Jones of the Bureau of Mineral Resources, Geology & Geophysics (BMR), and Professor W. Compston, Research School of Earth Sciences, Australian National University (ANU), is using zircons from biostratigraphically locatable volcanics to establish firm dates within the Late Palaeozoic succession of eastern Australia. The zircons are dated by the SHRIMP ion probe at ANU which is capable of determining the U-Pb ages from single lamellae within zircon crystals. Because of the relatively young ages of the Late Palaeozoic samples, the analytical procedure takes approximately two days of machine time (10 hours per day) to determine an age with an acceptable probability; some samples have an analytical accuracy of plus or minus 1.8 Ma.

Roberts' part of the project, which is oriented predominantly towards the Carboniferous, is funded by the Australian Research Council, and the remainder by the BMR-APIRA Phanerozoic History of Australia Project (APIRA is a division of the Australian Mineral Industries Research Association).

The main objectives (not in any priority order) of the project are to date:

1. The Frasnian-Famennian boundary located between volcanics and limestones with *Palmatolepis gigas* and mudstone containing *Cheiloceras*.
2. Famennian strata containing *Platyclymenia* and *Genuclymenia*. Both 1 and 2 will be accomplished in the Keepit region of the northern Tamworth Belt in the southern New England Orogen.
3. The Devonian-Carboniferous boundary by determining the age of units from the southern New England Orogen and Hasselbachtal, Germany, both of which contain conodonts of the *Siphonodella sulcata* Zone.
4. The Carboniferous brachiopod zones of eastern Australia, particularly the *Schellweinella burlingtonensis*, *Orthotetes australis*, *Delepineia aspinosa*, *Rhipidomella fortimuscula*, *Marginirugus barringtonensis* and *Levipustula levis* Zones (Roberts, 1975) by dating volcanics which underlie, intertongue with and overlie fossiliferous marine sediment in the southern New England Orogen (Roberts & Engel, 1987, fig.2). The age of the top of the *L. levis* Zone is an important objective because that zone can be used to correlate between Australia and South America. The age of the top of the zone

cannot be determined by biostratigraphic means because the fauna is restricted to Gondwana and cannot be related with northern hemisphere assemblages. In all except one section in eastern Australia, Carboniferous rocks overlying the *L. levis* Zone are non-marine. With the exception of the uppermost part, the Carboniferous marine section can be correlated with classical areas of the northern hemisphere on the basis of conodont, ammonoid, trilobite and brachiopod faunas. Because brachiopods are the predominant fossils, they are used for correlation throughout eastern Australia. Within the marine sequence, it may be possible to suggest ages for the Tournaisian-Visean and Visean-Namurian boundaries.

5. The Late Carboniferous non-marine units of the southern New England Orogen, particularly the glacial succession which contains the *Potonieisporites* Microflora (Kemp et al., 1977).

6. The Carboniferous-Permian boundary as utilised within Australia. A combination of a marine regression and the onset of glaciation and its attendant restricted floras and faunas renders it virtually impossible to correlate with precision between the Late Carboniferous and Early Permian of eastern Australia and elsewhere in the world.

7. The Permian marine invertebrate faunas of the Sydney and Bowen Basins, including the Allandale fauna (Runnegar, 1969) and Faunas II and IV of Dickins (1976).

8. The Late Permian coal measures of the Sydney and Bowen Basins.

Preliminary work involved 'tuning' the ion probe to cope with young zircons (it had primarily been used to date rocks from the Precambrian craton of Australia), prior to checking the ages of previously dated horizons from the Carboniferous of the New England Orogen (Roberts & Engel, in press). These volcanics included the Martins Creek Ignimbrite Member of the Gilmore Volcanic Group, the Paterson Volcanics and an unnamed pyroxene andesite within the Waverley Formation which has recently appeared on the international geological time scale (Cowie & Bassett, 1989) following publication of a date determined by AMDEL for J. Roberts (Jones, 1988). These three volcanics had been dated by K-Ar methods in earlier projects (e.g. Roberts & Oversby, 1974). The majority of K-Ar dates remain unpublished because of poor results from weathered volcanics (e.g. projects initiated by J. Roberts and also B. Runnegar, J. Roberts and J.D. Kleeman). On the basis of K-Ar determinations, the Martins Creek Ignimbrite has an age of between 331 and 328 Ma, the Paterson Volcanics 308 Ma and the unnamed pyroxene andesite 341 Ma.

Papers outlining new ages for Carboniferous volcanics and their significance to the Chronological Time Scale are currently in early stages of preparation. They should begin appearing in the literature in 1990.

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10.2 CANADIAN STUDIES

10.2.1 CARBONIFEROUS FLORAL STUDIES

from Erwin Zodrow, University College of Cape Breton, P.O.Box 5300, Sydney, Nova Scotia, B1P 6L2, Canada.

Erwin reports that he has just sent to press a monograph addressing the biostratigraphic problem of the cyatheoid fossils (marattialean ferns, Group *Pecopteris arborescens*), after having studied types and related material that have been deposited in 15 museums or institutions. Associated travels took him to China, Europe (east & west), and USA.

He has also just teamed up with Zhifeng Gao (PhD, Cardiff), a postdoctoral fellow at the University College of Cape Breton, to investigate epidermal structures of a wide range of marattialean, medullosean and related compression foliages from the Westphalian/Cantabrian strata of the Sydney Coalfield. The aim is to catalogue characteristics for taxonomic utility and ultimately for biostratigraphy.

As an invited scientist to the Polish Geological Survey (Warsaw) and Wrocław University (Wrocław), collaborative investigations are in progress for homotaxial correlations, using microfloras: Upper Silesia - Europe - Sydney Basin, Nova Scotia.

Erwin is also investigating the distribution of geochemical elements in coals of the Sydney Coalfield, Nova Scotia. Over

the past 18 years he has catalogued a very extensive collection of hydrated sulfate minerals that formed after pyritic oxidation in coal. Mineral donations have been made to the Smithsonian Institution, Washington; Mineralogical Museum, Paris; and the Geological Survey of Canada, Ottawa.

10.2.2 CANADIAN PALYNOLOGICAL STUDIES

from John Utting, Institute of Sedimentary and Petroleum Geology, 3303, 33rd St.NW, Calgary, T2L 2A7, Canada.

Current palynological research of the Carboniferous of Canada concerns mainly the Canadian Arctic Archipelago (Sverdrup Basin) and the Yukon. Preliminary zonations based on miospores have been proposed for rocks of Viséan to Gzhelian age for both these areas, and summaries have been published (Utting, 1989; Bamber et al., 1989). In association with M. Jachowicz and A. Jachowicz (University of Silesia), work has recently been completed on the non-marine Viséan oil shales of the Sverdrup Basin. Correlations have been made with Western Europe and Spitsbergen allowing relatively precise age determinations to be made (results in press). In Atlantic Canada, work has been carried out in association with J.D. Keppie and P.S. Giles (Nova Scotia Department of Mines and Energy) on a preliminary zonation for the Tournaisian. Detailed correlations are proposed with Western Europe (results in press).

10.2.3 CARBONIFEROUS - PERMIAN BASIN ANALYSIS IN THE CANADIAN ARCTIC

from Benoit Beauchamp, Institute of Sedimentary and Petroleum Geology, 3303, 33rd St.NW, Calgary, Alberta T2L 2A7, Canada.

The Geological Survey of Canada is currently assessing the upper Paleozoic basin analysis of the Sverdrup Basin, Canadian Arctic. This long-term project will provide a basin-wide understanding of the stratigraphy, paleoenvironments and economic potential of the 12 km thick Carboniferous and Permian succession of the Sverdrup Basin. Data from surface exposures and subsurface wells, as well as from seismic profiles, are being integrated for defining the long-term transgressive-regressive sequences of the basin. Various environmental aspects of volcanic, evaporitic, clastic, and carbonate rocks are also being investigated, with emphasis on the spectacular reef succession that rims the basin. The environmental study of both marine and non-marine strata will also provide a thorough understanding of the climatic changes that took place throughout the studied time interval. A number of scientists are attached to the project, dealing with specific aspects of the succession. These include C.M. Henderson, E.W. Bamber, S. Pinard, W.W. Nassichuk, B.L. Mamet, and J. Utting (Biostratigraphy); P. Thériault, and B. Rust (Sedimentology); L. Snowdon, and F. Goodarzi (Organic Geochemistry); G.R. Davies, H. Majid, and T. Brent (Subsurface Correlations); J.C. Harrison (Structural Geology).

In the summer of 1989, some of these scientists will return to Ellesmere Island in order to carry out detailed field work in an area of remarkable exposures. Emphasis will be given to: the Permian-Triassic boundary; the sedimentology of the

Upper Carboniferous redbeds; sequence analysis; coral, conodont, fusulinid, and palynomorph biostratigraphy; reef analysis; and facies mapping and correlations.

A number of papers have been or will soon be published on various aspects of the project. These include preliminary accounts of the Carboniferous and Permian carbonate buildups (*Can. Soc. Petrol. Geol. Memoir* 13, 1989); a preliminary assessment of the long-term sequences of the Sverdrup Basin (*Geol. Surv. Can., Paper* 89-1G, 1989); and a detailed paleoenvironmental, isotopic, and diagenetic study of upper Paleozoic *Microcodium* (in preparation).

10.2.4 LARGER FORAMINIFERA FROM THE CANADIAN ARCTIC

from Bernard L. Mamet, Département de Géologie, Université de Montréal, Montréal, P.Q., H3C 3J7, Canada.

Bernard reports that he is currently working with S. Pinard on samples collected by W. Nassichuk, G. Davies and B. Beauchamp (Geological Survey of Canada). They plan to establish a foraminiferal zonation ("Endothyrids") through the Carboniferous and Permian of the Sverdrup Basin.

In the Canadian Arctic, carbonate - evaporite sedimentation started in the Early Namurian Zone 18 and it is quite easy to recognise Zones 19-25 and to tie them with European standards (Bashkirian - Moscovian). Late Carboniferous microfauna is very poor and only fusulines are characteristic of the Orenburgian - Ghzelian levels. In the Asselian - Sakmarian, six foraminiferal zones enable correlations throughout the basin, but comparison with the Urals needs further work.

Charles Henderson (University of Calgary) has recently finished a PhD thesis on conodonts of a similar stratigraphic succession. He identified six zones in the Carboniferous and also six in the Asselian - Sakmarian. They can be tied in with the smaller foraminifera.

Endothyrids are much less prolific in the Arctic than in the Tethys. There are many broken phylogenies and there is a strong diachronism among some genera. In spite of these drawbacks, they have proven to be useful for short and long range correlations.

10.2.5 SMALL FORAMINIFERA OF THE CARBONIFEROUS AND LOWER PERMIAN, SVERDRUP BASIN

from Sylvie Pinard, Département de Géologie, Université de Montréal, C.P. 6128, succursale "A", Montréal, Québec H3C 3J7, Canada.

Small foraminifera of the Sverdrup Basin in the Canadian Arctic, have been studied, described and illustrated for the first time in a PhD thesis supervised by Dr. B. Mamet. The samples of more than forty stratigraphic sections measured in different sedimentary settings throughout the basin, were made available by the Geological Survey of Canada in Calgary (ISPG). Approximately four thousand thin sections were examined under a transmitted light microscope.

Fifty-seven genera and one hundred and sixty-two species were identified from the Namurian - Sakmarian sequences thus permitting the establishment of a biostratigraphic scheme designed to correlate sections across the basin. The thesis includes the description of ten new genera and twenty-two new species. Fifteen assemblages were recognised and described; of these, only the post-Moscovian Upper Carboniferous contains a poorly developed fauna. Until now, the small foraminifers of the Lower Permian have been overlooked despite their stratigraphic potential. In the Sverdrup Basin, they are as useful as the associated fusulines for detailed biostratigraphic correlation.

An arbitrary Carboniferous - Permian boundary has been based on the appearance of abundant *Protonodosaria*. This limit is supported by conodont and fusuline data and corresponds to a proliferation of small foraminifera, although some of these foraminifera genera are slightly diachronous in comparison to the USSR.

With the inclusion of the eurasian endemic form *Janischewskina*, the Namurian - Bashkirian fauna of the Sverdrup Basin are not characteristic of the North American realm. A comparison of the succeeding microfauna is difficult to make because of limited detailed data in the literature. During the Permian, the diversity and abundance of foraminifera are not typical of either warm or cold water microfauna and probably represent temperate conditions.

Few samples of post-Sakmarian sediments were examined with only two genera and seven species being described. They show good potential for stratigraphic correlation. The small foraminifera can be an important tool for those sediments where fusulines are lacking.

10.2.6 FORAMINIFERAL STUDIES

from Wilbert R. Danner, Department of Geological Sciences, University of British Columbia, 6339 Stores Rd, Vancouver, B.C. V6T 2B4, Canada.

Recent research by Dr. Danner has been concentrated on the re-study of the "early Pennsylvanian" limestones of the Quesnellia Terrane. The primitive fusulines of the *Eostafella* fauna contained in these rocks are now believed to be of Late Mississippian age rather than Pennsylvanian. This has been further indicated by the conodont studies of Dr. Mike Orchard of the Canadian Geological Survey. This means that the largest and most widespread limestone units of the Chilliwack Group of southwestern British Columbia and northwestern Washington, and the Harper Ranch Group of south central British Columbia are of Late Mississippian age. A study of the coral *Hexaphyllia* in these rocks is being followed up in collaboration with Dr. Kimiyoshi Sada of Hiroshima University, Japan.

Dr. Danner reports that he has retired as of July 1, 1989 but will remain at the University and will teach a third year course for Arts students on the Geology of Canada and its resources. Retirement plans include the completion of the mapping and study of the fusuline faunas of the Cache Creek Group in British Columbia and Washington with Merlynd Nestell of the University of Texas. Dr. Danner was given the teaching Excellence Award for 1988-89 by the University of British Columbia Science Undergraduate Society.

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11.0 SERVICE ANNOUNCEMENTS

11.1 EUROPEAN MAPS FOR SALE

SOUTH-WEST BORDER OF THE EAST EUROPEAN PLATFORM; LITHOLOGICAL - PALAEO- GEOGRAPHICAL MAPS 1:1,500,000

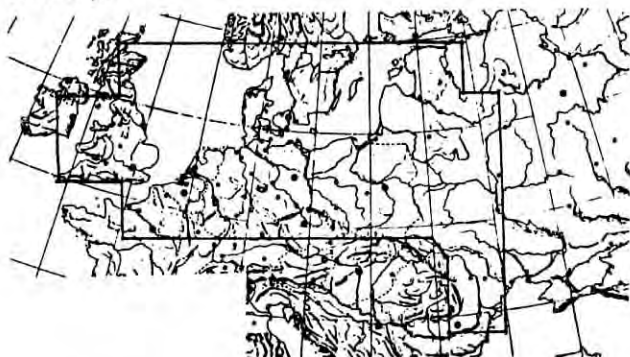
IGCP Project 86 has sponsored the preparation of a series of sixteen maps edited by the Zentrales Geologisches Institut Berlin under the direction of K.-B. Jubitz, J. Znosko, D. Franke and G. Katzung. The series includes fifteen lithological-palaeogeographical maps and one tectonic map, each in two parts (east, west), with explanatory text. The full series will cover:

- | | |
|-----------------------|------------------------------------|
| • 1. Middle Cambrian | • 9. Middle Bunter (Buntsandstein) |
| • 2. Llanvirnian | • 10. Muschelkalk |
| • 3. Ludlovian | • 11. Pliensbachian |
| • 4. Givetian | • 12. Oxfordian |
| • 5. Upper Viséan | • 13. Albian |
| • 6. Westphalian A/B | • 14. Turonian |
| • 7. Saxonian | • 15. Eocene |
| • 8. Stassfurt-Series | • 16. Tectonic Map |

Each map will show multicoloured, palaeogeographical conditions (shallow seas, littoral plains, lakes and swamps, volcanic areas, denudation areas, clastic influx, etc.), characteristic features of rocks, isopachs, 6-8 inset maps 1:10,000,000 (thickness, adjoining geological areas), in two parts (together 160x118 cm).

Five of the maps are now available but as yet no explanatory notes have been released. The five maps include (6) Westphalian A/B (1985); (7) Saxonian (1985); (9) Middle Bunter (1985); (12) Oxfordian (1987); and (16) Tectonic Map (1986), with 2 inset maps showing the arrangement of the main structures of the Platform Cover and Basement. This map (16) is now the largest scale tectonic map of the area.

The price of each map is DM 120 with the Standing-Order price being DM 100 per map. They are available from International Landeskartenhaus "GeoCenter", Schockenriedstrasse 40a, Postfach 80 08 30, D-7000 Stuttgart 80, West Germany.



11.2 UPPER PALAEOZOIC PALAEOBOTANICAL MEETING

Venue: Jardín Botánico de Córdoba, Córdoba, Spain

Dates: April 16-20, 1990

Organisers:

R.H. Wagner (Córdoba);

C. Alvarez-Vázquez (Córdoba)

M.C. Diéguez (Mus.Nac.Ciencias Naturales, Madrid)

M.J. Lemos de Sousa (Univ. Porto)

Aim of Meeting: 1. To acquaint palaeobotanists with the fossil floras recorded from the Carboniferous and Permian of the Iberian Peninsula. 2. To promote discussion on the distribution of Late Palaeozoic floras.

Changed Dates: The Committee apologises for the change of dates from September 1989, when this meeting was intended to follow the European Palaeobotanical Meeting in Madrid.

Program:

- **Monday, April 16:** Arrive in Madrid; register at the Museo Nacional de Ciencias Naturales; travel by coach to Puertollano.
- **Tuesday, April 17:** Visit Emma Opencast Mine of ENCASUR for collecting; bus to Córdoba.
- **Wednesday, April 18:** Meeting, papers, etc. in the Botanical Garden.
- **Thursday, April 19:** Symposium on the distribution of Late Palaeozoic floras in the World; evening entertainment.
- **Friday, April 20:** Visit Peñarroya Coalfield and Valdeinfierno.

Registration Charges-

- 32.000 pts (shared accommodation)
- 35.000 pts (single accommodation)

Field trip to Peñarroya/Valdeinfierno (incl. one extra night in Córdoba; bus fare; picnic lunch)

- 7.000 pts (shared accommodation)
- 8.000 pts (single accommodation)

Payment: Fees should be sent by bank transfer to

Jardín Botánico de Córdoba

C/C 304-813253.1

Caja Provincial de Ahorros de Córdoba (Oficina Principal)

stating your name and **PALAEOBOTANICAL MEETING**, before **December 31, 1989**. A Late Fee surcharge of 5.000 pts is payable. Earlier registration is highly desirable in order to secure the most convenient accommodation.

Registrants should send their name, address, title of proposed papers and statement of intent to join the excursion on April 20 to C. Alvarez-Vázquez, Jardín Botánico de Córdoba, Apartado 3048, 14080 Córdoba, Spain.

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