SCCS

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

Dr. W.H.C. Ramsbottom, Chairman
Dr. R.H. Wagner, Vice-Chairman
Dr. B.A. Engel, Secretary
Dr. Hisayoshi Igo, Associate Secretary

Newsletter on Carboniferous Stratigraphy

Number 6 (July 1988)

The Newsletter on Carboniferous Stratigraphy is distributed free of charge to both Titular and Corresponding Members of S.C.C.S. Other persons or institutions may subscribe to the Newsletter at an issue fee of US$8 (incl.postage) to be paid to the Secretary. If this modest price creates difficulties, please contact the Secretary to arrange an exchange agreement.

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Due to the high costs of printing and distributing this Newsletter, this assistance is insufficient to cover the operating expenses of the Subcommission. Small donations from members, sent to the Secretary, would help to keep the S.C.C.S. financial and will be acknowledged in subsequent Newsletters, subject to the donor's agreement.

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

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NEWSLETTER ON CARBONIFEROUS STRATIGRAPHY

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

VOLUME 6 JULY 1988

1.0 REPORT OF THE I.U.G.S. SUBCOMMISSION ON CARBONIFEROUS STRATIGRAPHY

1.1 MESSAGE FROM THE CHAIRMAN

For a variety of reasons it has been some time since we had a Newsletter on Carboniferous Stratigraphy. There is now, however, a good deal of news to put into it and this will be found on subsequent pages. It seems appropriate to say a few words here about the aims of the Subcommission and to present a progress report as I see it.

As most members will know, in the first years of the Subcommission (it was formed in 1965), activity and membership were restricted to Europe and to sorting out a stratigraphic classification which would be applicable throughout western Europe. By the time of the Krefeld Meeting in 1971, a more or less agreed scheme had been accepted and was published in the proceedings of that meeting (there have been a few minor later amendments). In subsequent years, and largely during the chairmanship of Professor Bouroz, the Subcommission, by the election of many additional members, became truly international and we now have members from most parts of the world where Carboniferous rocks are important.

It then became a question whether the so-called International classification applicable to Europe and previously more or less agreed, was suitable as a truly global classification. A vocal majority considered that it was not, and that a more generally applicable classification was desirable which would take account of actual practice in various parts of the world other than Europe. There is relatively little argument in the Carboniferous over correlation, but a great deal over nomenclature, and one of the first questions to be decided was whether it was more appropriate to divide the Carboniferous into three main divisions (as in the European scheme), or into two (as in much of the rest of the world).

This question was tackled at a meeting in Leeds in 1981 when biostratigraphic data relating to a possible international Mid-Carboniferous boundary was assembled and discussed. The consensus of this meeting was that a good boundary existed at the level approximating to the base of the goniatite zone of *Homoceras*, but for facies reasons this was to be recognised by means of conodonts rather than by means of goniatites. A Working Group, chaired by H.R.Lane produced a very full report on the situation and recommended that a boundary be taken at this level. This proposal was voted on and accepted by the Titular members in 1985. The next question is whether this boundary is to divide the Carboniferous into two major divisions, or to be merely the base of a mid-Carboniferous division. This question was put to the meeting in Beijing in 1988 and the overwhelming preference was for a two-fold, rather than a three-fold division of the Carboniferous. This question is now going to a formal vote of the Titular members, and the result should be known before the end of 1988.

This carries with it the implication that the Carboniferous, as currently understood, comprises one System and not two, and this question is also to be voted on by the Titular members.

The next question concerns the way in which the two Carboniferous divisions should be further subdivided so that any boundaries chosen shall be, as far as possible, recognizable on a world-wide scale, and two Working Groups have been set up under the Chairmanship of Dr. Cor Winkler Prins (upper) and Dr. Paul Brenkle (lower) to make some recommendations on this question. We hope to have at least some preliminary results of their deliberations in time for our meeting in Utah/Nevada in 1989.

We have 29 Titular members and about 340 corresponding members of the Subcommission. I may say that only a very small number of the corresponding members actually correspond, and I would like to make a plea here for more feedback on the activities of the Subcommission. Please let us know what you think about our activities. It would be fair to say, indeed, that if we had more comment from the membership there would be more to put into this Newsletter.

W. H. C. Ramsbottom

1.2 MEMBERSHIP AND OFFICERS

Dr. R.H. Wagner ceased to be Chairman in June 1987 and in accordance with previous arrangements the post was assumed by the Vice-Chairman, Dr. W.H.C. Ramsbottom until June 1989.

We had for some time been lacking an Associate Secretary and due to the urgent need to have someone in this position it was decided, during a visit by Dr. Ramsbottom to U.S.A. in August 1987 to consult with Secretary Manger, that as a temporary measure we would ask Dr. Brian Engel of the University of Newcastle, Australia, to become Acting Associate Secretary, which he agreed to do.

Subsequently, at the Beijing meeting, Dr. Manger resigned as Secretary and Dr. Engel was elected to take his place. At the same meeting, Dr. Hisayoshi Igo of the University of Tsukuba, Japan, was elected as the new Associate Secretary.

It is with great regret that we have to record that two Titular members have recently died. Dr. Meyen of the U.S.S.R. was Chairman of the Working Group on Angaraland, and he will be sadly missed. Prof. Minato has been the Japanese representative on the Subcommission for some years and our meetings will be the poorer for lack of his presence. Their company, help and advice will be missed.

Arrangements for replacing these members are not yet complete.

Dr. Paul Brenckle of Tulsa, U.S.A., became a Titular member on his agreeing to become Chairman of the new Working Group on the lower division of the Carboniferous.

1.3 CALL FOR NOMINATIONS FOR THE POSITION OF CHAIRMAN (1989-92)

The position of Chairman of SCCS will fall vacant in June, 1989. Under I.C.S. Statutes, a Chairman may be re-elected only once after a first term of office of normally four years. A call is now made for Titular and Corresponding Members of the Subcommission to nominate candidates for the Chairman's position. Nominations must be signed by two members and countersigned by the nominee to the effect that they are willing to accept the position if elected.

IMPORTANT

All nominations should be sent by **AIRMAIL** to the Secretary, Dr. B.A. Engel **NOT LATER THAN October 31, 1988.** On receipt of more than one nomination, the Secretary will organize a secret ballot of Titular (Voting) Members shortly thereafter. The new Chairman will take office in July, 1989 at the I.G.C. Meeting in Washington D.C.

1.4 CONFIRMATION OF SCCS CORRESPONDING MEMBERSHIP

The Subcommission on Carboniferous Stratigraphy has traditionally included a large number of Corresponding Members who have an interest in Carboniferous studies. At present, this membership numbers 340 many of whom have contact only through this Newsletter.

As is inevitable with such a large group, keeping the mailing list current is a very large task, more so because the last issue of the Newsletter was sent out in 1984. The high costs of printing and postage, combined with lower subsidies available to the Subcommission, have made it essential that we withdraw names of people who no longer have an interest in our activities. For this reason, you will find a separate form with this Newsletter on which you are asked to confirm your wish to remain on the mailing list of SCCS by returning it to the Secretary. You also have the opportunity to make corrections to your mailing label, if this is necessary. Please abbreviate to fit the spaces supplied as this is the maximum width of our computer labels.

IMPORTANT

FAILURE TO RETURN THIS FORM BY THE DUE DATE WILL INDICATE THAT YOU WISH TO BE REMOVED FROM THE MAILING LIST. We earnestly seek your cooperation in returning the form as QUICKLY as possible.

However, if the form (and *Newsletter*) did not reach you because of a wrong address label, or if subsequently, you have a renewed interest in the Carboniferous, then you will be very welcome to re-join our ranks by contacting the Secretary.

1.5 NOTICE OF FUTURE MEETINGS

1.5.1 BIENNIAL FIELD AND GENERAL MEETING - UTAH/NEVADA, 1989

Business Meeting

The next Business Meeting of SCCS will be held in Provo, Utah, USA during the combined Field and General Meeting which is presently scheduled for September 24-30, 1989.

Conveners:

Dr. Morris S. Petersen, Brigham Young University
Dr. H. Richard Lane, Amoco Production Company
Dr. Walter L. Manger, University of Arkansas

The Business Meeting will focus on potential horizons for the further subdivision of the Carboniferous. Following decisions reached at Beijing, ad-hoc Working Groups on "lower" and "upper" Carboniferous subdivision are chaired by Dr. Paul Brenckle (USA) and Dr. Cor Winkler Prins (Netherlands) respectively. These groups are to present an evaluation of biostratigraphic horizons that may be of value for series and stage level subdivisions of the Carboniferous

on an intercontinental basis. Identification of these potential horizons will direct SCCS research efforts towards its IUGS mandate to develop an intercontinental classification of the Carboniferous.

Field Trip

Leader:

Dr. Gary D. Webster, Washington State University

The field trip, planned in conjunction with the mid-Carboniferous Boundary Working Group, is to be led by Gary Webster, Washington State University, Pullman, Washington. Details of the proposed itinerary are given below:

- **September 24** - Arrive in Provo, Utah; Hosts - Department of Geology, Brigham Young University
- **September 25-26** - Technical sessions - Reports of ad-hoc Working Groups; SCCS Business Meetings.
- **September 27** - Depart on field trip - Lake Point Section, Oquirrh Mountains - overnight Delta, Utah
- **September 28** - Granite Mountain Section - overnight Ely, Nevada
- **September 29** - Frenchman Mountain - overnight Las Vegas, Nevada
- **September 30** - Arrow Canyon and Dry Lake Sections - overnight Las Vegas, Nevada
- **October 1** - Grand Canyon Section (optional, only run if there is enough interest); departure

Publication

Proceedings of this field and general meeting will be published in either the *Courier Forschungsinstitut Senckenberg* or the *BYU Geology Study Series*.

Details of the meeting are in the late planning stages. If you expect to be able to attend and wish to be kept informed about the arrangements then **PLEASE TICK THE APPROPRIATE BOX ON THE MAILING LIST UPDATE FORM**. A circular will be distributed with the final plans to those who reply. Direct requests for additional information should be sent to Walter L. Manger, Department of Geology, University of Arkansas, Fayetteville Arkansas 72701, USA.

1.5.2 XIIth I.C.C. ARGENTINA, 1991

The Permanent Committee of the International Congress of Carboniferous Stratigraphy and Geology met on September 3, 1987 during the XIth I.C.C. in Beijing. It had before it letters of invitation to stage the XIIth I.C.C. in either Poland or Argentina. The Committee elected to accept the invitation from Argentina which will host the XIIth Congress in Buenos Aires in 1991. The Chairman of the new Organizing Committee, Dr. Sergio Archangelsky, has supplied copies of the first circular for inclusion with this Newsletter. Further distribution will also be made at the Sao Paulo Gondwana Symposium, the Palaeobotanical and Palynological Meetings in Australia (1988), the SCCS Biennial Meeting in Utah/Nevada (1989) and the International Geological Congress in Washington DC (1989). Arrangements are well under way in Buenos Aires and we can look forward to this first occasion on which a Carboniferous Congress has been convened in the Southern Hemisphere.

1.6 PROPOSALS FOR RESTRUCTURING THE ORGANIZATION OF SCCS

1.6.1 INTRODUCTION BY THE CHAIRMAN, BEIJING MEETING, SEPTEMBER 1987

For some time now I have been thinking that the Subcommission was not working as it should, and that we had a lot of Working Groups which were apparently doing no work. Most of the groups have presented reports in the past, but had few or no current plans for further activities. How this situation has arisen is a matter of history. In the early sixties, when the Subcommission was getting going, it seemed reasonable that each section of the stratigraphic column within the Carboniferous of Europe (to which the activities were confined in the early days) should have someone responsible for coordinating and summarising the stratigraphic facts which might be useful to the Subcommission. When the membership was enlarged to cover regions other than Europe, the same principle applied. The general results have been useful, and the quality and number of reports initiated by the Working Groups over the years, and published in the various publications of the Subcommission provide evidence of this.

But now that we have in general a fair cover of good stratigraphic information for most parts of the world, and also given the present aim of the Subcommission to attempt to provide a world-wide classification for the Carboniferous, it seemed to me that the whole structure was wrong. What we now need is a body comprising, not so much local experts but rather consisting of experts with a world-wide view, so far as this is possible given that each of us has more of a local than a global experience.

Other Subcommissions are composed in this way, with up to twenty or twenty-five Titular Members who do not necessarily have the responsibilities of a working group, but are there simply because of their expertise and experience. We are, I think, unique in that our titular membership is made up solely of the Chairmen of Working Groups.

With this in mind, I met with our Secretary Walt Manger in the U.S.A. in August 1986 to discuss the future of the Subcommission. The result was a letter to members which eventually went out in February 1987 (reprinted below - apologies to those who did not receive this letter due to apparent partial failure of the mailing system), which gave notice that proposals for reform would be made at our meeting in Beijing in September 1987.

Briefly these proposals are that Titular membership of the Subcommission should no longer be dependent on being the Chairman of a Working Group; that Working Groups no longer actively working towards a definite objective should be wound up; and that any Working Groups which are retained or which are appointed in the future should have clearly defined aims and a realistic timetable for their work.

These proposals were put to the meeting of the Titular Members present in Beijing (20 out of 29 were at the meeting) and accepted unanimously. Accordingly I have undertaken to write to the Chairman of each of our old Working Groups as-

king whether they wish their group to be retained and if so to provide details of their objectives and timetable. We should end up with a tighter, altogether more realistic Subcommission, conforming much more closely to the guidelines laid down by the Commission on Stratigraphy of I.U.G.S.

It is not intended that these proposals should affect the standing of the existing Titular Members, who will remain Titular Members so long as they show evidence of interest and activity (see the discussion on this topic in the report of the Madrid meeting - C.R. Madrid, volume 4). At the same time it is desirable that there be a means of bringing in new people from time to time. Under the guidelines of I.C.S., the term of office of all Subcommission members, both titular and corresponding, is from one International Geological Congress to the next, and members have to be re-elected at each such congress. I would suggest that we make use of these provisions, and ask all members at the appropriate time (this will be next in June, 1989) whether they wish to continue in their membership. This will apply also to Corresponding Members, few of whom actually correspond (only three letters were received as a result of my February 1987 letter, one of which was from a Titular Member, out of more than 350 Corresponding Members). From a purely financial point of view, it would be desirable to have fewer corresponding members, for the costs of duplicating and mailing to so many is a financial burden we really cannot support with our very limited funds.

1.6.2 LETTER TO SCCS MEMBERS SENT BY THE CHAIRMAN, FEBRUARY 1987

For the record, the following letter was sent to voting members as advance notice of the Chairman's intention to introduce reorganization proposals at SCCS meetings held during the XIth I.C.C. in Beijing in September 1987.

Dear SCCS Member,

On taking over from Bob Wagner as Chairman of the Subcommission, I feel that this is a good time to review progress and to outline plans for the future work of the Subcommission, devised in consultation with Walt Manger, Secretary.

The Bouroz *et al.* proposals (1975), presented in Moscow over ten years ago, have never been put to a vote. Instead we concentrated at the Leeds Meeting (1981) and, under Bob Wagner's able chairmanship in Madrid (1983), on establishing a level for a mid-Carboniferous Boundary. You will note the small "m" in "mid", for this search for the major faunal boundary in the Carboniferous was not intended to preempt any future decision as to whether the level chosen should form the base of a "Middle Carboniferous" or the base of an "Upper Carboniferous". In other words, the basic decision as to whether the Carboniferous should be divided into two or into three was postponed. But the time has now come when this fundamental decision must be made, and accordingly a proposal will be put to the meeting in China in 1987 that the primary division of the System shall be into two and not three. This does not in any way prejudge the issue, but it should provide an opportunity for all views to be presented. We are now inviting contributions on this topic, and if you cannot attend the meeting in Beijing, let us have your views in writing -- they will be put at the meeting on your behalf -- and, if possible, issued in a *Newsletter* before the meeting.

Whatever happens at the Beijing Meeting, I will propose that two *ad hoc* committees be set up to consider and make proposals for any further necessary international boundaries for the lower part of the Carboniferous and for the upper part of the Carboniferous. These committees will need to develop an international, globally-oriented perspective and they will be asked to bring definite proposals to the general meeting in Utah/Nevada in 1989. With luck, discussions on that occasion will allow us to bring forward formal proposals at the next-following Carboniferous Congress.

The organizational structure of our Subcommission leaves something to be desired when such decisions are needed, and I will shortly be making some proposals for a reform of its structure. Meanwhile, we shall continue with major meetings at the Carboniferous Congresses and one meeting between congresses. I was sorry not to be able to get to the successful meeting in Argentina into which Dr. Sergio Archangelsky put so much worth-while (and appreciated) hard work. I look forward, however, to seeing as many as possible in Beijing in 1987 and Utah/Nevada in 1989.

We have been in urgent need of an Associate Secretary and I have asked Dr. Brian Engel of Australia to act in this capacity until we can have a formal vote.

The Beijing Meeting will provide an excellent opportunity to discuss the present status of Carboniferous research and plans for future progress. I hope that you will write your views on any topic either to me or Walt Manger, so that the *Newsletter* can properly reflect our activities.

Yours sincerely,

W.H.C. Ramsbottom

1.7 SCCS FINANCIAL STATEMENT 1985-1987

INCOME	
Balance Forward from 1984 . . .	$ 239.00
IUGS Allocation for 1985	$1000.00
IUGS Allocation for 1986	$ 900.00
Newsletter Subscriptions	$ 15.00
TOTAL REVENUE	$ 2154.00
EXPENDITURE	
Letter to Titular Members 1985 . .	10.84
Episodes article, Lane & Manger June 1985 (express mail,fax) .	88.00
1985 Argentina Meeting - Circular to Titular Members	11.88
1986 Argentina Meeting mailing costs	100.00
1987 Ramsbottom Letter (350 copies, postage)	167.70
1987 XI-ICC Letter (350 copies) . .	167.70
Travel costs (Chairmans meeting in Oklahoma 250 miles @ 0.20 mile)	50.20
Correspondence 1985-1987 . . .	43.22
Secretarial expenses 1985-1987 (86 hours @ 4.00/hour) . . .	344.00
Telephone/cable expenses 1985-1987	93.16
TOTAL EXPENSES	$1076.70
BALANCE SHEET	
INCOME 1985-1987	2154.00
Less EXPENSES 1985-1987 . . .	1076.70
BALANCE carried forward to 1988 .	1077.30

As a result of our budget submitted to I.C.S. in November 1987, we were granted the sum of US$450 to operate the affairs of the Subcommission during 1988. Unfortunately, the cost of publication and postage of this Newsletter will considerably exceed that amount let alone cover the additional costs of correspondence with Titular Members, further circulars on the field meeting and other operating costs. It is conservately estimated that the budgetted amount of US$1000 will be barely sufficient for the year.

The credit balance shown above is due to the long period that has elapsed since the last *Newsletter* was published. Obviously, there are sufficient funds available to cover the operating expenses for 1988 but in the longer term, it is necessary for the Subcommission to find additional means of supplementing the income from I.C.S. For this reason the cover of this issue carries a plea for members to support a voluntary, small donation scheme. The best vehicle for overseas money transfer is a bank draft made payable to S.C.C.S. and sent to the Secretary but for those of you who have access to a **MasterCard** Credit Card (only), it is possible to authorize payments with the Secretary using a non-profit conference organization "The Newcastle Symposium" which is run by the Department of Geology in the University of Newcastle, N.S.W.. Overseas personal cheques carry a very heavy bank fee which could exceed the value of modest donations.

1.8 PUBLICATIONS

1.8.1 CARBONIFEROUS OF THE WORLD, Volumes 1 and 2.

Volume 2 of the "Carboniferous of the World", edited by R.H.Wagner, C.F.Winkler Prins and L.F.Granados has now been published and was presented at the Opening Session of the Beijing Congress. Volume 2 covers Australia, India, South Africa, South America and North Africa and contains some 450 pages and 37 plates. Volume 3 on the USSR and Middle East is in the final editing stages and should go to the printer by the end of the year. Volume 4 on North America is progressing and the series will be completed by a fifth volume summarizing paleomagnetic data, biostratigraphy and stratigraphic classification.

Volumes 1 and 2 have been published on behalf of the IUGS Subcommission on Carboniferous Stratigraphy by the Geological and Mining Institute of Spain (IMGE) in cooperation with the National Company for Mining Investigation "ADARO" (ENADIMSA), Madrid. Both can be purchased from EPISODES SECRETARIAT, 601 Booth St., Room 177, Ottawa, Ontario K1A OE8, Canada. Individual requests may also be directed to Mr. L. F. Granados, ENADIMSA, Doctor Esquerdo 138, 28007 Madrid, Spain. The volumes have been moderately priced so that no Carboniferous research workers can afford to be without their personal copies.

- Volume 1 (China, Korea, Japan, SE Asia) costs US$30 (including postage)
- Volume 2 (Gondwana countries and North Africa) costs US$50 (including postage).

1.8.2 SELECTED STUDIES IN CARBONIFEROUS PALEONTOLOGY AND BIOSTRATIGRAPHY

Edited by P.L. Brenckel, H.R. Lane, and W.L. Manger, *Courier Forschungsinstitut Senckenberg*, vol.98, 1-206, 1987.

This volume contains 12 papers on paleoecology, taxonomy and biostratigraphy of the Early and Mid Carboniferous of North America, Great Britain, Ireland, Central Europe and Southeast Asia.

In detail the collection of papers deals with: taxonomy, classification and life cycle of foraminifers; ammonoids from the mid-Carboniferous boundary; coral and conodont zonation of Ireland and Britain; conodonts from the Kinderhookian - Osagean in New Mexico and from the Devonian-Carboniferous boundary in Moravia; conodont zonation of Carboniferous and Permian of North and Northwest China; palynostratigraphy and palynofacies of Devonian and Mississippian of Eastern Kentucky as a basis for correlation with Western Europe; stratigraphy of Mississippian of Idaho and Northeastern Utah; stratigraphy of Carboniferous bryozoans; stratigraphic distribution of camerate crinoids.

The interest of this and future volumes is to share with the reader the diversity and vitality of that research. Copies can be purchased by mail order from Forschungsinstitut Senckenberg, Senckenberganlage 25, D-6000

Frankfurt/Main 1, Federal Republic of Germany, for the price of DM 48 per copy plus handling and postage.

1.8.3 EL SISTEMA CARBONIFERO EN LA REPUBLICA ARGENTINA (The Carboniferous System in the Argentine Republic),1987

Edited by S. Archangelsky and A.J.Amos, R.R. Andreis, C.L. Azcuy, C.R. Gonzalez, O. Lopez Gamundi & N. Sabattini, 430 pp., 34 authors. US$30 plus postage.

A pre-print of this book, "*The Carboniferous System in Argentina - A Synthesis*" was presented to the participants of the scientific sessions held in association with the mid-Congress Field Meeting in Cordoba, Argentina in March 1986. After discussion and revision, the Cordoba Academy of Sciences published the final version in 1987. It was first presented during the XIth International Congress on Carboniferous Stratigraphy and Geology in Beijing, Peoples Republic of China in August-September 1987. It is written in Spanish, with extended English summaries for each chapter and Spanish-English legends for all figures and plates.

The following chapters are included in the volume - 1. Introduction; 2. Tarija Basin; 3. Paganzo Basin; 4. Rio Blanco & Calingasta-Uspallata Basins; 5. Paleontology, biostratigraphy & paleoecology of the Paganzo, Rio Blanco & Calingasta - Uspallata Basins; 6. San Rafael Basin; 7. Tepuel Genoa Basin; 8. Chaco Paranense Basin; 9. Sauce Grande & Colorado Basins; 10. Malvinas Area; 11. Diastrophism; 12. Late Paleozoic magmatism in Argentina; 13. General correlation of biozones; 14 Ages of biozones; 15; Economic resources; 16. Bibliography; 17. Index.

Orders for **'THE CARBONIFEROUS SYSTEM IN THE ARGENTINE REPUBLIC'** should be sent direct to **ACADEMIA NACIONAL DE CIENCIAS, Casilla de Correo No.36, 5000 Cordoba, Republic of Argentina**. The price is US$30 plus surface postage of US$3. (please enquire re airmail rates). Names and addresses should be typed or printed clearly and all cheques made payable to Academia Nacional de Ciencias.

1.8.4 FIELD GUIDE FOR THE CORDOBA MEETING, ARGENTINA, 1986

Dr. Archangelsky advises that there are a few copies of the field guide, issued to participants of the 1986 excursion, which he is willing to supply to SCCS members. The guide contains 54 pages (in English) and includes road logs, maps, sections and references. Anyone interested should forward their request to Dr. S. Archangelsky, URQUIZA 1132, Vincente Lopez (1638), Buenos Aires, Argentina, together with a cheque to cover the postage (US$1 surface mail or US$3 airmail).

1.9 REPORT OF THE SCCS FIELD AND GENERAL MEETING, ARGENTINA, 1986

by S. Archangelsky, URQUIZA 1132, Vincente Lopez 1638, Buenos Aires, ARGENTINA, M. Hünicken & T. Dutro.

The SCCS held its field and general meeting in Cordoba, Argentina from March 26-April 8, 1986 in conjunction with the participants of IGCP Project 211 (Late Paleozoic of South America) and with sponsorship from the National Academy of Sciences, Cordoba and the National Research Council of Argentina (CONICET). This was the first meeting which SCCS has held in the Southern Hemisphere. The focus of the meeting involved the analysis and correlation of the Late Paleozoic biota, particularly the floras of the Gondwana Realm.

Academic sessions (March 26-30) were attended by 46 delegates from Argentina, six Titular/Bureau Members of SCCS (J.T.Dutro, P.K.Sutherland, J.Roberts, C.F.Winkler Prins, W.L.Manger and S.Archangelsky) and 19 foreign delegates (USA, Australia, Brazil, Uruguay, Chile, Bolivia, Ecuador and Colombia).

On the first day, a detailed survey of Argentinian Carboniferous Basins was presented by different authors; Permian strata were also included for some continental sections. The second day's program was devoted to biostratigraphy, magmatism and diastrophism, paleomagmatism and natural resources in these basins. A lecture by V.Ramos on "Patagonia: new evidence for its allochthony" was followed by a round table session on "Problems in Carboniferous chronology and the Carboniferous-Permian boundary in Argentina". This discussion carried over on to the third day, the remainder of which was taken up with reports by national delegates of the IGCP 211 Project. Similarities between Brazil, Paraguay, Uruguay and Argentina were stressed, particularly in respect of their terrestrial strata. The Andean sector (Argentina, Chile, Bolivia, Peru, Colombia and Equador) has different problems, mostly related to marine environments and the combination of sedimentary, igneous and metamorphic rocks. On the last day, the Closing Ceremony was followed by a display of Carboniferous fossils from collections lodged in Cordoba University, La Plata Natural History Museum, Buenos Aires University, Lillo Institute (Tucuman) and the CIRGEO (Buenos Aires).

A 400 page book, *The Carboniferous System in Argentina: A Synthesis*, was prepared for the meeting. The volume was edited by Dr. Sergio Archangelsky and it contains contributions by more than 30 specialists on the Late Paleozoic Basins of Tarija, Chacoparana, Sierra Australes-Colorado, Malvinas, Paganzo, Rio Blanco, Calingasta-Uspallata, San Rafael, and Tepuel-Genoa. A chapter was devoted to the Carboniferous biostratigraphy, including a general correlation chart, which generated considerable discussion among SCCS members. Non-Gondwana specialists gained appreciation for the difficulties in working with the southern, terrestrial-dominated sections with a cold climatic influence. The magnitude of the unconformities involving the Carboniferous was also forcefully demonstrated. A copy of the chart is included with this report. All participants received a copy of

the volume, in the form of a pre-print, with the final volume to be distributed later.

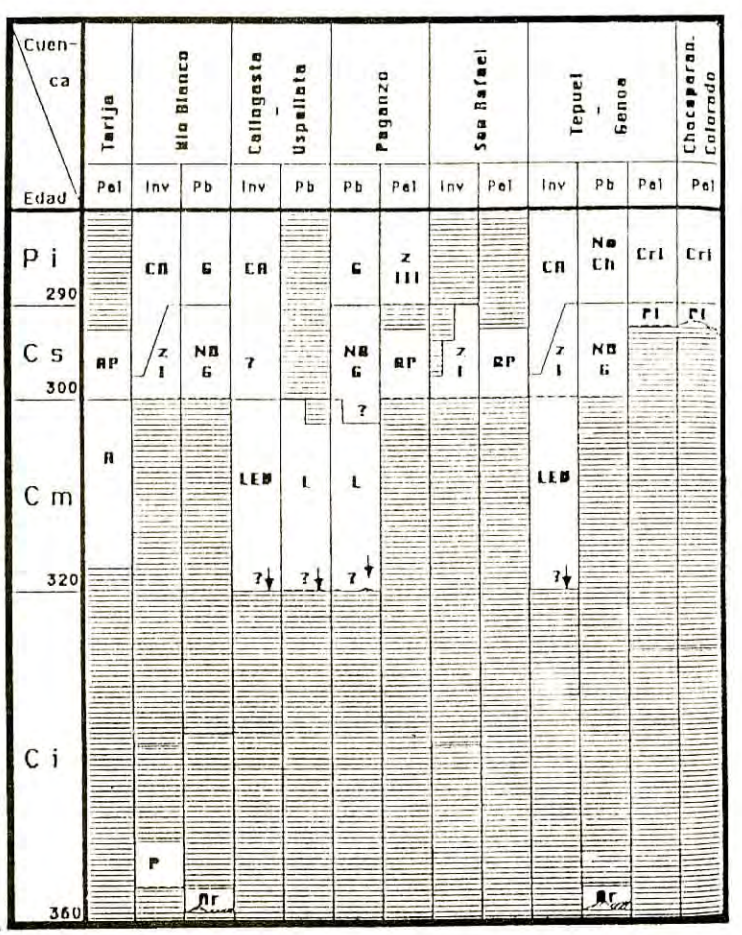
The field trip began on March 31. The first part included sections in Paganzo continental strata, including coal mine visits. Among classical localities, Bajo de Veliz, Tupe, Sierra de los Llanos (Anzulon and Malanzan), Amana and Los Colorados were visited. Carboniferous and early Permian floras were seen at these stratotypes, including those referred to the biozones *Nothorhacopteris-Botrychiopsis* (Carboniferous) and *Glossopteris* (Permian). The second part was spent in the western area of Paganzo Basin and the mostly marine Calingasta-Uspallata Basin, where different stratotypes were also visited (La Capilla, Barreal, Uspallata, Huaco, San Juan River section), including the biozones *Levipustula levis* and *Cancrinella*. Glacial evidence was also shown in some areas (glacial blocks, dropstones, striated pavements). Associated Late Paleozoic magmatism was seen on the last day in the Aconcagua region and strong diastrophism in the Barreal-Uspallata area.

The excursion covered a distance of 2500 Km, through the provinces of Cordoba, San Luis, La Rioja, San Juan and Mendoza. The trip ended in Mendoza City from where the participants returned home via Chile or Buenos Aires. Some colleagues stayed for a few days to visit institutions and museums in Buenos Aires and La Plata.

Other interesting sites were visited during the excursion: the Ischigualasto Triassic basin, known for its spectacular scenery as well as for its vertebrate fauna and fossil flora, the Rio Mendoza Valley with the "Inca's Bridge" and a close view of the Aconcagua, the highest mountain of the Andes Cordillera, and the San Juan Valley with spectacular gorges and thick early Paleozoic sequences. Social activity during the excursion included a reception in Merlo village (San Luis Province) and in San Juan City. The Leoncito Astronomical Observatory was visited during the night when the Halley's Comet was in its nearest position (the visit included taped films of the comet's route). In San Juan, the Natural History Museum was also visited. Logistic support was available during the excursion with vehicles from the governments of Cordoba and La Rioja provinces, YPF (Argentine National Oil Company) and San Juan University. A 54 page Field Guide (in English) was distributed among the participants. It included the complete road log, maps, sections and the main references.

The Organizing Committee for this SCCS meeting were pleased that they were given the opportunity to stage this excursion which made it possible for Argentinian and South American specialists to have discussions with visiting SCCS members on the many problems associated with the very different, Southern Hemisphere, geological setting. The meeting provided a valuable opportunity for "northern" specialists to become aware of the geological, stratigraphic, and paleontological problems in one region of the vast Gondwana supercontinent. They also gained appreciation for the problems involved in correlations using standard sections in the paleoequatorial belts.

The Subcommission is most grateful to Professor Archangelsky and his colleagues who organized this meeting.



GENERAL CORRELATION OF BIOZONES IN ARGENTINA

Pi = Pérmico inferior
Cs = Carbonifero superior
Cm = Carbonifero medio
Ci = Carbonifero inferior
Pal = Palinologia
Inv = Paleontologia Invertebrados
Pb = Paleobotánica
Edades: según Odin 1983

ZONAS

Palinológicas

AP = *Ancistrospora - Potonieisporites*
PL = *Potonieisporites - Lundbladispora*
Cri = *Cristatisporites*

Paleontologia de Invertebrados

P = Fauna de *Protocanites*
Zl = Intervalo
CA = *Cancrinella*
L = *Levipustula*

Paleobotánicas

Ar = *Archaeosigillaria*
L = Flora de *Lepidodendropsis*
NBG = *Nothorhacopteris argentinica*
- *Botrychiopsis weissana*
- *Ginkophyllum diazii*
G = *Gangamopteris*
NoCh= *Nothorhacopteris chubutiana*

2.0 XIth INTERNATIONAL CARBONIFEROUS CONGRESS - BEIJING, 1987.

2.1 REPORT OF THE CONGRESS PROCEEDINGS

The Chinese Organizing Committee for the XIth I.C.C., which was held in Beijing from August 31 to September 4, 1987, are to be highly commended for the very successful outcome of their dedicated efforts. Conference participants were housed in the well-appointed Building 3, Friendship Hotel in northwest Beijing and attended meetings in the adjacent Beijing Science Hall. This is a very popular venue for International Conferences judging from the Notice Board outside which revealed an average meeting rate in excess of one per week for the whole year. Despite many language complications, our Chinese hosts managed to provide for the needs of the foreign delegates in an efficient and friendly atmosphere. They were indeed most gracious hosts.

The Scientific Secretary of the Organizing Committee, Jin Yugan, reported to the Permanent Committee that 254 overseas delegates were registered (182 attending; 42 accompanying; 30 non-attending) to which must be added a further 200 Chinese participants. Some 29 countries including China were represented at the Congress. Eight excursions were organized (numbers of participants are indicated in brackets): Pre-Congress 1(24), 3(21), 4(59) and 5(4); Post-Conference 4(23), 5(22), 6(45), 8(16). A one day excursion was held during the Congress. A total of 582 abstracts were submitted (352 - foreign; 230 - Chinese) of which 244 papers were presented to 21 symposia or sessions.

SCCS held two open meetings and one business meeting during the XIth I.C.C.. The Subcommission is most grateful to our Chinese colleagues for the meeting facilities which they provided.

2.2 SCCS SYMPOSIUM ON THE MID-CARBONIFEROUS BOUNDARY

On September 1, 1987 the Subcommission sponsored an all day symposium on "Subdivisions of the Carboniferous" which provided a forum for 11 papers and was attended by over 90 registrants at the Congress. The detailed contents of these papers will be published in the "Compte Rendu" at a later date. The schedule of speakers was as follows:

1. Potential horizons for intercontinental subdivision of the Carboniferous System - **Manger, W.L. & Sutherland, P.K.**

2. New advances in the study of the mid-Carboniferous boundary in China - **Yang Jingzhi & Xu Shanhong**

3. Significant levels for intercontinental subdivision of the Lower Carboniferous Subsystem - **Higgins, A.C., Lane, H.R., Brenckle, P.L., Manger, W.L. & Marchant, T.R.**

4. A proposed boundary stratotype in Jingyuan, E.Gansu for the Upper and Lower Carboniferous of China - **Li Xingxue, Shen Guanglong, Wu Xiuyuan & Tong Zaishan**

5. The Lake Point Limestone, an alternate mid-Carboniferous boundary stratotype in western North America - **Davis, L. & Webster, G.**

6. Brachiopod faunas at the proposed mid-Carboniferous boundary stratotype, Arrow Canyon, southern Nevada, USA - **Langenheim, R.L.Jr & Shroba, C.S.**

7. The early-late Carboniferous transitional zone in Tianshan area, Xinjiang with discussion on the early-late Carboniferous boundary - **Cai Tuci**

8. Major subdivisions of the Carboniferous System - **Wagner, R.H. & Winkler Prins, C.F.**

9. Conodont sequence across the mid-Carboniferous boundary and its correlation with England and North America - **Wang Zhihao, Lane, H.R. & Manger, W.L.**

10. Mid-Carboniferous conodont zones and mid-Carboniferous boundary of Nandan, Guangxi - **Xu Shanhong, Yin Bao'an & Huang Zhanxing**

11. The Transition Interval in the Bashkirian-Moscovian Boundary of the Cantabrian Mountains (Northern Spain) - **Villa, F., Leyva, F., Granados, L.F., Martinez-Diaz, C. & Garcia, C.A.**

2.3 PUBLICATIONS RELEASED AT THE XIth I.C.C. 1987, BEIJING, CHINA

2.3.1 CARBONIFEROUS STRATIGRAPHY IN CHINA (1987)

by Wu Wangshi, Zhang Linxin, Zhao Xiuhu, Jin Yugan & Liao Zhuoting. (Zhang Linxin, *Ed.*), 1-160, *Science Press*, Beijing, China.

This volume contains a valuable summary of the Carboniferous stratigraphy of China which was especially prepared by the Chinese hosts as a contribution to the XIth Carboniferous Congress.

The publication begins with a short definition of five stratigraphic provinces of China which vary in biostratigraphy and sedimentary types. It is followed by an outline of the major Carboniferous chronostratigraphic units of China. Most of the volume is devoted to a detailed summary of regional stratigraphy as observed in the five provinces which include -

- **South China [southeast]:** Lower Carboniferous marine sediments with local non-marine deposits; an Upper Carboniferous fossiliferous carbonate province.
- **North China or China-Korea platform in China [central-east]:** An unconformable Upper Carboniferous sequence of paralic coal measures with intercalated marine limestones.
- **Tianshan/Hinggan or North Geosynclinal Province [north]:** A thick basinal sequence of clastic sediments associated with volcanics and local neritic carbonates; Upper Carboniferous well developed but Lower Carboniferous missing in some regions.
- **Northwest China [central-west]:** Thick sequences of carbonates and clastic sediments conformably overlain by Permian deposits; biotas similar to those in South China.
- **Xizang/Western Yunnan Province [southwest]:** A carbonate province intercalated with clastic deposits, and locally developed volcanics. Biotas are also similar to those of South China. Deposits along Mount Qomolangma and in the area west of Nujiang River contain aqueo-glacial sediments ("Gondwana Facies") and biotas quite different to those of adjacent South China.

The detailed stratigraphy is followed by an outline of the faunal/floral distribution throughout the provinces of foraminifera, conodonts, ammonoids, brachiopods, corals, bryozoans, bivalves and plants. The volume concludes with a useful bibliography and stratigraphic index. Non-Chinese readers should have access to a good indexed map of China in order to appreciate the stratigraphic discussion.

2.3.2 CARBONIFEROUS BOUNDARIES IN CHINA (1987)

Edited by Wang Chengyuan, 1-180, 24 plates. *Science Press*, Beijing, China.

The Chinese hosts of the XIth Carboniferous Congress are to be congratulated for the planning and publication of this most useful addition to world literature on Carboniferous boundaries.

The volume contains a collection of thirteen papers which present new and summarized data on Carboniferous boundaries, mostly in connection with Chinese stratigraphy. Five papers deal with the Devonian-Carboniferous boundary, six with the Mid-Carboniferous boundary and two with the Carboniferous-Permian boundary. The papers represent an effort by our Chinese colleagues to identify potential stratotype localities in China for each of these horizons and to provide backup faunal data to support their nominations. Most of the plates illustrate the occurrence of conodont faunas but there are also data on foraminifera, corals, brachiopods, ammonoids, plants and miospores. The papers included are -

1. Devonian-Carboniferous boundary in South China - **Wang Chengyuan**, p.1-10.

2. A desirable section for the Devonian-Carboniferous boundary stratotype in Guilin, Guangxi, South China - **Yu Changmin, Wang Chengyuan, Ruan Yiping, Yin Baoan, Li Zhengliang and Wei Weilie**, p.11-21, pl.1-3.

3. Devonian-Carboniferous boundary sections in Yishan Area, Guangxi - **Wang Chengyuan, Yin Baoan, Wu Wangshi, Liao Weihua, Wang Keliang, Liao Zhuoting, Mu Xinan, Qian Wenlong and Yao Zhaogui**, p.22-43, pl.1-8.

4. New proposal for an international Devonian-Carboniferous boundary - **Bai Shunliang and Wang Chengyuan**, p.44-49.

5. Problems on the correlation of the Devonian-Carboniferous transitional sequences of South China: a palaeobotanical and palynological review - **Cai Chongyang, Ouyang Shu, Wu Xiuyuan and Chen Yongxiang**, p.50-65.

6. New advances of researches on Mid-Carboniferous Boundary in China - **Yang Jingzhi and Xu Shanhong**, p.66-68.

7. A proposed boundary stratotype in Jingyuan, Eastern Gansu for the Upper and Lower Carboniferous of China - **Li Xingxue, Shen Guanglong, Wu Xiuyuan and Tong Zaishan**, p.69-88, pl.1-4.

8. Conodont sequence across the Mid-Carboniferous Boundary in China and its correlation with England and North America - **Wang Zhihao, H. Richard Lane and W.L. Manger**, p.89-106, pl.1-3.

9. Luosuan - A new chronostratigraphic unit at the base of the Upper Carboniferous, with reference to the mid-Carboniferous Boundary in South China -**Rui Lin, Wang Zhihao and Zhang Linxin**, p.107-121, pl.1-2.

10.Mid-Carboniferous conodont zones and mid-Carboniferous Boundary of Nandan, Guangxi - **Xu Shanhong, Yin Baoan and Huang Zhanxing**, p.122-131, pl.1-2.

11.Late Early Carboniferous to Early Late Carboniferous brachiopods from Qixu, Nandan, Guangxi and their palaeoecological significance - **Li Shoujun**, p.132-150, pl.1.

12.Conodont sequence across the Carboniferous-Permian Boundary in China with comments on the Carboniferous-Permian Boundary - **Wang Zhihao and Rui Lin**, p.151-162, pl.1.

13.Carboniferous-Permian Boundary in the World - **Rui Lin and Zhang Linxin**, p.163-180.

2.3.3 BIBLIOGRAPHY OF CHINESE CARBONIFEROUS-PERMIAN PALAEONTOLOGY AND STRATIGRAPHY, 1987.

Edited by Jin Yugan, Ma Zhengang *et al.*, *XIth International Congress of Carboniferous Stratigraphy and Geology*, Nanjing University Press, 162pp. (US $12.00).

This is an extremely useful bibliographic tool, prepared in the English language by our Chinese colleagues. It contains some 1522 citations (translated into English) dealing exclusively with the stratigraphy and palaeontology of the Carboniferous and Permian in China. Despite its size, the editors

state that it is far from complete since it includes only pre-1987 papers and excludes some internal series such as the "*Fossil Atlas of China*", "*Chinese Fossils*", "*Regional Stratigraphy of China*" and "*Regional Fossil Atlas of China*", as well as a few contributions by foreign geologists. This does not detract from the value of this volume.

The bibliography is arranged alphabetically by author surname. A subject index of papers and a listing of the full name of abstracted periodicals are included.

2.3.4 OTHER PUBLICATIONS, BEIJING, 1987.

Other publications issued by the XIth Carboniferous Congress include:

Abstracts -

- **Abstracts of Papers (I), Sections 1-8**, p.1-297.
- **Abstracts of Papers (II), Symposia 1-11 & Misc.**, p.299-489.

Excursion Guide Books -

- 1. Carboniferous and Permian Stratigraphy in Shanxi. 66pp.
- 3. Carboniferous Stratigraphy in Jingyuan, Gansu. 65pp.
- 4. Carboniferous and Permian Stratigraphy in Eastern Mts., Tianshan. 39pp.
- 5. Carboniferous and Permian Stratigraphy in Guizhou. 69pp.
- 6. Carboniferous carbonate sequences of Guangxi.
- 8. Carboniferous and Permian Stratigraphy in Jiangsu and Zhejiang.

Excursions 2 and 7 were cancelled.

3.0 REPORT ON SCCS PROGRAM OF MEETINGS, BEIJING, 1987

3.1 SCCS BUSINESS MEETING AND MINUTES

Titular and Corresponding Members of the Subcommission on Carboniferous Stratigraphy (SCCS) were encouraged to participate in SCCS activities held in conjunction with the XIth International Congress of Carboniferous Stratigraphy and Geology held in Beijing, China from August 31 to September 4, 1987.

The Business Meeting of SCCS was conducted on Tuesday, September 1, 1987, at which the following agenda items were scheduled.

- 1. Remarks by Dr. John W. Cowie, Chairman, International Commission on Stratigraphy.
- 2. Presentation and discussion of Subcommission reorganization by Dr. W.H.C. Ramsbottom, Chairman, SCCS.

The Minutes of this meeting are presented below:

3.1.1 MINUTES OF THE S.C.C.S. GENERAL MEETING, SEPTEMBER 1, 1987

The meeting of the Subcommission on Carboniferous Stratigraphy (SCCS) was opened by Chairman W.H.C.Ramsbottom. Dr.John Cowie, Chairman of the International Commission on Stratigraphy (ICS) was introduced and given the opportunity to address the Titular and Corresponding membership of SCCS.

Dr. Cowie informed those present that the "Guidelines and Statutes of the International Commission on Stratigraphy" had been published by the Senckenberg Museum in 1986 following their ratification in 1984 (Cowie, J.W. *et al.*, 1986). These statutes have thus become the formal working directives for the ICS and its Subcommissions. Dr. Cowie noted that the Subcommissions with the ICS are perpetual, while the Working Groups have a limited tenure. The duration of Working Groups reflects their assignment of specific tasks and it was felt that 8-10 years is probably a desirable lifetime. The SCCS has a long tradition, predating the formation of the ICS, and it is larger than other Subcommissions. Typically a Subcommission consists of approximately a dozen Titular Members in addition to a chairman and secretary. Twenty would seem to be the maximum size. The Subcommission must meet every four years and the chairman must change every eight years. Membership may be cancelled if a member becomes inactive or fails to answer correspondence. Chairman Ramsbottom thanked Dr. Cowie for his remarks. Secretary-General Remane of ICS was then introduced and both members of the ICS executive were thanked for their participation in the Beijing Congress.

The Chairman then stated that the organization of SCCS needed examination since there are 29 Titular Members and a Corresponding membership exceeding 340. Some of the Working Groups have never been active, while others have finished their business.

Chairman Ramsbottom announced with regret the deaths of Titular Members Minato from Japan and Meyen from the Soviet Union. A moment of silence was observed for the passing of these colleagues.

The Chairman then turned to the question of divisions of the Carboniferous. He reviewed briefly the history of this investigation, citing the Leeds Meeting where a consensus was reached on the utilization of the base of the *Homoceras* zone as an intercontinental datum. Dr. H.R. Lane (USA), Chairman of the Working Group on the mid-Carboniferous Boundary stratotype, reported on events at the Madrid Congress and meetings of the working group since 1983. He reviewed the decision to use the conodont *Declinognathodus noduliferus* in the lineage *Gnathodus girtyi simplex - D. noduliferus* to place the boundary in the absence of the ammonoids, and noted that the group had met in Nottingham, 1985 and in Gansu during the pre-Congress excursion.

Chairman Ramsbottom opened discussion involving the desirability of bipartite or tripartite subdivisions of the Carboniferous System, using the mid-Carboniferous Boundary as one of the datum horizons. Written responses were read from the German Stratigraphic Commission and Drs. Lazarev and Solovieva, both from the Soviet Union, supporting the bipartite division. He then moved the motion that -

- **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.**

The motion was seconded and the floor opened for discussion. Titular members Paproth (FRG), Gordon (USA), Winkler Prins (Netherlands), Yang (China), Archangelsky (Argentina), and Engel (Australia) each spoke in turn in favour of the bipartite division. In addition, Gordon and Archangelsky mentioned problems in the Upper Carboniferous. Dr. Yang Jing-shi provided a written summary of his comments, and Chairman Ramsbottom requested that they be included as an addendum to these minutes (see 3.4). Following the discussion, a non-binding vote of those persons present was taken on the proposal for bipartite versus tripartite division of the Carboniferous.

- **In favour of bipartite division - 36**
- **In favour of tripartite division - 0**
- **Abstentions - 2**

Chairman Ramsbottom thanked all assembled for their fruitful discussion and concluded with comment that the question

of names was a separate one to the number of divisions and their boundaries. The question of names could and should be dealt with at a later time.

Corresponding member Sevastopulo (Ireland) inquired as to future plans for the SCCS and Chairman Ramsbottom stated that he envisaged the formation of two new Working Groups to examine potential boundaries for chronostratigraphic subdivisions in the bipartite scheme just approved. Dr. Sevastopulo urged the SCCS to work closely with the IUGS Subcommission on Geochronology for improvement of absolute dating for the Carboniferous.

Titular member Lane (USA) reported that the next field and general meeting of SCCS would be held in May, 1989 [now September, 1989;(Ed.)] in Utah/Nevada as a joint venture with the mid-Carboniferous Working Group. Tentative plans include a pre-meeting field trip to Oklahoma and Arkansas followed by a post-meeting field trip to southern Nevada and Utah.

Walter L. Manger, Secretary,SCCS

Reference:

Cowie, J.W., Ziegler, W., Boucot, A.J., Bassett, M.G., and Remane, J., 1986. Guidelines and Statutes of the International Commission on Stratigraphy (ICS). *Courier Forschungsinstitut Senckenberg*, **83**, p.1-14.

ATTENDANCE AT GENERAL MEETING - *September 1, 1987:*

Argentina (S. Archangelsky); **Australia** (Brian Engel); **Canada** (Bernard Mamet); **Peoples Republic of China** (Gao Lian-da, Li Xing-xue, Lin Ying-dang, Yang Shipu, Yang Xilu); **FRG** (C. Brauckmann, H. Herbig, M. Horn, K.H. Josten, E. Paproth, A. Rabitz); **GDR** (D. Franke, N. Hoffmann); **Ireland** (G. Sevastopulo); **Malaysia** (Ian Metcalfe) ; **Netherlands** (C.Winkler Prins); **Spain** (L.F. Granados, A.Garcia-Loygorri, Robert Wagner); **Scotland** (M.A. Browne); **Switzerland** (J. Remane); **UK** (W.J. Barclay, J.W. Cowie, Alan Higgins, W.H.C. Ramsbottom, John Varker); **USA** (J.T. Dutro, Robert Gastaldo, Mackenzie Gordon, P.H. Heckel, Richard Lane, R.L.Langenheim, Walt Manger, Chris.G. Maples, June R.P.Ross, Betty Skipp, P.K.Sutherland, Johnny Waters, C.Pius Weibel).

3.2 MID-CARBONIFEROUS BOUNDARY WORKING GROUP MEETING

Corresponding and Titular Members of SCCS were invited to attend the Mid-Carboniferous Boundary Working Group Business Meeting on Wednesday, September 2, 1987. Details of matters discussed this and other meetings of the Working Group are presented with the Chairman's report (see article 4.4).

3.3 SCCS TITULAR MEMBERS MEETING AND MINUTES

Titular Members met on Thursday, September 3, 1987 to discuss the following agenda items. Minutes of this meeting are presented below.

- 1. Welcome by the Chairman
- 2. Announcement of the deaths of M. Minato and S.V. Meyen
- 3. Election of Acting Associate Secretary Engel
- 4. Progress report on the "Carboniferous of the World".
- 5. Discussion on the two-fold classification proposal to be voted on by members present.
- 6. Reorganization of the Subcommission
- 7. New Working Groups
- 8. Membership
- 9. Names for "Upper" and "Lower" divisions of the Carboniferous:(a) principle; (b) procedure.
- 10. Regional Stratotypes
- 11. Newsletter
- 12. Other Business

3.3.1 MINUTES OF THE SCCS TITULAR MEMBERS MEETING, SEPTEMBER 3, 1987

The meeting of the Titular Members of the Subcommission on Carboniferous Stratigraphy (SCCS) in attendance at the Eleventh International Congress on Carboniferous Stratigraphy and Geology was opened by Chairman W.H.C. Ramsbottom. A welcome was extended to all members and the five Chinese Titular Members were each introduced formally by Chairman Ramsbottom.

The first order of business involved the appointment of Dr. Brian Engel (Australia) as Associate Secretary of SCCS. Chairman Ramsbottom informed members that Dr. Engel had been serving in this capacity informally and that he was agreeable to continued service. A motion from the floor was seconded and passed unanimously that Dr. Engel be appointed Associate Secretary of SCCS.

Vice-Chairman Robert Wagner was then given the floor to report on the status of the **Carboniferous of the World.** He stated that two volumes had been published, the first dealing with China and the second dealing with Gondwana Countries (Australia, India, southern Africa and South America) and North Africa. The editors are now busy with volume three which includes the Soviet Union and the Middle East. Good progress has been made on the Middle East and the editors have processed approximately two-thirds of the Russian manuscript. They hope this will be completed by the end of 1987. Volume four will contain North America and possibly Europe. Two-thirds of the contributions have been received and it is hoped that the remaining manuscripts will be in hand by the end of the year. Volume five will be the least extensive and combine paleomagnetic data with stratigraphic classification.

Attention then turned to the question of bipartite division of the Carboniferous. Chairman Ramsbottom reviewed the events of the meeting of all SCCS members on Tuesday, September 1, and then opened the discussion on this matter, noting that the final disposition of the question will be based on a postal ballot of all Titular Members. Dr. Bernard Mamet (Canada) explained that the maritime region can be easily divided into two intervals, while the arctic region is more amenable to tripartite division and for this reason he abstained from voting at the Tuesday meeting. He also expressed reservations about the level of the mid-Carboniferous Boundary. The question of the level of classification was addressed by Dr. Cor Winkler Prins (Netherlands) who favoured recognition as subsystems, and by Dr.Thomas Dutro (USA) who expressed a preference for two systems.

Designation of the intervals was then discussed by several members. Dr. Dutro urged the use of geographic names, and that sentiment was also expressed by Dr. Winkler Prins who noted that the terms "Lower" and "Upper" were used in many different ways. Vice-Chairman Wagner also spoke against using "Lower" and "Upper" stating that their use in Europe was abolished some 20 years ago because of the confusion they created. Dr. Mamet stated that Dinantian and Silesian should not be considered because of their regional connotation. Dr. H.R. Lane (USA) reminded members that a subsystemic boundary would fall at the mid-Carboniferous Boundary. Dr. Eva Paproth (FRG) expressed the view that names were not a pressing issue at the moment and urged thought in their selection. Following the discussion, Chairman Ramsbottom called for a vote to recognize bipartite subdivision of the Carboniferous. That vote resulted in 13 yes, 0 no, 3 abstentions. A motion was then moved and seconded from the floor that the bipartite divisions be recognized as subsystems. There was no discussion and that motion was passed unanimously (**16 In favour, 0 Against**).

Reorganization of the SCCS was the next item on the agenda. Chairman Ramsbottom reviewed the history and organization of SCCS. He stated the concern that many Working Groups and some Titular Members were inactive. He also reminded the members that ICS would like to see the number of Working Groups reduced. Therefore, Chairman Ramsbottom proposed as a course of action that an enquiry be made as to whether each Working Group has a specific task and whether it is actively pursuing that objective. He also suggested that the stipulation that each Titular Member chair a Working Group be dropped. The floor was then opened for discussion. Several members concurred with Chairman Ramsbottom's views, emphasising that a Working Group would always be chaired by a Titular Member and that all Titular Members would remain for the present. A motion was then moved, seconded and passed unanimously that the SCCS reorganize itself along the pattern suggested in the Guidelines and Statutes of the International Commission on Stratigraphy.

The subject of Working Groups was considered further with the proposal by Chairman Ramsbottom that two *ad-hoc* committees be formed to investigate the "Lower" and "Upper" divisions of the Carboniferous as now conceived. The principal thrust of activity for these committees would be to evaluate potential boundaries which could provide further subdivisions of the respective subsystems. The floor was then opened for discussion and several Titular Members spoke in favour of this proposal. Dr. Winkler Prins expressed a view, also supported by others, that this approach would allow selection of boundaries for further study and that the *ad-hoc* committees could be dissolved at the end of this specific task. It was agreed without vote at the conclusion of the discussion that the two *ad-hoc* committees be formed. Several persons were nominated and after some discussion, it was moved, seconded and passed unanimously that the bureau of SCCS should approach Dr. Paul Brenckle (USA) and Dr. Winkler Prins to chair the "lower" and "upper" committees respectively. The question of the development of an interim classification for the Carboniferous was raised but not discussed further.

Chairman Ramsbottom then notified the Titular Members of the passing of Drs Minato (Japan) and Meyen (USSR) and a moment of silence was observed in their memory. Chairman Ramsbottom stated that Soviet procedures required that a request for a nominee be made to them and it was agreed that they should be contacted to provide an Angaraland representative. Suggestions for a Japanese representative were solicited and the names of Drs Kato and Igo were proposed. Chairman Ramsbottom was charged with arranging a replacement from those two names.

The issue of regional stratotypes and nomenclature was raised in Madrid (1983) and again in China. Chairman Ramsbottom stated the policy that regional chronostratigraphic classification is the responsibility of the regional Working Group and the SCCS Bureau. The decisions regarding the Westphalian made in Madrid were then reconsidered, particularly whether the correct procedure was followed. Dr. Winkler Prins reported that only members of the Westphalian A, B, and C Working Groups voted on the matter, but that all Europeans should have voted. Chairman Ramsbottom suggested that the regional voting requirement be rescinded and that all members should vote on an issue. Vice-Chairman Wagner reviewed the issues involving the Barruelian, Langsettian, Duckmantian and Bolsovian Stages and the Cantabrian boundary stratotype horizon (see Compte Rendu, X-ICC, Volume 4, p.459-460 for review). It was agreed that this question be included in the postal ballot to be circulated following this meeting.

The Newsletter was discussed briefly, with the statement that one will be forthcoming soon.

The resignation of Dr. Walter Manger (USA) as Secretary of SCCS was accepted with regret by Chairman Ramsbottom, and Dr. Manger was thanked for his service. A motion to promote Dr. Engel to Secretary of SCCS was seconded and passed unanimously. The name of Dr. Hisayoshi Igo (Japan) was proposed by the Bureau of SCCS for the position of Associate Secretary. Dr. Igo's name was then placed in nomination and seconded. The floor was opened to further nominations and there being none, Dr. Igo was elected without dissent.

Walter L. Manger, Secretary SCCS

ATTENDANCE OF SCCS BUREAU AND TITULAR MEMBERS - September 3, 1987

W.H.C. Ramsbottom (UK) - Chairman
R.H. Wagner (Spain) - Vice-Chairman
W.L. Manger - Secretary
B.A. Engel - Associate Secretary

S. Archangelsky (Argentina)
J.T. Dutro Jr (USA)
Gao Lian-da (China)
M. Gordon Jr (USA)
Guo Hong-zun (China)
H.R. Lane (USA)
J.P. Laveine (France)
Li Xing-xue (China)
B. Mamet (Canada)
E. Paproth (FRG)
P.K. Sutherland (USA)
C. Winkler Prins (Netherlands)
Yang Shipu (China)
Yang Xilu (China)

3.4 COMMENTS ON BIPARTITE DIVISION OF THE CARBONIFEROUS

by Yang Jing-shi, Nanjing Inst. Geol. & Paleont., Academia Sinica, Nanjing, PEOPLES REPUBLIC OF CHINA (Submitted September, 1987).

Formerly, the Carboniferous of China followed a three-fold division, corresponding to that of the Moscow Basin of the U.S.S.R. The lower series was named the Fengningian, approximately equivalent to the Mississippian of North America. The middle series was named Weiningian or Huanglungian, corresponding to the Bashkirian and Moscovian of the U.S.S.R. The upper series was named the Mapingian or Chuanshanian, roughly equivalent with the Kasimovian, Gzelian and Sakmarian of the U.S.S.R.

In the two-fold division, advocated now, the Carboniferous of China is divided into a lower series, that still retains the name Fengningian, and an upper series that is called the Hutienian, including the middle and upper series of the former three-fold division. The upper series is approximately equivalent to the Pennsylvanian of North America. Most Chinese paleontologists and stratigraphers favour a two-fold division, reflecting recent advances made in the Carboniferous biostratigraphy of China, as well as current practice elsewhere in the world. In China, Carboniferous biostratigraphic successions may be summarized as follows:

1.Fusulinids - the fusulinids first appear in the uppermost Lower Carboniferous with only two primitive genera, *Eostaffella* and *Millerella*, characterized by small, discoidal shells with unfluted septa. At the beginning of the Late Carboniferous, many subfamilies arose, usually persisting to the end of the Carboniferous, and exhibiting no sharp boundary between the Mapingian and Weiningian.

2. Cephalopods - the suture of the early Carboniferous ammonoids belongs to the most primitive type. In sutural characters, the goniatites of the Weiningian are quite similar to those of the Mapingian. The end of the early Carboniferous was an important point in the evolution of the nautiloidea.

3. Rugosa - an obvious dissimilarity exists between early and late Carboniferous forms, but more similarities and continuity exist between middle and late Carboniferous forms in the old stratigraphic classification.

Based on biostratigraphic data, we are inclined to view the two-fold division scheme as more practical for the Carboniferous of China.

The geologic history of the region also favors a two-fold division. The Caledonian Uplift occurred in the vast area of north China. As a result, the Fenchi Series of early Late Carboniferous age rests unconformably on the Ordovician, and the deposits of Late Ordovician to Early Carboniferous are entirely absent there. Lithologically, the Penchi and Taiyuan Formations in north China are similar and continuously deposited. They are characterized by sandstones, shales, intercalated limestones, and coal seams. In south China, the Huanglung Formation and the Chuanshan or Maping Formation are characterized by continuously deposited limestones, while deposits of the Lower Carboniferous are distinct.

3.5 THE PRIMARY SUBDIVISION OF THE CARBONIFEROUS SYSTEM

by Dr. H. Kozur, H-1029 Budapest, Rézsü u. 83, HUNGARY. (Submitted: March, 1987).

The top of the lower subsystem of the Carboniferous (Mississippian) is clearly defined (not facies-controlled) by major changes in all stratigraphically important groups. It is situated between the Chesterian and Morrowan, between the Serpukhovian and Bashkirian and within the upper part of the Namurian A. The question of the primary division of the Carboniferous is therefore reduced to the question, whether the post-Mississippian Carboniferous should be *one* subsystem (Pennsylvanian) or *two*. In the latter case comparable faunal/floral changes, as at the top of the Mississippian, should be present within the Pennsylvanian. The only major faunal/floral change within the Pennsylvanian that could be used for the separation of a Middle Carboniferous from an Upper Carboniferous (*s.str.*) lies near the Moscovian-Kasimovian boundary. But in comparison with the Mississippian-Pennsylvanian boundary, the faunal/floral changes near the Moscovian-Kasimovian boundary are more gradual and as a whole not so strong. The conodonts for example show major changes in their genus-species composition at the lower boundary, but only changes in their species composition near the upper boundary.Moreover, there is even in the species composition a certain transitional interval. For instance, the conodont fauna of the upper Berenás Member of the Bükk Mountains (Kozur, 1984) contains both species restricted to the Moscovian, like *Gondolella clarki* Koike and *Neognathodus colombianus* (Stibane) and species that were until now only reported from the Kasimovian, like *Idiognathodus magnificus* Stauffer & Plummer, *Streptognathodus excelsus* Stauffer & Plummer and *S.gracilis* Stauffer & Plummer. The generic composition of the conodont fauna is quite the same in the whole of the Moscovian and Kasimovian (e.g. *Diplognathodus, Gondolella, Idiognathodus, Neognathodus, Streptognathodus*). A similar picture can be found in

other stratigraphically important fossil groups (see Wagner & Winkler Prins, 1985).

The Moscovian-Kasimovian boundary seems to be therefore only a series (stage) boundary. Its importance was overestimated in the past because of some not quite correct correlations. So, for a long time, different regional boundaries were correlated: The Middle-Upper Pennsylvanian (Desmoinesian-Missourian), Westphalian-Stephanian (Westphalian D-Cantabrian) and Middle-Upper Carboniferous (Moscovian-Kasimovian) boundaries. But the positions of these boundaries do not coincide. The oldest amongst these boundaries is the Westphalian D-Cantabrian boundary that lies within the uppermost Moscovian (within the Myachkovian), the youngest one is the Desmoinesian-Missourian boundary that lies according to the conodont data within the higher Kasimovian at a level that corresponds approximately to the Stephanian A-Stephanian B boundary (Kozur, 1984).

Summarising the floral and faunal development within the Carboniferous, we can state that only one first order major change occurs within the Carboniferous (Mississippian-Pennsylvanian boundary). Therefore a subdivision of the Carboniferous into two subsystems seems to be justified. But according to the faunal/floral data alone, a three-fold subdivision cannot be excluded. In spite of the fact that the faunal/floral changes near the Moscovian-Kasimovian boundary are not as strong as at the Mississippian-Pennsylvanian boundary, they could well be used for the definition of a Middle/Upper Carboniferous boundary, if this three-fold division were supported by other data (priority, time-balanced subdivision). But these very aspects contain the strongest arguments against a three-fold subdivision, for it has neither the priority nor a time-balanced subdivision. The Upper Carboniferous (*s.str.*) (=Stephanian) would be considerably shorter than the Lower Carboniferous and even than the Middle Carboniferous. Therefore a two-fold subdivision of the Carboniferous System into the Mississippian and Pennsylvanian is here supported. The names Lower and Upper Carboniferous for these subsystems should be avoided. The Mississippian comprises the Western European Lower Carboniferous *and* the largest part of the Namurian A (now grouped as part of the Western European Upper Carboniferous). The Pennsylvanian (highest Namurian A to Stephanian) neither coincides with the Western European Upper Carboniferous (Namurian A to Stephanian) nor with the East European Upper Carboniferous (*s.str.*) (Stephanian only).

References:

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Wagner, R.H. & Winkler Prins, C.F. (1985). The Cantabrian and Barruelian stratotypes: A summary of basin development and biostratigraphic information. *Ann.Fac.Ciênc.*, Suppl. Vol. 64, 359-410.

4.0 SCCS WORKING GROUP REPORTS

4.1 WORKING GROUP ON INTERNATIONAL "LOWER" CARBONIFEROUS SUBDIVISION

by P.L. Brenckle, Amoco Production Co., P.O. Box 3385, Tulsa, Oklahoma 74102, USA. (Submitted: May, 1988).

Last year in Beijing, the Subcommission asked me to organize an international Working Group to identify potential boundaries within the lower part of the Carboniferous. The request stemmed from the Subcommission's informal acceptance of a bipartite division of the Carboniferous System, and the accompanying need to establish paleontologic criteria for recognition of worldwide subdivisions within the lower, or "Mississippian" subsystem. The approach of the group will generally follow that of the Mid-Carboniferous Working Group, leading eventually to designation of boundary-defining species and stratotype sections.

The immediate objective of the International "lower" Carboniferous Working Group is to identify evolutionary changes in various fossil groups that may provide suitable horizons for intercontinental correlation and, from this information, to recommend which stratigraphic levels seem most promising for further paleontologic investigation. The intent is not to propose either formal subdivisions or boundary-defining taxa at this time. As far as practicable, the work will be divorced from established time-stratigraphic and zonal terminology to minimize bias in putting together recommendations. However, this approach does not preclude the selection of currently used boundaries if paleontologic evidence is supportive.

Thus far, the following researchers have agreed to participate in the working group: Dr. Martin Bless (ostracodes), Natural History Museum, Maastricht, The Netherlands; Dr. Oksana Bogush (foraminifers), Soviet Academy of Sciences, Novosibirsk, U.S.S.R.; Dr. Geoffrey Clayton (palynomorphs), Trinity College, Dublin, Ireland; Dr. Brian Engel (trilobites), University of Newcastle, Newcastle, Australia; Dr. Eric Groessens (conodonts), Geological Survey, Brussels, Belgium; Dr. Hisayoshi Igo (conodonts), University of Tsukuba, Ibaraki, Japan; Professor Jurgen Kullmann (goniatites), University of Tubingen, Tubingen, Federal Republic of Germany; Dr. Marie Legrand-Blain (brachiopods), University of Pau, Pau, France; Dr. Liao Zhou-ting (brachiopods), Academia Sinica, Nanjing, People's Republic of China; Dr. Geoffrey Playford (palynomorphs), University of Queensland, St.Lucia, Brisbane, Australia; Dr. Vladimir Poletaev (brachiopods), Soviet Academy of Sciences, Kiev, Ukraine, U.S.S.R.; Dr. Barry Richards (stratigraphy), Institute of Sedimentary and Petroleum Geology, Calgary, Alberta, Canada; Dr. Nora Sabattini (molluscs), Museum of Natural Sciences, Buenos Aires, Argentina; Dr. William Sando (corals), U.S. Geological Survey, Washington, D.C., U.S.A.; Dr. George Sevastopulo (echinoderms), Trinity College, Dublin, Ireland; Dr. Wang Zhi-hao (conodonts), Academia Sinica, Nanjing, People's Republic of China; and Dr. Gary Webster (conodonts), Washington State University, Pullman, Washington, U.S.A.

I have asked each investigator to coordinate research in his or her speciality and send me a short paper outlining significant biotic changes within the "Mississippian" subsystem. I plan to summarize these papers in a report to be presented next year at the Carboniferous Subcommission meeting in Utah/Nevada. Individual contributors are also invited to present conclusions about their specific research at the meeting. Afterwards, I would like to publish a volume incorporating all the individual contributions, my summary report and comments from the meeting. This will represent a "state-of-the-art" compilation of our understanding of "lower" Carboniferous interregional correlations and provide a blueprint for future directions of the Working Group.

4.2 WORKING GROUP ON THE MISSISSIPPIAN - NORTH AMERICA

by J. Thomas Dutro, U.S. Geological Survey, E-501 National Museum of Natural History, Washington D.C. 72701, U.S.A. (Submitted: July, 1987).

Work is continuing on the compilation of the North American Mississippian volume for the "Carboniferous of the World" series. Original plans for the volume have been modified after correspondence with Bob Wagner, who indicated that the planned volume would have to be cut by about 40 percent. Several of the authors of chapters have expressed concern that the shorter format severely limits their ability to adequately describe the depositional diversity in their regions. We are trying to resolve these differences, but some of the chapters may have to be reassigned or compiled by other authors.

The original plan of 14 chapters has been revised to 10, including: Introduction; Type region (northern mid-continent); Appalachian region; Southern mid-continent; Northern Rocky Mountains (USA); Southern Rocky Mountains (USA); Alaska and Pacific Coast; Canada (by Mamet & Bamber); Biostratigraphy; and Summary.

A request by Wagner to include plates of "characteristic" fossils is still being considered, Proper documentation of such plates would lengthen the manuscript, perhaps beyond acceptable limits.

At present, we have drafts of four chapters and work is progressing on three others. Completion of the manuscript is anticipated within two years.

4.3 WORKING GROUP ON THE LATE MISSISSIPPIAN (CHESTERIAN) AND EARLY TO MIDDLE PENNSYLVANIAN (MORROWAN)

by Mackenzie Gordon Jr, U.S. Geological Survey, E-501 National Museum of Natural History, Washington D.C. 72701, U.S.A. (Submitted: October, 1987).

This report deals with studies recently completed, now in progress, and planned for the near future, mostly by geologists of the U.S. Geological Survey and their associates. Studies of the boundary between these two series (and systems) are an integral part of this work. Most of this work has been done on the Mississippian side of this boundary. T.W. Henry is well along in a comprehensive study of the Morrowan fauna, which he began some time ago, but the pressure of other duties has prevented him from concluding this work.

Great Basin Region: This monographic study of 79 species of Late Mississippian gastropods from the Chainman Shale in west-central Utah, by E.L. Yochelson and myself, a culmination of 30 years of collecting, has finally been published. We recognize eight different gastropod assemblages, seven of them in ascending order, and show that gastropods at the species level can be almost as useful as ammonoids, conodonts, and foraminifera biostratigraphically.

For the next paper in this series, I have completed the descriptive work on 35 species of ammonoids from the same area. These occur in six zones that have worldwide application for correlation and can be equated with foraminiferal and conodont zonation. The illustrations for this report are nearing their final stages of preparation, but the stratigraphic part has not yet been written.

T.W. Henry and I are studying the brachiopod faunas from the same sections. To make the published results more manageable, we are dividing the brachiopod report into two parts. Our first paper will deal only with brachiopods from the *Rhipidomella nevadensis* Zone, which we equate almost entirely with Mamet's foraminiferal Zone 19 (sensu Mamet). This report will deal with approximately 44 species, most of them new. The change in the brachiopod faunas between Zone 18 and Zone 19 is just as profound as that between Zones 19 and 20 (the Mississippian-Pennsylvanian boundary). The brachiopod faunas of Zones 15 through 18 reach a total of slightly less than 40 species. So, breaking the section at the top of Zone 18 will yield two papers of similar size. The brachiopod faunas below Zone 18 are much more sparse because most lithofacies at that level are more suitable for ammonoid rather than for brachiopod preservation.

Appalachian Region: T.W. Henry and I have also completed a first draft of our paper on the brachiopods of the Hinton and Bluestone Formations in the central Appalachian region, along the Virginia-West Virginia border. Many of the assemblages seem to be biocoenoses, having lived approximately where they died. Although not a single foraminifer was found in these sections, probably because of a preponderance of fine clastic detritus in most of the rocks, the brachiopods permit correlation to areas where the foraminiferal zonation is well established. We can show, therefore, that the fossiliferous beds range from the upper part of Mamet Zone 17 through Zone 19.

New linoproductid genus: T.W. Henry and I have also completed the first draft of a paper on a new genus of small *Ovatia*-like linoproductids. The feature common to the six species that we recognize is a thickened ridge in both valves bordering the visceral disc, resembling those of certain marginiferids. When the valves were closed, the ridges tended to seal off the visceral cavity. This genus ranges in age from the late Meramecian (Late Mississippian) to early Atokan (Middle Pennsylvanian). Although species occur on both sides of the boundary, none have a range which spans across the actual boundary.

Move to Denver: Henry, who recently completed several reports on the effects of the atomic explosions in the lagoon at Eniwetok Atoll, and has had other interruptions to his work on the Carboniferous, has moved his base of operations to the Denver Federal Center, near Boulder, Colorado. At the same time, a move of the Geological Survey's working Carboniferous collections to a new storage facility at the Denver Federal Center has begun. Perhaps one quarter of them are no longer available at the National Museum in Washington. The Chainman brachiopods will remain in Washington, however, until the report is completed.

Future Work: The Granite Mountain section in Juab County, Utah, which was collected three times, foot-by-foot for several hundred feet across the Mississippian-Pennsylvanian boundary, exposes three conodont zones in the vicinity of the systemic boundary. The lowest, the rather extensive *Adetognathus unicornus* Zone, which corresponds rather closely to the *Rhipidomella nevadensis* brachiopod Zone terminates roughly 20 feet below the boundary as determined by the first appearance of *Declinognathodus noduliferus*. The intervening section is dominated by *Rachistognathus primus* and several rather distinctive anthracospirifers. Accompanying the first appearance of *Declinognathodus noduliferus* at the Mississippian-Pennsylvanian boundary is the first appearance of Mamet's Zone 20 foraminifers. A foot or two higher, the distinctive productoid brachiopods of the *Rugoclostus* Zone make their appearance. *Rachistognathus primus* is also present in these higher beds.

In the Arrow Canyon section, however, no overlap seems to be in evidence of *Rachistognathus primus* below *Declinognathodus noduliferus*; both species are reported for the first time in the same bed. The question arises as to whether there is some sort of hiatus in the section at Arrow Canyon or if the range of *D.noduliferus* is slightly different at Granite Mountain. We propose, therefore, that additional sections in the eastern Great Basin be studied to establish some consistency in the succession. It is further proposed that pending this further study, no final selection of a boundary stratotype be made.

4.4 WORKING GROUP ON THE MID-CARBONIFEROUS BOUNDARY

by H. Richard Lane, Amoco Production Company USA, 501 Westlake Park Blvd., Rm. 16.162, Houston, Texas 77079, USA. (Submitted: June, 1988).

The Mid-Carboniferous Boundary Working Group met twice during the XIth I.C.C. in Beijing. The first was an informal meeting held on August 28 in Xian on the East Gansu Field Excursion. Six members of the Working Group attended the meeting and field excursion, visiting the Yushuliang section which was proposed as a candidate stratotype by our Chinese colleagues. Voting members present included H.R.Lane (Chairman), A.C.Higgins (Secretary), P.Brenckle, B.A.Engel, I.Metcalfe, and B.Skipp. Others in attendance included R.A.Gastaldo, P.H.Heckel, J.Kullman, Mee Young-chun, A.Rabitz, W.J.Sando, Shen Guang-long, R.H.Wagner and Wang Zhi-hao.

Conclusions about the Yushuliang section were as follows:

- 1. No distinctive foraminifera are present below a level well above the proposed mid-Carboniferous Boundary level and they are probably of late Bashkirian age.
- 2. There appears to be a gap in the conodont succession between the occurrences of *Gnathodus bilineatus bollandensis* and *Declinognathodus noduliferus*. The association of *D.noduliferus* and *Neognathodus symmetricus* indicates an horizon higher than the base of the Chokierian stage.
- 3. Plant-bearing strata occur between the marine Arnsbergian, *G.bilineatus bollandensis* faunas and in the lowest *D.noduliferus* faunas. Plant specialists on the excursion agreed that early Namurian plants were present, but were accompanied by genera such as *Linopteris*, which in western Europe, do not occur below the late Namurian-early Westphalian interval.
- 4. The goniatite record indicates the presence of a gap in the sequence, that is, goniatites of Arnsbergian age followed by faunas of possible late Marsdenian and Yeadonian age. The few meters of non-goniatite-bearing strata separating the two faunas were felt to be inadequate to explain the gap.

In conclusion, it was recommended that the section be more fully studied before attempting to correlate it. It was also recommended that a geological map of the area be made available to increase understanding of possible structural complications. Points in its favour include good exposure, good access, and a wide variety of fossils, including non-marine plants.

A formal meeting of the Working Group was held in Beijing. The following eleven voting members attended: H.R.Lane (Chairman), A.C.Higgins (Secretary), B.A.Engel, H.Igo, W.L.Manger, I.Metcalfe, B.Owens, W.H.C.Ramsbottom, Ruan Yi-ping, B.Skipp and Yang Jing-zhi. Other attendees included: S.Archangelsky, W.J.Barclay, M.Browne, J.T.Dutro Jr, R.A.Gastaldo, M.Gordon Jr, T.Koike, Li Lan, E.Paproth, A.Rabitz, J.Remane, B.C.Richards, J.R.P.Ross, G.D.Sevastopulo, W.J.Varker, Wang Zhi-hao, J.Waters, G.D.Webster, C.Winkler Prins, Wu Xinguan and Zhen Guang-long.

Chairman Lane opened the meeting by outlining the functions of the Working Group, reading the ratified proposal for a mid-Carboniferous Boundary and listing the publications connected with the Working Group's activities. These include:

Lane, H.R. *et al.* 1985. Proposal for an international Mid-Carboniferous Boundary. *Compte rendu 10ème Congrès International de Stratigraphie et de Géologie du Carbonifère, Madrid, 1983*, 4, 323-339

Lane, H.R. & Ziegler, W. (*Eds*) 1985. Towards a Boundary in the Middle of the Carboniferous: Stratigraphy and Palaeontology. *Cour. Forsch. - Inst. Senckenberg*, 74.

Brenckle, P.L., Lane, H.R. & Manger, W.L. (*Eds*) 1987. Selected studies in Carboniferous Palaeontology and Biostratigraphy. *Cour. Forsch. - Inst. Senckenberg*, 98.

Bill Ramsbottom, Bernard Owens and John Varker discussed the Stonehead Beck Section (formerly Gill Beck), a stratotype candidate examined by the Working Group in 1985. The Stonehead Beck Section is well exposed and belongs to the goniatite-pectinoid biofacies of the Craven Basin. The British Government has recently designated the locality as a Site of Special Scientific Interest (SSSI), which will guarantee its preservation. The section exposes 34 m of mud rocks with minor grits and the important Arnsbergian-Chokierian boundary. The details of the section are published in a paper by Riley *et al.*, 1987 (*Courier Forschungsinstitut Senckenberg*, Bd 98, 169-177).

The authors outlined the sequence of goniatites, bivalves, spores and conodonts in the section. Although the goniatite fauna is restricted, the section does include all the key late Arnsbergian and Chokierian forms and is the type locality for *Homoceras subglobosum*. The bivalves include *Caneyella semisulcata*, a species newly appearing at the base of the Chokierian. No major spore change occurs at the Arnsbergian-Chokierian boundary but two species, *Schulzospora campiloptera* ranging up to the first appearance of *D.noduliferus*, and *Grandispora spinosa* appearing at the *D.noduliferus* level, may be of value in recognising the boundary. Conodont faunas illustrate an ascending sequence consisting of *Gnathodus bilineatus bollandensis*, *Rhachistognathodus minutus* and *Declinognathodus noduliferus*. The lower two characterise the late Arnsbergian and the latter the early Chokierian. A possible barren few metres still exist between the late Arnsbergian/early Chokierian faunas.

Future plans

1. Donetz Basin Section, USSR Field Trip. An invitation for the Working Group to visit the Donetz Basin, Ukraine has been received from Dr. T. Nemirovskaya and Dr. E.O. Einor. The trip is to be run in late September 1988 and will look at important mid-Carboniferous Boundary exposures in that area and will also include a technical meeting in Kiev. The itinerary for the field trip is now being worked out, but details should be available by the time the *Newsletter* is published.

2. Biennial SCCS Meeting, Provo, Utah (September 24-30, 1989). Associated with the biennial meeting of the SCCS in Provo, Utah, the mid-Carboniferous Boundary Working Group plans a field trip led by G.D. Webster, Washington

State University, Pullman, Washington, USA, to include the Lake Point Section in the Oquirrh Mountains; Granite Mountain, Confusion Range, Utah; and Arrow Canyon, Arrow Canyon Range, southern Nevada. It is hoped that an additional trip can be arranged which will examine the Carboniferous exposures in the Grand Canyon of Arizona. Details of the field excursion and business meeting in Provo are still being formulated. When finalized, **THEY WILL BE MAILED TO THOSE MEMBERS WHO INDICATE THEIR INTEREST ON THE ENCLOSED MAILING LIST UPDATE FORM.** It is planned that proceedings of the meeting will be published in a volume of the Brigham Young University Geology Studies. Local organization is being handled by Prof. Morris Peterson, Brigham Young University, Provo, Utah, Dr. H. Richard Lane, Amoco Production Company, Houston, Texas, USA, and Prof. Walter Manger, University of Arkansas, Fayetteville, Arkansas, USA.

3. Bechar Basin, Algeria, 1990?. It is hoped that an excursion can be arranged to visit mid-Carboniferous exposures in the Bechar Basin of Algeria in the fall of 1990. Initial attempts to contact appropriate Algerian authorities are currently underway.

Voting Members, mid-Carboniferous Boundary Working Group, June 1988.

- Dr. H.R. Lane, Amoco Production Company USA, Houston, Texas, USA (Chairman)
- Dr. A.C. Higgins, British Petroleum Res.Centre, Middlesex, England (Secretary)
- Dr. J. Bouckaert, Katholieke Univ., Leuven, Belgium
- Dr. P. Brenckle, Amoco Production Co., Tulsa, Oklahoma USA
- Dr. J. Dvorak, Ustredni ustav geol., Brno, Czechoslovakia
- Dr. O.L. Einor, Kiev Univ., Kiev, USSR
- Dr. B.A. Engel, Univ.of Newcastle, Newcastle, NSW, Australia
- Dr. R.A. Gastaldo, Auburn Univ., Auburn, Alabama, USA
- Dr. H. Igo, Univ.of Tsukuba, Ibaraki, Japan
- Dr. W.L. Manger, Univ.of Arkansas, Fayetteville, Arkansas, USA
- Dr. I. Metcalfe, Univ.Kebangsaan Malaysia, Bangi, Selangor, Malaysia
- Dr. T. Nemirovskaya, Ukrainian Acad.of Science, Kiev, USSR
- Dr. B. Owens, British Geol.Survey, Nottingham, England
- Dr. A. Rabitz, Geol. Landes. Nordrhein-Westfalen, Krefeld, F.R.Germany
- Dr. W.H.C. Ramsbottom, Univ.of Sheffield, Sheffield, England
- Dr. A.C. Rocha-Campos, Univ.de Sao Paulo, Sao Paulo, Brazil
- Dr. Ruan Yi-ping, Nanjing Inst.Geol.& Paleont., Nanjing, P.R.China
- Dr. B. Skipp, U.S.Geol.Survey, Denver, Colorado, USA
- Dr. M. Weyant, Uni. de Caen, Caen, France
- Dr. Yang Jing-zhi, Nanjing Inst. Geol. & Paleont., Nanjing, P.R.China

4.5 WORKING GROUP ON INTERNATIONAL "UPPER" CARBONIFEROUS SUBDIVISION

by C.F. Winkler Prins, Rijksmuseum van Geologie en Mineralogie, Hooglandsekerkgracht 17, 2312 HS Leiden, The Netherlands.

This working group has been formed with the same requirements as those stated for the "lower" Carboniferous subdivision (see 1.6 & 4.1). Dr. Cor Winkler Prins reports that invitations have been forwarded to 24 research workers asking them to contribute to the Working Group. They have been asked to make suggestions for suitable subdivisions, to state what evidence is available to support their nominations and to give reasons why any particular subdivision is preferred.

It is expected that reactions will reach Dr. Winkler Prins by the end of 1988 and he will then summarise the results and distribute them among the members of the group during January, 1989, together with proposals to be discussed at the SCCS meeting in Provo, Utah in September, 1989. Members unable to attend the biennial meeting are asked to provide him with written contributions to the discussion. All members have been sent a copy of the manuscript by Wagner and Winkler Prins entitled "Major subdivisions of the Carboniferous System" which will appear in the Compte Rendu for the XIth ICC, Beijing.

Invited members include: M.F. Bogoslovskaya (USSR). R.C. Douglass (USA), O.P. Fissunenko (USSR), Gao Lianda (P.R.China), A.D Grigorjeva (USSR), H.P. Heckel (USA), A. Higgins (UK), Jin Yu-kan (P.R.China), F. Kahler (F.R.Germany), H.R. Lane (USA), Li Xing-xue (P.R.China), B.L. Mamet (Canada), W.L. Manger (USA), T.I. Nemirovskaya (USSR), B. Owens (UK), R. Peppers (USA), H.W. Pfefferkorn (USA), W.H.C. Ramsbottom (UK), Rui Lin (P.R.China), R.H. Shaver (USA), M.N. Solovieva (USSR), P.K. Sutherland (USA), R.H. Wagner (Spain), Wang Cheng-yuan (P.R.China).

4.6 WORKING GROUP ON THE MOSCOVIAN STAGE 1984-1987

by M. Solovieva, Geological Inst. AN SSSR, Pyzhevsky per. 7, Moskva, 109017 USSR. (Submitted: July, 1987).

In 1984-1987, the Working Group on the Moscovian Stage continued its activity with the same membership. Most efforts were concentrated on defining the upper and lower boundaries, better delineation of the standard section, and the elimination of errors in both recognition and correlation of the stage.

The definition of the lower boundary of the Moscovian Stage relies heavily on the faunistic and floristic changes which mark its contact with the Bashkirian Stage. The upper boundary is dependent upon relationships with the overlying Mid-

dle and Upper Carboniferous in the USSR, where difficulties exist with the boundaries of the Cantabrian, Westphalian and Stephanian Stages.

Within the limits of fulfilling the above mentioned tasks, members of the Working Group in 1984 actively participated in arranging the first field colloquium on the biostratigraphy and foraminiferal content of neighbouring deposits of the Middle and Upper Carboniferous. There were 22 participants from 10 organizations present. The program included an excursion to a section in Domodedovo quarry, which was proposed as a type section at the boundary between the Moscovian and Kasimovian Stages. Detailed microfaunal sampling was undertaken.

Also in 1984, a number of Working Group members participated in the 27th IGC in Moscow where they presented several papers including -

- 1. Fisunenko, O.P. Fitogeography of Carboniferous and continental drift.
- 2. Solovieva, M.N. Middle Carboniferous of Euroasia (biogeographical differentiation of a zonal scheme).
- 3. Vdovenko, M.V., Aizenverg, D.E., Astakhova, T.V., Berchenko, O.I., Brazhnikova, N.E., Gorak, S.V., Kozitzkaya, O.I., Lipnyagov, O.M., Nemirovskaya, T.I., Novik, E.O., Poletayev, V.I., Sergeev, M.T., Tschegolev, A.K., Vasilyuk, N.P., Inosova, K.I., Kruzina, A.Kh., Shvartzman, E.G., Kireeva, G.D., Pogregnyak, V.A., Teteryuk, V.K., Fisunenko, O.P. Zonal stratigraphic scheme of the Donbass Carboniferous.

After completion in Moscow, of the analysis of the fauna collected during the first working colloquium, a second colloquium on biostratigraphy and foraminifera was organized in 1985. This resulted in the coordinated decision to place a boundary in stratum 10 - "Garnasha" (see stratigraphic section in "Excursion Guidebook, 27 IGC, M.",1984). Taking into account the importance of data on the Order Ozawainellida, a colloquium was also organized in 1985 in Artyomovsk by the Commission on Micropaleontology.

In 1986, members of the Working Group arranged and participated in the 10th All-Union meeting on micropaleontology in Leningrad. (Dr. Solovieva, Convener of the Working Group on the Moscovian Stage, acted as a Vice-Chairman of the organizational committee of the meeting). Members of the Working Group presented papers and participated in a number of colloquia which were arranged during the meeting. These included a colloquium on foraminifera and biostratigraphy of the Lower Carboniferous (Chairman - Dr. Solovieva); a colloquium on the Order Ozawainellida (Conveners - M.N. Solovieva and A.V. Dzhenchuraeva).

In 1987, members continued with their activities, aiming to provide a higher level of reliability in distinguishing and correlating deposits of the Moscovian Stage, based on more precise faunal data and better correlation models. The members published a considerable number of papers in 1984-1987. The Convener presented 8 papers on the Moscovian Stage, dealing with the micropaleontological basis of Carboniferous biostratigraphy, in the Moscow Society of Nature Researchers.

4.7 WORKING GROUP ON THE UPPER PENNSYLVANIAN

by R.M. Kosanke, U.S.Geological Survey, Branch of Paleontology and Stratigraphy, Box 25046 M.S.919, Denver Federal Center, Denver, Colorado, 80225-0046, USA. (Submitted: May, 1988).

Robert Kosanke of the Branch of Paleontology and Stratigraphy, U.S. Geological Survey, Denver reports that palynological investigations of the proposed Pennsylvanian System stratotype located in West Virginia and Virginia have been completed. The work will be presented in three separate publications covering the Lower, Middle and Upper Pennsylvanian Series in the USGS Professional Paper Series.

4.8 WORKING GROUP ON CARBONIFEROUS STUDIES IN CHINA

by Yang Shipu, Beijing Graduate School, Wuhan College of Geology, Beijing, Peoples Republic of China. (Submitted: April, 1988), and Guo Hongzun, Dept. Geology, Changchun College of Geology, Changchun, Jilin, Peoples Republic of China. (Submitted: May, 1988).

Recent studies by Professor Yang Shipu and his students have concentrated on the investigation of early Carboniferous brachiopods, their systematics, paleoecology and biogeography. The faunas described are chiefly found in the Guizhou, Hunan of South China and Sichuan, Tibet of Western China. In addition there are some works on plant fossils by Yang Guanxiu.

Further plans include -

- 1. An ecostratigraphic framework for the Lower Carboniferous of Guizhou (a dissertation by Zhang Jianping due for completion in late 1988).
- 2. An Atlas of the Carboniferous Brachiopods of China.
- 3. A study of Carboniferous paleobiogeography.

Publications:

Yang Shipu, 1987. Development of the International Carboniferous subdivision and the middle boundary of the Carboniferous System in China, *in* Special Paper of the National Carboniferous Symposium of China, *China Publ. House*, 10-20.

Yang Shipu & Jiang Jianjun, 1987. Early Carboniferous strata and brachiopods of the Longmenshan Region, Sichuan. *Ibid.*, 69-92.

Yang Guanxiu, 1985. On the succession of plant assemblage zones of Late Paleozoic coal-bearing strata in Yuxian, west Henan, and re-interpretation of regional stratigraphic units. *Earth Science*, 10, 145-161.

Yang Shipu, Wang Shaofang & Li Aiguo, (in press). Early Carboniferous brachiopod communities of Central Hunan, southeastern Guizhou, *in* Symposium of XIth International Congress on Carboniferous Stratigraphy and Geology.

Yang Shipu, (in press). The geographic distribution of Early Carboniferous brachiopods of China and its adjacent regions. *Earth Science.*

CARBONIFEROUS OF THE TIANSHAN-XINGAN GEOSYNCLINAL REGION AND NORTH CHINA PLATFORM. Professor Guo Hongzun reports that Lin Yingdang (corals) and Wu Shizhong (corals) have continued their investigations on the Upper Carboniferous rugose corals in North China. Huang Zhuxi (fusulinids and paleoecology) and Zhao Da (conodonts) are working on corals, fusulinids and conodonts associated with the mid-Carboniferous Boundary in central Jilin.

The most important work during the past months was achieved by Guo Hongzun (biostratigraphy and paleobiogeography) and Huang Zhuxi on the Carboniferous of the Tianshan-Xingan region. These authors have presented a synthesis of the stratigraphy, paleogeography and paleontology of this region where three main Variscan subcycles have been distinguished.

4.9 WORKING GROUP ON THE CARBONIFEROUS OF NORTH AFRICA

by Marcel Weyant, Dept. Geol., UER Sci.de la Terre, Université de Caen, Esplorade de la Paix, F-14032 Caen, France.

Whereas field activity has remained rather restricted during the last few years, several major contributions on the Carboniferous of North Africa have been achieved.

Marie Legrand-Blain completed an important work on Carboniferous brachiopods from the Algerian Sahara. Based mainly on the Productidae and Spiriferidina, seven biozones are defined within the Bechar Basin. Several zones of this standard sequence are recognized throughout the Saharan platform, although displaying a certain amount of vertical shift from west to east. An important faunal change, characterized by the extinction of the Gigantoproductidae and the appearance of the Choristitidinae, occurs near the level bearing the first representatives of the critical conodont species *Declinognathodus noduliferus*, i.e. near the worldwide mid-Carboniferous major faunal break. Comparisons with coeval brachiopods from other continents show fairly good affinities between northern Sahara and Eurasia, whereas episodic relations are recorded between Central Saharan and American faunas (Legrand-Blain thesis).

A comprehensive synthesis of micropaleontological investigations (foraminifera, algae) carried out over several decades on the southern parts of the Tethyan realm was recently presented by Maurice Lys (1986). A weighty part of this work is devoted to Visean through Moscovian marine successions on the Sahara platform, resulting in a detailed biostratigraphy and comparisons with biozones known from western Europe and southern Soviet Union (Donetz Basin and Russian Platform). Paleogeographical connections with the Cantabric area as well as the eastern Mediterranean domain are discussed.

Working on a much more restricted area within the Bechar Basin Amina Sebbar, presently at the Algiers University, completed a detailed study on foraminifera and calcareous algae of the Upper Visean and Serpukhovian. An important point discussed in this study concerns the true vertical range of *Asteroarchaediscus postrugosus* (Reitlinger), considered hitherto as being diagnostic of the *Homoceras* (H) Zone. In the area investigated this species is found in association with foraminifera typical of the upper *Eumorphoceras* (E2) Zone (Sebbar 1986).

Abstracts of an informal meeting held at Louvain-la-Neuve University on the Carboniferous of North Africa are published in the second part of volume 96 (1987) of *Géologie, Bulletin de la Société belge de Géologie.* The same issue contains a full length contribution by Legrand-Blain on the Namurian gigantoproductids from the Algerian Sahara.

Another paleontological monograph by Legrand-Blain (1986) deals with Visean and Serpukhovian spiriferids from the Algerian Sahara.

A paper by Marcel Weyant (1988) on the relationship between Devonian and Carboniferous systems near the northern margin of the Bechar Basin was presented at the 1987 meeting of the Working Group on the Devonian-Carboniferous Boundary at Montpellier.

A most recent collective work devoted to Carboniferous paleobiogeography has been elaborated by Marie Legrand-Blain (brachiopods), J. Conrad (ammonoids), R.J. Coquel (microflora), A. Lejal-Nicol (macroflora), J. Poncet (algae), and P. Semenoff-Tian-Chansky (corals). It is to be published in the Compte Rendu of the XIth I.C.C., Beijing, China.

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Lys, M., 1986: Biostratigraphie du Carbonifère et du Permien en Mésogée (Espagne, Afrique du Nord, Régions Egéennes, Proche-Orient). Etudes micropaléontologiques (Foraminifères), paléobiogéographie. Thèse de doctorat d'-Etat, Université de Paris-Sud, Centre d'Orsay, 1986, 239pp., dactylogr., 29 tables, 72 figs, 21 pls. (Now printed as a publication of the BRGM - Reference: Documents BRGM No.147 (1988)).

Sebbar, A., 1986: Foraminifères et Algues calcaires du Carbonifère Inférieur (Viseén Supérieur, Serpukhovien) de coupes significatives du Bassin de Béchar (Sahara Sud-Oranais, Algérie). Utilisation paléobiogéographique. Thèse doctorat 3ème Cycle, Université Pierre et Marie Curie, Paris, 1986, 151pp., dactylogr., 37 figs, 11 pls.

Weyant M., (in press): Relationship between Devonian and Carboniferous strata near the northern confines of the Bechar Basin, Algeria, 6pp., 2 figs, 2 pls, *Courier Forschungsinstitut Senckenberg* No.100.

5.0 I.C.S. WORKING GROUP REPORTS

5.1 WORKING GROUP ON THE DEVONIAN CARBONIFEROUS BOUNDARY

by E. Paproth, Geol. Landes. Nordrhein-Westfalen, Postfach 1080, D-4150, Krefeld, Federal Republic of Germany. (Submitted: April-May, 1988).

Several candidate sections have been proposed for the Devonian-Carboniferous Boundary stratotype: two sections in southern China and three sections in Europe (Austria, France and Germany). These sections have been studied in great detail but none of them ideally combines "complete" sets of guide fossils in an unbroken sequence, combined with volcanic ash deposits which permit radiometric age determination. Nevertheless, it seems possible to determine the boundary level very nearly all over the globe in sections of the relevant age.

The Working Group members have therefore decided to finish their task by selecting a stratotype section for the Devonian-Carboniferous Boundary. With this objective, the presumably last "conclave" meeting was held in Courtmacsherry, southern Ireland on May 22-28, 1988. Seven of the sixteen titular members and ten collaborating specialists engaged in detailed discussions which centred primarily on the biostratigraphy of the boundary beds. After much effort, a strong majority voted for the following package (13 votes in favour; 2 preferred other sections; 2 abstentions):

- **La Serre (France) for the Global Boundary Stratotype; and**
- **Hasselbachtal (Germany) and Nanbiacun (China) for Auxiliary Boundary Stratotypes.**

The results of a definitive postal ballot by all Titular Members is expected by September 1, 1988, at which time the decision will be communicated to the International Commission on Stratigraphy for ratification.

5.2 WORKING GROUP ON THE CARBONIFEROUS PERMIAN BOUNDARY

compiled by the Editor from Working Group Circulars 1 (September, 1987) and 2 (March, 1988) by Dr. Wu Wang-shi, Nanjing Inst.of Geology & Palaeontology, Academia Sinica, Nanjing, Peoples Republic of China.

During the XIth I.C.C. held in Beijing, the Chairman of the I.C.S., Dr. J.W. Cowie, organized an official meeting on September 2, 1987 at which Dr. Wu Wang-shi and Dr. B. Chuvashov were appointed as Chairman and Vice Chairman respectively of the International Carboniferous-Permian Boundary Working Group.

Eighteen people attended the meeting at which discussion was held on the scope of appropriate membership of the group. The following were nominated for, or accepted membership of the Working Group and further contacts are currently being made with potential members:

- Mr. C. Henderson, University of Calgary, Canada
- Dr. J. Utting, Geological Survey of Canada, Calgary, Canada
- Dr. B. Wardlaw, U.S.Geological Survey, Reston, Virginia, USA
- Dr. Charles A. Ross, Chevron, U.S.A. Inc., Houston, Texas, USA
- Dr. J. Yanagida, Kyushu University, Fukuoka, Japan
- Dr. B.J. Chuvashov, Institute of Geology, Sverdlovsk, USSR
- Dr. M.V. Durante, Geological Institute, Moscow, USSR
- Dr. S. Loboziak, Lab. palaeobotanique, Villeneuve d'Asq, France
- Dr. Rui Lin, Nanjing Inst., Academia Sinica, Nanjing, P.R.China
- Dr. N.W. Archbold, University of Melbourne, Vic.,Australia
- Dr. R. Ingvat, Geological Survey, Bangkok, Thailand

Since the Beijing meeting, suggestions have been put forward on the organization of the Working Group. Under I.C.S. guidelines, definition of a global boundary stratotype must follow the definition of the boundary between the Carboniferous and Permian. At present there are many conflicting views on just where this boundary should be placed. Current viewpoints are presented in the following summary:

(a) Some workers take the base of the *Pseudoschwagerina* zone as the base of the Permian; this is a widely held traditional view.

(b) Recent fusulinid studies across the boundary by Soviet paleontologists have shown that the *Schwagerina moelleri - Pseudofusulina fecunda* zone can be regarded as the base of the Permian, this level corresponding to the first appearance of *Neogondolella*.

(c) Some Soviet conodont specialists take the first occurrence of *Neogondolella bisselli* as the beginning of the Permian, which is equivalent to the base of the Middle Asselian.

(d) Some contributors hold that the first occurrence of the ammonoids *Svetlanoceras - Juresanites* should be taken as the base of the Permian.

(e) Some Chinese paleontologists take the first appearance of the fusulinid *Pamiria* and the conodont *Neogondolella bisselli* in the open marine platform carbonate facies and the basin marginal gentle slope facies, together with the fusulinid *Darvasites ordinatus* and/or *Schwagerina cushmani* in the restricted marine platform carbonate facies as the base of the Permian, which approximately corresponds to the base of the Sakmarian in Ural, USSR.

(f) A further proposal exists that the coral *Kepingophyllum* assemblage is found at the base of the Permian in South China which roughly corresponds with the *Pseudoschwagerina* zone.

Judging from the widely different opinions which are held, the Chairman has presented to the membership his views on the way forward with the following points:

(a) In the choice of a boundary, it is necessary to select those fossil group/s on which the boundary should be based. He suggested that the fusulinids, conodonts and ammonoids are the best elements to be used in the decision, with reference to other fossil groups which occur near the boundary.

(b) Under I.C.S. guidelines, it is important to look for a continuous marine sequence at the boundary. However non-marine deposits should also be studied for correlation purposes.

(c) In addition to paleontological data, special attention must also be paid to the support which isotopic dating can provide.

The Working Group proposes to meet again at the 28th I.G.C. in Washington. The Chairman would appreciate comments or suggestions and copies of any relevant publications.

6.0 CONTRIBUTIONS BY SCCS MEMBERS

6.1 RECENT CONTRIBUTIONS TO THE CARBONIFEROUS GEOLOGY AND PALEONTOLOGY OF JAPAN (1986-1988)

by Dr. Hisayoshi Igo, Institute of Science, University of Tsukuba, Ibaraki, 305 Japan. (Submitted: May, 1988).

Geology: Recently, most Carboniferous and Permian rocks distributed in the Japanese Islands have been interpreted as accreted terranes or as variously sized, exotic blocks which are embedded in Jurassic to early Cretaceous strata. Taira and Tashiro (1987) summarised the tectonic evolution of the Japanese Islands on the basis of accretion tectonics. Conversely, Toshio Kimura (1986,1987) briefly mentioned his current view concerning the Chichibu Geosyncline and the geologic development of the Japanese Islands. Otoh (1987) comprehensively discussed tectonic development in the Chugoku Mountains including classical Carboniferous fields. Oho and Sada (1986) have described structural relationships between calcareous and non-calcareous facies in the Taishaku district, central part of the Chugoku Mountains, west Japan.

Sano *et al.*, (1987) studied the Carboniferous and Permian rocks in the Akiyoshi Terrane of the central part of the Chugoku Mountains, west Japan and they elucidated the stratigraphy of calcareous and non-calcareous facies of the Upper Paleozoic rocks. They established a radiolarian biostratigraphy for the non-calcareous facies. Haikawa (1986) studied the stratigraphy of the Lower Carboniferous rocks of the Okubo area in the Akiyoshi Limestone Plateau, southwest Japan using detailed field observation and the stratigraphical occurrence of abundant rugose corals.

Paleontology: Study of radiolarians is one of the most progressive current micropaleontological works in Japan, but papers on Carboniferous radiolarians are rather scarce. Ishiga (1986) has established radiolarian zonation in the Upper Carboniferous to Permian in southwest Japan. Biostratigraphic study of smaller foraminifers and primitive fusulinids was reported by Matsusue (1986) from the lower part of the Akiyoshi Limestone Group. He established 10 foraminiferal zones in the Visean to Westphalian parts of the mentioned limestone and discussed interregional as well as intercontinental correlation. Niko (1987) described several primitive fusulinids, *Eostaffella*, from the Ichinotani Formation of central Japan and revised earlier work of Igo (1957). Niko and Watanabe (1987) reported the occurrence of interesting forms of *Quasifusulina* and other genera from Fukui Prefecture, central Japan.

Rugose corals were described from the Omi Limestone, Niigata Prefecture by Yoshida, Okimura and Kato (1987). Prolific Carboniferous coral faunas similar to the Akiyoshi Limestone Group have long been known from this limestone, but no comprehensive study was published after the classical work of Hayasaka (1924). Kato *et al.* (1987) illustrated Carboniferous corals from the Tateishi Formation of the Abukuma Massif, northeast Japan with a brief explanation in Japanese.

The occurrence of gastropods has been recorded from the Carboniferous of Japan. However, most of these fossils have not yet been described. Kase (1988) described some gastropods collected from the Visean Hikoroichi Formation exposed in the Kitakami Mountains, northeast Japan. Kyuma and Nishida (1987) and Nishida, Kyuma and Takahashi (1986,1988) studied a well preserved, rich ammonoid fauna from the Upper Carboniferous of the Akiyoshi Limestone Group. An interesting new genus, *Akiyoshiceras* was introduced by Kyuma and Nishida. This ammonoid accompanies interesting forms of orthoceratids and they are described by Niko, Nishida and Kyuma (1987). A new species of *Adnatoceras* was reported from the *Profusulinella* Zone of the Ichinotani Formation of the Hida Massif, central Japan by Niko and Hamada (1987).

Two interesting papers on Carboniferous bryozoans have appeared. Sakagami and Sugimura (1987) proposed a new genus, *Hinaclema* and Sugimura (1987) described a rich fauna from the Akiyoshi Limestone Group. Tazawa and Kato (1986) described Lower Carboniferous brachiopods from the lowest part of the Ichinotani Formation of central Japan.

Kobayashi and Hamada (1987) reported a new Carboniferous trilobite, *Paladin hidensis*, from the Hida Massif, and Kaneko (1986) briefly introduced trilobites which came from the Visean Hikoroichi Formation of the Kitakami Mountains.

Haikawa (1988) reported on the conodont biostratigraphy of the lower part of the Akiyoshi Limestone Group. He established the *Gnathodus delicatus* Zone and *Gnathodus semiglaber - Gnathodus cuneiformis* Zone below the previously known *Gnathodus commutatus - Gnathodus texanus* Zone. These two, newly introduced, zones are the lowest Carboniferous conodont zones hitherto reported in Japan.

Tatsuaki Kimura (1987) summarised the distribution of Paleozoic and Mesozoic plants in east and southeast Asia and discussed some problems of Carboniferous paleophytogeography.

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(J+E)=In Japanese with English abstract; (J)=In Japanese.

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Matsusue, K., 1986. Foraminiferal biostratigraphy of the lower part of the Akiyoshi Limestone Group. *Sci. Repts. Dept. Geol. Kyushu Univ.*, vol.14, 163-185, pls 1-7 (J+E).

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Niko, S., Nishida, T. & Kyuma, Y., 1987. Middle Carboniferous Orthocerataceae and Pseudorthocerataceae (Mollusca: Cephalopoda) from the Akiyoshi Limestone, Yamaguchi Prefecture (Molluscan paleontology of the Akiyoshi Limestone Group-VIII). *Ibid.*, no.148, 335-345, 4 figs.

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6.2 COMMENTS ON SOME AUSTRALIAN, BRITISH AND GERMAN ISOTOPIC AGE DATA FOR THE CARBONIFEROUS SYSTEM

by P.J. Jones, Bureau of Mineral Resources, Division of Continental Geology, G.P.O. Box 378, Canberra, A.C.T. 2601, AUSTRALIA. (Submitted June, 1988).

I am in the process of compiling a biostratigraphic summary chart for the Carboniferous of Australia, which incorporates biozones based on diverse fossil groups, and integrates these biozones with international time-scales and with available isotopic age data. This work necessitates a literature search of the stratigraphic settings of much of the Australian, British and German isotopic age data for the Carboniferous. The present comments outline the reasons for the choice of standard stratigraphic and geochronometric scales (Fig. 1) that I have used for the Australian chart.

Standard Stratigraphic Scale

There are no formally designated local stages for the Carboniferous of Australia. The brachiopod zones of eastern Australia (Roberts, 1975) were grouped into three major faunal divisions (Werrian, Gresfordian, and Barringtonian) by Jones & Roberts (1976), which could form the basis of local stages in the future, and Clarke & Farmer (1976) proposed the Hellyerian for the Stage 1 microflora (Kemp *et al.*, 1977) in Tasmania, but none of these units has formally designated boundary stratotypes. In the absence of formally designated local stages, there are three areas that provide standard stratigraphic scales with which to compare the Australian Carboniferous, namely western Europe, Soviet Union, and USA.

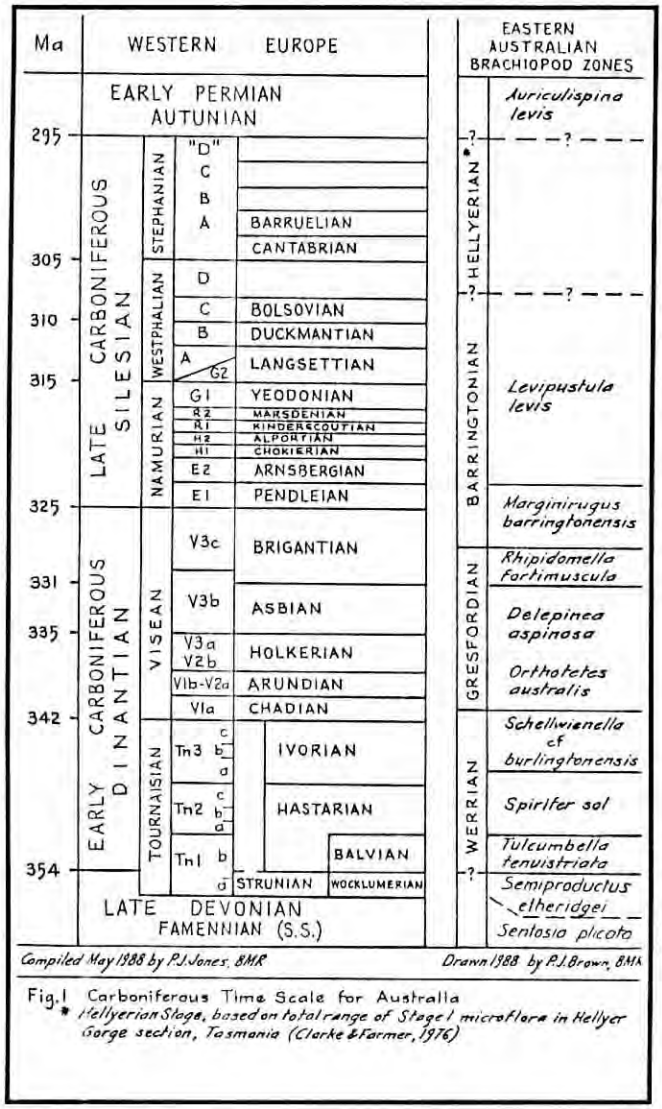

Fig. 1 Carboniferous Time Scale for Australia
* Hellyerian Stage, based on total range of Stage 1 microflora in Hellyer Gorge section, Tasmania (Clarke & Farmer, 1976)

The western European scale is the most appropriate standard for the Carboniferous of Australia, where cosmopolitan shelly faunas of the Early Carboniferous (Dinantian) are replaced by endemic (Gondwanan), poorly-represented faunas of Late Carboniferous (Silesian) age. It is also the scale favoured most by Australian palynostratigraphers (i.e., Helby & Playford *in* Kemp *et al.*, 1977; Powis, 1984). Powis (1984) used the west European scale "because resolution to the USSR stage level using palynology, is not possible with a high degree of confidence in Australia." Accepting the present uncertainty of global correlations about the mid-Carboniferous Boundary (see Lane & Ziegler, 1985), it seems premature to use an international standard scheme, such as Bouroz *et al.* (1978), that combines elements of American, Russian and west European standards in a single scale. The scarcity of conodonts and the absence of fusulinid foraminiferids in the late Carboniferous (Gondwanan) faunas of Australia inhibit their correlation with the standard sequences of North America and Russia, where the main biozonations are based on these groups.

The standard stratigraphic scale that I am using for the Australian Carboniferous (Fig.1) is a compilation of scales proposed by several authors for western Europe (George *et al.*, 1976 and Paproth *et al.*, 1983 for the Dinantian; and Ramsbottom *et al.*, 1978, Owens *et al.*, 1985, and Wagner & Winkler Prins, 1985 for the Silesian). The Devonian/Carboniferous boundary is taken at the Wocklumerian/Balvian boundary of Germany, which is close to the Strunian/Hastarian boundary of Belgium. Thus, as has been known for a long time, the Strunian part of the Tournaisian Series is a correlate of the uppermost Devonian standard of Germany. The Carboniferous/Permian boundary is difficult to place in the non-marine sequences of this age in western Europe; in Fig. 1 it is equated with the Stephanian/Autunian boundary (*sensu* Bouroz & Doubinger, 1977). These authors show on palynological evidence (Bouroz & Doubinger, 1977; Doubinger & Bouroz, 1984) that the base of the Asselian, the Soviet boundary stratotype for the base of the Permian System, lies within the lower Autunian at the base of the Assise de Muse. The Assise d'Igorny of the lowermost Autunian, below the Carboniferous/Permian boundary, was then referred to the Stephanian (as Stephanian D). Wagner (1984) argued against this redefinition, because a new base of the Autunian was proposed in the type locality solely for the purpose of correlation with the Carboniferous/Permian boundary in the Soviet stratotype.

Geochronometric Scale

The geochronometric scale, compiled from recent sources from both within and outside Australia, brackets the Carboniferous System between 354 Ma and 295 Ma. Each of these limits is regarded, on balance, as the best compromise of the latest available data.

For the base of the Carboniferous, an estimate of 354 Ma is preferred in the Australian chart, following the 354 (+10, -5) Ma figure suggested by McKerrow *et al.* (1985). This date is reasonably compatible with the 356±6 Ma and 357±6 Ma computations derived by Carr *et al.* (1985). In contrast to these dates, Forster & Warrington (1985) have recently proposed a 365±5 Ma date for the Devonian/Carboniferous boundary, based on radiometric data available from the Scottish Borders (De Souza, 1982) and from eastern Victoria (Richards & Singleton, 1982; Williams *et al.*, 1982). However, Odin (1985) pointed out that the youngest limit proposed by Forster & Warrington (1985) is older than the date accepted by the authors of the original studies in Victoria i.e., both Richards & Singleton (1982) and Williams et al. (1982) proposed a Devonian/Carboniferous boundary younger than 360 Ma.

In terms of international classification, the base of the Carboniferous cannot be picked with precision in either of the red bed sequences of the Scottish Borders or of Victoria, because marine fossils are absent and plant miospores have not been preserved. In the zonation of the Lower Carboniferous based on miospore assemblages (Neves *et al.*, 1973), the basal two zones recognized in England (PL, now latest Devonian, and NV) have not been found in Scotland or the Scottish Borderlands. Here, the lowest zone (CM Zone) of late Courceyan age conformably overlies Upper Old Red Sandstone, which suggests that the Old Red Sandstone facies extends upwards into the Carboniferous. A similar situation exists at Cultra, County Down, Northern Ireland (Clayton, 1986).

In the Scottish Border region, the Birrenswark and Kelso lavas, with a maximum K/Ar average age of 361±7 Ma (De Souza, 1982) are used locally to arbitrarily define the base of the Carboniferous (House *et al.*, 1977). The lavas immediately overlie calcrete palaeosols formed at the top of Upper Old Red Sandstone sediments (Leeder, 1976). The Whita Sandstone, that directly overlies the Birrenswark Lava, is difficult to correlate with neighbouring dated sequences, because of the lack of marine fossils. The same may be said of the Cementstone Group that overlies the Kelso Lava. Both lavas must be regarded as dubious time-markers, because similar lavas have been found in bore hole material, well down in the Upper Old Red Sandstone (Westoll, *in* House *et al.*, 1977: 71). Thus, I regard the stratigraphical age of the Scottish Border lavas as an open question. Odin (1985:116) did not know of "definite arguments which reject a latest Devonian stratigraphical age ---", and neither do I.

In eastern Victoria, granites (e.g., the Barjarg and Strathbogie Granites) with an overall mean age of 360±1 Ma (Richards & Singleton, 1981: 405, 417) intrude the Cerberean Volcanics (a minimum 367±2 Ma for the pre-late Frasnian; Williams *et al.*, 1982), and are themselves unconformably overlain by the Mansfield Group. Hills (1936) placed the Devonian/Carboniferous boundary arbitrarily at the base of the Mansfield Group. The Broken River fish fauna in the middle part of the Mansfield Group at present indicates a general Carboniferous age (J.A. Long, *fide* G.C. Young), and therefore cannot be used as evidence to suggest that the non-volcanic red beds in the lower part is of possible Late Devonian age. However, the stratigraphic position of the Devonian fish faunas indicates that volcanicity ceased in eastern Victoria well before the end of the Late Devonian, allowing time for flood-plain red bed sedimentation (Marsden, 1976:109). Thus, the Devonian/Carboniferous boundary is younger than 360 Ma, and may lie above the base of the Mansfield Group, in agreement with the 354 Ma date suggested by McKerrow *et al.* (1985).

The Tournaisian/Visean boundary in Australia may be taken at about 342 Ma on the basis of the oldest dated volcanic in the succession of the southern New England Orogen. This is (J. Roberts, pers. comm. 6 May, 1986) an unnamed pyroxene andesite in the upper part of the Waverley Formation, near Foybrook, which has a K/Ar age of 341±4 Ma determined from plagioclase. This andesite is overlain almost immediately by the Ayr Conglomerate at the base of the Isismurra Formation (Roberts & Oversby, 1974). There is a disconformity at the base of the Ayr Conglomerate, and the Waverley Formation is unfossiliferous in this area, but from regional considerations the uppermost part of the Waverley Formation is equivalent to the uppermost Dangarfield Formation, which on ammonoid evidence (Campbell *et al.*, 1983) appears to be no younger than early Visean (or Chadian). Thus, the Tournaisian/Visean boundary is taken at about 342 Ma, slightly older than the 341±4 Ma age for the unnamed pyroxene andesite in the upper part of the Waverley Formation near Foybrook.

The 355±5 Ma proposed by De Souza (1982) for the Tournaisian/Visean boundary in the Midland Valley of Scotland appears to be too old by comparison with the Australian evidence. It was based on K/Ar dates of 353±7 Ma for the Garleton Hills Volcanic Rocks of East Lothian, and 354±5 Ma for the Arthur's Seat Volcanic Rocks, Edinburgh, both on palynological evidence indicating an early Visean age (Neves *et al.*, 1973). As 355±5 Ma is more likely to correspond to the Devonian/Carboniferous boundary (see above), at present, I would question the validity of the Scottish radiometric dates, rather than the age indicated by palynological correlation. However, even some aspects of palynological correlation of the early Carboniferous of the Midland Valley have been questioned (Patterson & Hall, 1986: 8).

Late Carboniferous (Silesian) dates are taken from the work of Lippolt & Hess (1985) who determined Ar^{40}/Ar^{39} ages on sanidines taken from biostratigraphically well dated Carboniferous tonsteins in West Germany and Czechoslovakia. The dates are:

- 305 Ma - Westphalian/Stephanian boundary
- 310 Ma - Westphalian B/Westphalian C boundary
- 315 Ma - Westphalian A/Namurian boundary
- 325 Ma - Visean/Namurian boundary; in agreement with Forster & Warrington (1985).

The 325 Ma date suggested by Lippolt & Hess (1985) and Forster & Warrington (1985) for the Visean/Namurian boundary is compatible with Australian isotopic age data (Roberts & Engel, 1980). In contrast, the 333 Ma date suggested by Harland *et al.* (1982) for the Visean/Namurian boundary is too old, when compared with the eastern Australian evidence. The Martins Creek Ignimbrite of the Hunter Valley has an average age of 331 Ma, based on 6 K/Ar analyses (Roberts & Engel, 1980). It lies between the Late Visean *Gigantoproductus tenuirugosus* Subzone and the late Visean *Rhipidomella fortimuscula* Zone. Because the ammonoids of the *R.fortimuscula* Zone are of Brigantian age (Campbell *et al.*, 1983), it is reasonable to accept 331 Ma as the base of the Brigantian, and to reject the Harland *et al.*

(1982) value of 334 Ma for the top of this stage i.e., at the Visean/Namurian boundary.

The Australian evidence of 331 Ma for the base of the Brigantian is compatible with De Souza's (1982) estimate of 335 Ma for the base of the British Asbian Stage, and both figures are accepted in the Australian scale.

Some K/Ar dates are available for volcanic rocks within the Late Carboniferous (Silesian) sequences of the Tamworth Trough. In the absence of biostratigraphic evidence, their ages may be approximately determined from the estimates given on the Lippolt & Hess (1985) scale. For example, the 319 Ma date for the Ermelo Dacite Tuff at the base of the Clifden Formation in the Rocky Creek Syncline indicates a Namurian age, and a tuff above that level, dated 313 Ma, is probably early Westphalian (Roberts, in McKelvey & McPhie, 1985). Pitchstones from the upper part of the Currabubula Formation in the Werrie Syncline have yielded dates of 302±4 and 295±4 Ma (Roberts, *in* McPhie, 1984), which would place them respectively within the Stephanian and about the Carboniferous/Permian boundary.

An interesting comparison can be made between the isotopic age evidence and the magnetostratigraphy of the Paterson Volcanics. These volcanics have an average age of 308 Ma, based on K/Ar dates from a rhyodacite at the Glennies Creek damsite on Carrow Brook (308±7) and an equivalent dacite at Raymond Terrace Quarry (307±4) (Roberts, *pers. comm.*), that would place them on the Lippolt & Hess (1985) scale in Westphalian C. Thus the normally magnetized Paterson Toscanite, at the base of the Kiaman reversed interval, can be correlated with the zone of mixed polarities within British Westphalian C coals (Noltimier & Ellwood, 1977).

The Carboniferous/Permian boundary, taken as 295 Ma, is a compromise between the 290 Ma date of De Souza (1982), Forster & Warrington (1985), and the 300 Ma date of Lippolt & Hess (1985). It is also close to the mathematically determined ages of 293±5 Ma and 296±6 Ma calculated by Carr *et al.* (1985) for the base of the Permian. Thus, the 295 Ma date for the base of the Permian is in contradistinction with the 286 Ma figure of Harland *et al.* (1982).

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6.3 CARBONIFEROUS STUDIES IN THE TAMWORTH BELT AND NEW ENGLAND TABLELANDS, N.S.W., AUSTRALIA

by B.C. McKelvey & P.G. Flood, Department of Geology, The University of New England, Armidale, N.S.W. 2351, AUSTRALIA

Over the past three years, Honours students (P.Kelk, D.Cherry, T.Dawson and J.Davies) working in the Kankool, Castle Mountain and Quipolly Domes, and the southern Werrie Basin, have traced a major regional disconformity within the Late Carboniferous, terrestrial, Currabubula Formation of the Tamworth Belt (McKelvey & McPhie, 1985).

This previously unrecognized erosion surface separates the typical Currabubula Formation sequence of volcaniclastic fluvial strata and interbedded pyroclastics from an overlying and complex (variable facies) and extensive glaciolacustrine and (?)fluvioglacial succession up to 200 metres thick. Stratigraphic control in these studies is maintained through correlation by the numerous pyroclastic units, following on McPhie's pioneering regional study (1986) of the Cana Creek Tuff. P.G. Flood has continued his study of the distribution and degree of zeolitization of vitric dacitic and rhyodacitic ignimbrites in the Currabubula Formation. This work involves the separation of diagenetic zeolites from subsequent burial metamorphic species (Flood, 1987).

Current work by T.Dawson has also re-emphasized the stratigraphic and palaeogeographic importance in the Werrie Basin of the Quipolly Conglomerate or Porphyry Boulder Horizon of Carey (1934).

In the New England Tablelands region, J. Aitchison is studying widespread and well preserved Early Carboniferous (and Devonian) radiolarian faunas of the New England Orogen. Data from this regional investigation are being used to constrain the ages of various, previously undated, terranes (Murray *et al.*, 1987) and to determine terrane relationships.

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SCCS CORRESPONDING AND TITULAR MEMBERSHIP LIST, 1988

Please check your entry in this list and report any errors to the Secretary

ARGENTINA

Dr. A.J. Amos
HIDRENED
Esmeralda 320 2 piso
Buenos Aires, ARGENTINA

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

Dr. C. Azcuy
Univ. de Buenos Aires
Pabellon 2,Ciudad Universitaria
Buenos Aires, ARGENTINA

Dr. C.R. Gonzales
Univ. Nacional de Tucuman
Miguel Lillo 205
Tucuman, ARGENTINA

Dr. R. Herbst
Lavalle 2675
Corrientes 3400, ARGENTINA

AUSTRALIA

Dr. K.S.W. Campbell
Australian Natl. University
Dept. Geology, P.O.Box 4
Canberra, A.C.T. 2601, AUSTRALIA

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

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

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

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

Mr. R. Nazer
Department of Geology
University of Queensland
St.Lucia, QLD 4067, AUSTRALIA

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

Dr. J. Roberts
Univ. of New South Wales
P.O. Box 1
Kensington, NSW 2033, AUSTRALIA

Prof. G.A. Thomas
Department of Geology
University of Melbourne
Parkville, VIC 3052, AUSTRALIA

Prof. J.B. Waterhouse
Department of Geology
University of Queensland
St.Lucia, QLD 4067, AUSTRALIA

AUSTRIA

Dr. F. Ebner
Abt. f. Geol. Pal.u. Bergbau, Landes
-museum Joanneum, Raubergasse 10
A-8010 Graz, AUSTRIA

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

BELGIUM

Dr. J. Bouckaert
Lab. Geol., Katholieke Universiteit
Redingenstraat 16 bis
Leuven, BELGIUM

Prof. R. Conil
Inst. Geol. Geogr. de l'Univ.
3 Place Louis Pasteur
B1348 Louvain-la-Neuve, BELGIUM

Dr. A. Delmar
Service Geol. de Belgique
13 Rue Jenner
B-1040 Bruxelles, BELGIUM

Dr. E. Groessens
Service Geol. de Belgique
13 rue Jenner
B-1040 Bruxelles, BELGIUM

Dr. P. Pierart
Service de Biologie, Mons Univ.
24 Avenue du Champ de Mars
B-7000 Mons, BELGIUM

Dr. Paul Sartenaur
Service Geol. de Belgique
13 rue Jenner
B-1040 Bruxelles, BELGIUM

Prof. M. Streel
Lab. Paleont., Univ. Liege
Place du XX Aout 7
B-4000 Liege, BELGIUM

BOLIVIA

Dr. A. Castanos
Univ. Mayor de San Andres
La Paz, BOLIVIA

Dr. L.A. Rodrigo
Dept.Geosc.,Univ.M.de San Andres
Pl. d. Obelisco 1175, Casilla 4455
La Paz, BOLIVIA

BRAZIL

Dr. M. Marques Toigo
Rua Domingo
Jose de Almeida n.185
Proto Alegre, BRAZIL

Dr. A.C. Rocha Campos
Inst. de Geociencias
Universidade de São Paulo
São Paulo, CP 20899, BRAZIL

Prof. O. Rösler
DPE-IG- Univ. São Paulo
Caixa Postal 20.899
São Paulo, SP 01498, BRAZIL

BULGARIA

Dr. Y.G. Tenchov
Geol.Inst. ul. 36 bloc II
Sofia, BULGARIA

CANADA

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

Mr. Sedley Barss
Atlantic Geoscience Centre
Bedford Inst. Oceanog., Box 1006
Dartmouth, N.S. B2Y 4A2, CANADA

Dr. A.R. Berger
Room 177
601 Booth Street
Ottawa, ON K1A 0E8, CANADA

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

Dr. Alex R. Cameron
Instit. of Sed. and Pet. Geol.
3303-33rd St., N.W.
Calgary, AB T2L 2A7, CANADA

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

Dr. Peter A. Hacquebard
Coal. Sect., Geol. Surv. Canada
601 Booth Street
Ottawa, ON K1A 0E8, CANADA

Dr. L. Jansa
Atlantic Geoscience Center
Bedford Inst., P.O.Box 1006
Dartmouth, N.S. B2Y 4A2, CANADA

Dr. R.W. MacQueen
Dept. of Earth Sciences
University of Waterloo
Waterloo, ON N2K 3G1, CANADA

Prof. Bernard L. Mamet
Department of Geology
University of Montreal
Montreal, P.Q. H3C 3J7, CANADA

Dr. A. McGugan
Dept. Geol., Univ. of Calgary
2920-24 Avenue N.W.
Calgary, AB T2N 1N4, CANADA

Dr. J.W.H. Monger
Geol. Survey of Canada
100 W. Pender Street
Vancouver, B.C. V6B 1R8, CANADA

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

Dr. S. Nelson
Dept.Geol., Univ. of Calgary
2920-24 Avenue N.W.
Calgary, AB T2N 1N4, CANADA

Dr. A. Roux
Department of Geology
Univ. of Montreal, B.P. 6128
Montreal, P.Q. H3C 3J7, CANADA

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

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

CHILE

Dr. R. Charrier
Dept.Geol., Univ. de Chile
Casilla 13518, Correo 21
Santiago de Chile, CHILE

Dr. J. Corvalan
Univ. de Chile
Casilla 13518, Correo 21
Santiago de Chile, CHILE

COLOMBIA

Dr. A. Forero
Dept. Geol.
Univ.Nacional de Colombia
Bogota, COLOMBIA

CZECHOSLOVAKIA

Dr. I. Chlupac
Ustredni ustav geol.
Post.Schranka 85 PSC, PRAHA 11
118 21 Mala Strana, CZECHOSLOVAKIA

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

Dr. V. Holub
Ustredni ustav geol
Post.Schranka 85,PSC, PRAHA 11
118 21 Mala Strana, CZECHOSLOVAKIA

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

Dr. F. Rehor
Komsomolska 9
736 01 Havirovl, CZECHOSLOVAKIA

Dr. G. Weiss
Geol. Pruzkum
Ostrava, Hrabova, CZECHOSLOVAKIA

DENMARK

Geol. Museum Library
Kobenhavns Univ.
Oster Voldgade 5-7
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FED.REP.GERMANY

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

Dr. H.E.R. Fiebig
Westfal. Berggewerkschaftskas
Postfach 2749
D-4630 Bochum, FED.REP.GERMANY

Dr. H. Grebe
Geol. Landes. Nordrhein-Westfalen
Postfach 1080, de Greiff Str.195
D-4150 Krefeld, FED.REP.GERMANY

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

Dr. K.H. Josten
Geol. Landes. Nordrhein-Westfalen
Postfach 1080, de Greiff Str.195
D-4150 Krefeld, FED.REP.GERMANY

Dr. E. Paproth
Geol. Landes. Nordrhein-Westfalen
Postfach 1080, de Greiff Str.195
D-4150 Krefeld, FED.REP.GERMANY

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

Dr. D. Stoppel
Bundesanst. f. Bodenforschung
Stilleweg 2
D-3000 Hannover, FED.REP.GERMANY

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

FRANCE

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

Ms. C. Brousmiche
UER Sci. de la Terre
Univ. Sci. Techn. de Lille
F59655 Villeneuve d'Ascq, FRANCE

Dr. J.J. Chateauneuf
Bureau Rech. Geol. Minieres
B.P. 6009
F-45067 Orleans, FRANCE

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

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

Dr. C. Greber
Bureau Rech. Geol. Minieres
Geol., B.P. 6009
F-45068 Orleans, FRANCE

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

Prof. J.P. Laveine
Lab. Paleobot. UER Sci. de la Terre
Univ. Sci. Techn.de Lille, BP 363
F59655 Villeneuve d'Ascq, FRANCE

Dr. M. Legrand-Blain
University of Pau
Pau, FRANCE

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

Dr. M. Lys
Lab. Geologique, Faculte Sciences
Universite Paris Sud
F-91405 Orsay, FRANCE

Prof. C. Pareyn
UER Sci. de la Terre
Esplanade de la Paix
F-14032 Caen, FRANCE

Ms. M.F. Perret
Lab. Geol. Petrol., Univ. Paul-Sabatier,
38 rue des 36 Ponts
Toulouse, FRANCE

Dr. P. Semenoff Tian-Chansky
Centre Natl. Recherche Sci.ER154
8 Rue de Buffon
F-75005 Paris, FRANCE

Dr. P. Vetter
Charbonnages de France
Av. Percier 9
F-75008 Paris, FRANCE

Dr. C.C. Weber
IUGS Sec. Gen., Maison de la Geol.
77 rue Claude Bernard
F-75005 Paris, FRANCE

Dr. M. Weyant
Dept. Geol., UER Sci. de la Terre
Unive. Caen, Esplorade de la Paix
F-14032 Caen, FRANCE

GERMAN DEM.REP.

Prof. K. Schmidt
Zentrales Geol. Inst.
Invalidenstr. 44,
DDR 104 Berlin, GERMAN DEM.REP.

Dr. D. Storch
Z. Inst. Mikrobiol u. exp. Therapie
Adad. Wiss. DDR, Bentenbergstr.11
DDR 69 Jena, GERMAN DEM. REP.

HUNGARY

Prof. K. Balogh
J.Attila Tudomanyegyetem, Foltani
-es Oslen. Tanszeke, Tans .Mihaly 2
H-6722 Szeged, HUNGARY

Dr. H. Kozur
Hungarian Geol. Inst.
Rézsü u. 83
H-1029 Budapest, HUNGARY

INDIA

Dr. V.J. Gupta
Centre of Adv. Study in Geology
Panjab University
Chandigarh 160014, INDIA

IRELAND

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

ITALY

Dr. F. Francavilla
Inst. Geol. Paleont.
via Zamboni 67
I-40100 Bologna, ITALY

JAPAN

Mr. M. Ehiro
Dept.Geol., Tohoku Univ.
Kawauch
Sendai, JAPAN, 980

Dr. Y. Fujiwara
Dept. Geol. Miner.
Hokkaido Univ. N-8, W-5
Sapporo, JAPAN, 060

Dr. T. Haikawa
Akiyoshidai Sci. Museum
Shuho-cho, Akiyoshi
Yamaguchi Pr., JAPAN, 759-22

Dr. T. Hamada
Inst.Earth Sci. & Astronomy
Uni. Tokyo, Kamada 3-8-1, Meguro-ku
Tokyo, JAPAN, 153

Dr. A. Hase
Dept. Geol .& Min., Hiroshima Univ
Higashi-Senda-cho
Hiroshima, JAPAN, 730

Dr. Y. Hasegawa
Department of Geology
Niigata University, Igarashi
Niigata Pr., JAPAN, 950-21

Prof. M. Hunahashi
Dept. Geol. Miner.
Hokkaido Univ., N-8, W-5
Sapporo, JAPAN, 060

Dr. Hisaharu Igo
Dept. Geol., Tokyo Gakugei Univ.
Nukii Kitamachi 4-1-1
Koganei-shi, Tokyo, JAPAN, 184

Dr. Hisayoshi Igo
Institute of Geoscience
The University of Tsukuba
Ibaraki, JAPAN, 305

Dr. K. Ishida
Dept.Geol., Tokushima Univ.
Nanjo-Mishima-Cho 1-1
Tokushima, JAPAN, 770

Dr. K. Ishii
Dept.Geol., Himeji Univ.
Shosha 2167, Himeji
Hyogo Pr., JAPAN, 670

Dr. K. Ishizaki
Inst. Geol. Palaeont.
Tohoku University, Aobayama
Sendai, JAPAN, 980

Dr. H. Isomi
Geol.Surv.Japan, Higashi 1-1-3
Yatabe-Cho, Tsukuba-yama
Ibaragi Pr., JAPAN, 305

Dr. T. Kamei
Dept.Geol.Miner., Kyoto Univ.
Kitashira-kawa Oiwake-Cho
Sakyo-ku,Kyoto, JAPAN, 606

Dr. K. Kanmera
Dept.Geol., Kyushu Univ.
Hakozaki 6-10-1, Higashi-ku
Fukuoka, JAPAN, 812

Dr. N. Kashima
Dept. Geol., Ehime Univ.
Bunkyo-cho, Matsuyama
Ehime Pr., JAPAN, 790

Dr. M Kato
Dept. Geol. Miner.
Hokkaido University, N-8, W-5
Sapporo, JAPAN, 060

Dr. S. Kawada
Maeji 2-3-5
Urawa, Saitama Pref., JAPAN, 336

Dr. M. Kawamura
Department of Geology
Hokkaido Univ. N-8, W-5
Sapporo, JAPAN, 060

Dr. M. Kawano
Takara-machi 3-54
Yamaguchi
Yamaguchi Pr., JAPAN, 735

Prof. J. Koike
Dept.Geol.,Yokohama Natl.Univ.
Tokiwadai 156, Hodogaya-ku
Yokohama, JAPAN, 240

Dr. K. Konishi
Dept.Geol., Kanazawa Univ.
Marunouchi
Kanazawa, JAPAN, 920

Dr. N. Minoura
Dept. Geol.Miner.
Hokkaido Univ., N-8, W-5
Sapporo, JAPAN, 060

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

Dr. M. Murata
Dept. Geol., Kumamoto Univ.
Kurokami-cho
Kumamoto, JAPAN, 860

Dr. M. Musashino
Kyoto Univ. Education
Fukakusa-Fujimori-cho
Fushimi-ku, Kyoto, JAPAN, 612

Prof. K. Nakamura
Dept. Geology & Mineralogy
Hokkaido University N-8 W-5
Sapporo, JAPAN, 060

Dr. T. Nakamura
Kokusai-Kogyo K.K. Ltd
Rokubancho 2, Chiyoda-ku
Tokyo, JAPAN, 102

Dr. K. Nakazawa
Faculty of General Education
Kinki University, Kowakae 3-4-1
Higashiosaka, JAPAN, 577

Dr. I. Niikawa
Dept. Geol. Miner.
Hokkaido Univ., N-8, W-5
Sapporo, JAPAN, 060

Dr. T. Nishida
Saga Univ.
Honjo-cho
Saga, JAPAN, 840

Dr. Y. Nogami
Narutaki-Haruki-cho 5-23
Ukyo-ku
Kyoto, JAPAN, 616

Dr. Y. Okimura
Inst. Geol. Miner., Hiroshima Univ
Higashi-Senda 1-1-89
Hiroshima, JAPAN, 730

Dr. M. Okubo
Dept.Geol., Shimane Univ.
Nishi-Kawazu-cho, Matsue
Shimane Pr., JAPAN, 690

Dr. Y. Onuki
Kunimi 2-15-5
Sendai, JAPAN, 980

Dr. M. Ota
Mus.Nat.Hist.,Yahata St.Bld.6-1
Nishihomachi 3Ch,Yahatahigashiku
Kitakyushu, JAPAN, 805

Dr. Ozawa
Dept.Geol., Tokyo Univ.
Hongo 7-3-1, Bunkyo-ku
Tokyo, JAPAN, 113

Dr. K. Sada
Dept.Geol. Sogo Kagakubu
Hiroshima Uni,Higashi-Senda-cho
Hiroshima, JAPAN, 730

Dr. Y. Saito
Earth Sci.Sect.,Natl.Sci.Museum
Hyakunin-cho 3-23-1,Shinjuku-ku
Tokyo, JAPAN, 160

Dr. S. Sakagami
Dept. Geol., Chiba Univ.
Yayoi-cho
Chiba, JAPAN, 260

Dr T. Sato
Dept.Geol., Shinshu Univ.
Asahi 3-1-1, Matsumoto
Nagano Pr., JAPAN, 390

Dr. K. Shibata
Geol. Survey, Yatabe-cho
Higashi 1-1-3, Tsukuba-gun
Ibaragi Pr., JAPAN, 305

Dr. A. Sugimura
Akiyoshidai Sci. Museum
Shuho-cho, Akiyoshi
Yamaguchi Pr., JAPAN, 759022

Dr. T. Sugiyama
Dept.Geol., Fukuoka Univ.
8-19-1 Nanakuma, Ihonan-Ku
Fukuoka, JAPAN, 814-01

Dr. K. Suyari
Tokushima University
Nanjo-Mishima-cho
Tokushima, JAPAN, 770

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

Dr. H. Takeda
Kokusai-Kogyo K.K. Ltd
Rokubancho 2, Ciyoda-ku
Tokyo, JAPAN, 102

Dr. J. Tazawa
Tohoku University
Aobayama
Sendai, JAPAN, 980

Dr. R. Toriyana
Dept.Geol., Fukuoka Univ.
Nanakuma, Nishi-ku
Fukuoka, JAPAN, 814

Dr. J. Watanabe
Dept. Geol. Miner.
Hokkaido Univ. N-8, W-5
Sapporo, JAPAN, 060

Mr. K. Watanabe
C/- Mr Onuki
Shinjuku 1-12-12, Shinju-ku
Tokyo, JAPAN, 160

Dr. Y. Yamada
Yamagishi 5-15-31
Morioka
Iwate Pref., JAPAN, 020

Dr. K. Yamada
Dept. Geol. Fac. Sci.
Kanazawa University, Marunouchi
Kanazawa Pr., JAPAN, 920

Dr. N. Yamagiwa
Dept.Geol., Osaka Univ.Ed.
Minawi-Kawahori-cho, Tennoji-ku
Osaka, JAPAN, 543

Dr. J. Yanagida
Dept.Geol., Kyushu Univ. 33
6-10-1 Higashi Ku
Fukuoka, JAPAN, 812

Dr. T. Yoshida
Geol. Surv., Higashi 1-1-3
Yatabe-cho, Tsukuba-gun
Ibaragi Pref., JAPAN, 305

MALAYSIA

Dr. I. Metcalfe
Department of Geology,
Universiti Kebangsaan Malaysia
Bangi,Selangor, MALAYSIA

MONGOLIA

Dr. O. Tomurtogoo
Geol. Inst. Acad. Sci.
Ulan Bator, MONGOLIA

PEOPLES REP.CHINA

Dr. Gao Lian-da
Chinese Acad. Geol. Sciences
C/- State Bureau Geology
Beijing, PEOPLES REP.CHINA

Professor Guo Hongzun
Changchun College of Geology
Changchun
Jilin, PEOPLES REP.CHINA

Dr. Li Xing-xue
Nanjing Inst. Geol. Palaeont.
Academia Sinica, Jimingsi
Nanjing, PEOPLES REP.CHINA

Dr. Ruan Yi-ping
Nanjing Inst. Geol. Paleont.
Academia Sinica, Jimingsi
Nanjing, PEOPLES REP.CHINA

Dr. Yang Jingzhi
Nanjing Inst. Geol. Palaeont.
Academia Sinica, Jimingsi
Nanjing, PEOPLES REP.CHINA

Professor Yang Shipu
Beijing Graduate School
Wuhan College of Geology
Beijing, PEOPLES REP.CHINA

Dr. Yang Xilu
Inst. of Geol. & Exploration
CCMRI, Coal Ministry, Xi'an
Shaanxi, PEOPLES REP.CHINA

POLAND

Dr. Z. Beka
Inst. Geol. Podstatowej, Univ.
Warszawski, Al Zwirki i Wigury 93
PL-02-089 Warszawa, POLAND

Dr. K. Bojkowski
Kaliska 16
PL 41.200
Sosnowiec, POLAND

Dr. A. Jachowicz
Univ. Slaski
ul. Bankowa 12
40-007 Katowice, POLAND

Dr. K. Rdzanek
Inst. Geol., Warsaw Univ.
Al Zwirki i Wigury 93
PL-02-089 Warszawa, POLAND

Dr. H. Zakowa
Inst. Geol, Oddzial Swietokrzyski
Slir Poczt 59
PL 25-953 Kielce, POLAND

PORTUGAL

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

Dr. J. Pais
Univ. Lisboa, Rua da Escola Politecnica
Lisboa 2, PORTUGAL

Prof. C. Teixeira
Univ. Lisboa
rua da Escola Politecnica 58
Lisboa 1294, PORTUGAL

REPUBLIC OF KOREA

Prof. C.H. Cheong
Dept. Geol. Sci.
Seoul National University
Seoul 151, REPUBLIC OF KOREA

ROMANIA

Ms C. Bitoianu
Inst.Geol.Geof.
78344 Str. Caransebes nr.1, sec.1
7000 Bucuresti, ROMANIA

SPAIN

Biblioteca Dept. Estratigrafia
Univ. Madrid
Pabellon III, Ciudad University
Madrid 3, SPAIN

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

Prof. B. Melendez
Dept.Paleo., Univ. Madrid
Pabellon III,Ciudad University
Madrid 3, SPAIN

Dr. G. Ortuno
E.N. Adaro, Principado 5
Oviedo, SPAIN

Dr. L.C. Sanchez de Posada
Dept. Paleont
Univ. Oviedo
Oviedo, SPAIN

Prof. J. Truyols
Dept. Paleontology
University of Oviedo
Oviedo, SPAIN

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

SWEDEN

Prof. A. Martinsson
Paleobiol. Avd.
Uppsala Univ., Box 564
S-75122 Uppsala, SWEDEN

THE NETHERLANDS

Bibliotheek
Rijksmuseum Geol. Miner.
Hooglandse Kerkgracht 17
2312 HS Leiden, THE NETHERLANDS

Bibliotheek
Geologisch Bureau v. h. Mijingeb
Postbus 126
640 AC Heerlen, THE NETHERLANDS

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

Dr. M. Boersma
Palaebot. Inst, Rijksuniv. Utrecht
Transitorium 2,Heidelberglaan 2
3584 CS Utrecht, THE NETHERLANDS

Dr. M. van den Boogaard
Rijksmuseum Geol. Miner.
Hooglandse Kerkgracht 17
2312 HS Leiden, THE NETHERLANDS

Prof. A. Brouwer
Geol.Inst., Rijksuniv. Leiden
Postbus 9518
2300 RA Leiden, THE NETHERLANDS

Dr. A.C. van Ginkel
Rijksmuseum Geol. Miner.
Hooglandse Kerkgracht 17
2312 HS Leiden, THE NETHERLANDS

Dr. G.E. de Groot
Rijksmuseum Geol. Miner.
Hooglandse Kerkgracht 17
2312 HS Leiden, THE NETHERLANDS

Bibliotheek Palaeobot. Inst.
Rijksuniv. Utrecht
Transitorium 2, Heidelberglaan 2
3584 CS Utrecht, THE NETHERLANDS

Subcommissei Stratig. Nederland
Rijksmuseum van Geologie
Postbus 9518
2300 RA Leiden, THE NETHERLANDS

Dr. C.F. Winkler Prins
Rijksmuseum Geol. Miner.
Hooglandse Kerkgracht 17
2312 HS Leiden, THE NETHERLANDS

TURKEY

Mr. E. Demirtasli
Maden Tetkik ve Arama Inst.
Ankara, TURKEY

Dr. N. Dil
E.K.I. Uzulmez Bolgesi
Zonguldak, TURKEY

UNITED KINGDOM

Dr. M.G. Bassett
Dept. of Geology
National Museum of Wales
Cardiff CF1 3NP, WALES

Dr. C.J. Cleal
Conservation Review Unit
Pearl House, Bartholomew St.
Newbury,Berk. RG14 5LS, ENGLAND

Dr. R.M.C. Eagar
Manchester Museum
University of Manchester
Manchester M13 9PL, ENGLAND

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

Prof. F. Hodson
Dept. of Geology
Univ. of Southhampton
Southhampton S09 5NH, ENGLAND

Dr. G.A.L. Johnson
Department of Geology
University of Durham
Durham DH1 3JB, ENGLAND

Dr. J. Knight
'Ashmount', Belmont Gardens
Haydon Bridge
Hexham NE47 6HG, ENGLAND

General Library
British Museum (Nat.Hist.)
Cromwell Road
London SW7 5BD, ENGLAND

Dr. M. Mitchell
British Geological Survey
Keyworth
Nottingham NG12 5GG, ENGLAND

National Coal Board Library
Coal House
P.O. Box #90
Doncaster,Yorks DN1 3HD, ENGLAND

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

Dr. W.H.C. Ramsbottom
Brow Cottage
Kirkby Malzeard, RIPON
N.Yorks HG4 3RY, ENGLAND

U.S.A.

Dr. A.K. Armstrong
U.S. Geological Survey
345 Middlefield Rd.
Menlo Park, CA 94025, U.S.A.

Harold Arndt
U.S. Geological Survey
P.O. Box 25046, M.S. 972
Denver, CO 80225, U.S.A.

Dr. John Baesemann
Amoco Research Center
P.O. Box 591
Tulsa, OK 74102, U.S.A.

Dr. James W. Baxter
Illinois Geological Survey
Natural Resources Bldg.
Urbana, IL 61801, U.S.A.

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

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

Dr. T.W. Broadhead
Department of Geology
University of Tennessee
Knoxville, TN 37916, U.S.A.

Dr. R.G. Browne
4007 Elfin Avenue
Louisville, KY 40207, U.S.A.

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

Dr. D.R. Choi
Fisher Island Station
Univ. of Miami
Miami Beach, FL 33139, U.S.A.

Dr. Charles W. Collinson
Illinois State Geol. Survey
Urbana, IL 61801, U.S.A.

Dr. Aureal T. Cross
Department of Geology
Michigan State University
E.Lansing, MI 48823, U.S.A.

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

Dr. Raymond C. Douglass
U.S. Geological Survey
Rm E-501, U.S.National Museum
Washington, DC 20560, U.S.A.

Dr. J.T. Dutro
U.S. Geological Survey
Rm E-501, U.S. National Museum
Washington, DC 20560, U.S.A.

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

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

Dr. Robert Gastaldo
Dept Geology, Auburn University
210 Petrie Hall
Auburn, AL 31849-50309, U.S.A.

Michael A. Gibson
Department of Geology
Auburn University
Auburn, AL 36849, U.S.A.

Mr. William H. Gillespie
West Virginia
Dept. of Agriculture
Charleston, WV 25305, U.S.A.

Dr. Brian F. Glenister
Department of Geology
University of Iowa
Iowa City, IA 52240, U.S.A.

Dr. Mackenzie Gordon Jr.
U.S.Geological Survey
Rm E-501, U.S. National Museum
Washington, DC 20560, U.S.A.

Prof. R.C. Gutschick
Dept. of Earth Science
Univ. of Notre Dame
Notre Dame, IN 46556, U.S.A.

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

Dr. A.S. Horowitz
Department of Geology
Indiana University
Bloomington, IN 47401, U.S.A.

Ms. C.A. Horsey
Geol. Survey Alabama
P.O. Drawer 0,
University, AL 35486, U.S.A.

Prof. J.R. Jennings
Department of Geology
Eastern Kentucky University
Richmond, KY 40475, U.S.A.

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

Dr. H. Richard Lane
Amoco Production Company USA
501 Westlake Park Blvd, Rm 16.162
Houston, Texas 77079 U.S.A.

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

Dr. Jerry A. Lineback
N/A

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

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

Dr. R.H. Mapes
Department of Geology
Ohio University
Athens, OH 45701, U.S.A.

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

Prof. G.K. Merrill
N/A

Dr. R.D. Narby
Department of Geology
University of Illinois
Urbana, IL 61801, U.S.A.

Dr. Hermann W. Pfefferkorn
Dept. Geol., Univ. Pennsylvania
240 S 33rd Street
Philadelphia PA 19104, USA

Dr. Carl B. Rexroad
Indiana Geological Survey
611 N. Walnut Grove
Bloomington, IN 47401, U.S.A.

Dr. T.G. Roberts
Dept. of Geology
University of Kentucky
Lexington, KY 40506, U.S.A.

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

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

Dr. Amos Salvador
P.O. Box 2180
Houston, TX 77001, U.S.A.

Dr. C.A. Sandberg
U.S. Geological Survey
Bldg.25, Federal Center
Denver, CO 80225, U.S.A.

Dr. W.J. Sando
U.S. Geological Survey
Rm E501, U.S. National Museum
Washington, DC 20560, U.S.A.

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

Mr. D.E. Schindel
Div. Invert. Paleo, Peabody Museum-
Nat. Hist., Yale Univ., PO Box 666
New Haven, CT 06511, U.S.A.

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

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

Dr. C.H. Stevens
Dept. Geol.
San Jose State Univ.
San Jose, CA 95192, U.S.A.

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

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

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

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

Dr. E.L. Yochelson
U.S. Geological Survey
Rm E-501, U.S.National Museum
Washington, DC 20560, U.S.A.

U.S.S.R.

Dr. B.A. Abramov
Geol.Inst.Sib.Otdel. AN SSSR
ul. Lenina 39
677891 Yakutsk 20, U.S.S.R.

Dr. D.E. Aisenverg
Inst. Geol. Nauk AN SSSR
ul. Chkalova 55b
252054 Kiev, U.S.S.R.

Dr. I.A. Alekseeva
Sev.-Zap. Territ. Geol. Upravl.
il. Gertsena 59
Leningrad, U.S.S.R.

Mrs. T.V. Astakhova
Inst. Geol. Nauk AN USSR
ul. Chkalova 55b
242054 Kiev, U.S.S.R.

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

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

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

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

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

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

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

Dr. N.E. Brazhnikova
Inst. Geol. Nauk AN USSR
ul. Chkalova 55b
252054 Kiev, U.S.S.R.

Dr. T.V. Byvsheva
V.N.I.G.N.I.
Shosse Entusiastov 124
105275 Moskva, U.S.S.R.

Dr. V.A. Chernnykh
Inst.Geol.Komi Filial AN SSSR
ul. Kommunisticheskaya 28
167610 Syktyvkar,K.ASSR, U.S.S.R.

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

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

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

Mrs. T.A. Dedok
N.I.I.C.A., nab. r. Mojki 120
190121 Leningrad, U.S.S.R.

Mr. D.D. Degtyarev
Sverdlovsky Gornyj Inst.
ul. Kujbysheva 30
Sverdlovsk, U.S.S.R.

Dr. M.V. Durante
Geol. Inst. AN SSSR
Pyzhevsky per. 7
109017 Moskva, U.S.S.R.

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

Prof. O.L. Einor
Geol.Dept., Kiev Univ.
ul. Vasilovskaya 90
252022 Kiev, U.S.S.R.

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

Mrs. E.V. Fomina
T.G.U.Ts.R.
2 Roshchinskaya ul. 10
Moskva M191, U.S.S.R.

Dr. R.S. Furduy
Geol.Dept., Kiev Univ.
ul. Vasilovskaya 90
262022 Kiev, U.S.S.R.

Dr. A. Galitskaya
Geol. Inst. AN KSSR
Bul'var Dzerzhinskogo 30
720071 Frunze, U.S.S.R.

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

Mr. I.M. Garan
Sverdlovsky Gornyj Inst.
ul. Kujbysheva 30
Sverdlovsk, U.S.S.R.

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

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

Dr. A.D. Grigoryeva
Paleont. Inst. AN SSSR
Profsoyuznaya ul. 113
117321 Moskva, U.S.S.R.

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

Dr. N.P. Ilyukhina
V.S.E.G.E.I., V.O. Sredny pr. 72b
199026 Leningrad, U.S.S.R.

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

Dr. E.A. Ivanova
Paleont. Inst. AN SSSR
Profsoyuznaya ul. 113
321 Moskva, U.S.S.R.

Dr. N.V. Kalashnikov
Inst. Geol. Komi Filial AN SSSR
ul. Kommunisticheskaya 28
167610 Syktyvkar, U.S.S.R.

Dr. M.A. Kalmykova
V.S.E.G.E.I., Srednij pr. 7s b
199026 Leningrad, U.S.S.R.

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

Dr. M.V. Konovalova
Ukhtinskaya Temat. Eksp.
ul. Pushkina 2
169400 Ukhta, K.ASSR, U.S.S.R.

Dr. N.M. Kotchetkova
Gorno-Geol. Inst. AN SSSR
ul. K. Marksa, korpus 4
Ufa, U.S.S.R.

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

Mrs. T.A. Kozyreva
Donetskij Politekhn. Inst.
ul. Artema 58
Donetsk, U.S.S.R.

Dr. S.S. Lazarev
Paleont. Inst. AN SSSR
Profsoyuznaya ul. 113
117321 Moskva, U.S.S.R.

Mrs. O.A. Lipina
Geol. Inst. AN SSSR
Pyzhevsky per. 7
109017 Moskva, U.S.S.R.

Dr. N.V. Litvinovitch
Geol.Fak.k.609, Moskovskij
Gosud. Univ., Leninskie Gory
117234 Moskva, U.S.S.R.

Mr. Ya.L. Lutfullin
Gorno-Geol. Inst. AN SSSR
ul. K. Marksa, Korpus 4
Ufa, U.S.S.R.

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

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

Mrs. N.M. Michno
Litol.-Strat.partiya Minist.
Geol. Uzb. SSR
700087 Tashkent, U.S.S.R.

Mrs. Z.P. Mikhailova
Inst. Geol. Komi Filial AN SSSR
ul. Kommunisticheskaya 28,
167610 Syktyvkar, U.S.S.R.

Dr. Ye. V. Movshovich
Volgo-Donskoe Geol. Upravl.
Budenovskij pr. 25
Rostov, U.S.S.R.

Prof. I.S. Muravyev
Kazan. Gosud. Univ.
ul. Lenina 4/7
Kazan,TASSR, U.S.S.R.

Mrs. V.A. Muromtseva
V.N.I.G.R.I., Liteiny pr. 39
192104 Leningrad, U.S.S.R.

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

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

Dr. A.A. Plusnina
Geol. Dept.
ul. Vainena
Sverdlovsk, U.S.S.R.

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

Mr. A.V. Popov
V.S.E.G.E.I., V.O. Sredny pr. 72b
199026 Leningrad, U.S.S.R.

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

Dr. B.V. Poyarkov
Dal'nevostochnyj Gosud.Univ.
ul. Sukhanova 8
690652 Vladivostok, U.S.S.R.

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

Dr. D.M. Rauser-Chernousova
Geol. Inst. AN SSSR
Pyzhevsky per. 7
109017 Moskva, U.S.S.R.

Dr. E.A. Reitlinger
Geol. Inst. AN SSSR
Pyzhevsky per. 7
109017 Moskva, U.S.S.R.

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

Mrs. V.D. Saltovskaya
Inst. Geol.
pr. Lenina 21
Dushanbe, U.S.S.R.

Dr. O.A. Scherbakov
Politekhn. Inst.
Komsomol'skij pr. 29a
614600 Perm, U.S.S.R.

Dr. M.V. Scherbakova
Politekhn. Inst.
Komsomolskij pr. 29a
614600 Perm, U.S.S.R.

Mrs. M.F. Schestakova
Permskij Politekhn. Inst.
Komsomol'skij pr. 29a
614600 Perm, U.S.S.R.

Mrs. M.T. Sergeeva
Inst. Geol. Nauk AN USSR
ul. Chkalova 55b
252054 Kiev, U.S.S.R.

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

Dr. P.L. Shulga
Inst. Geol. Nauk AN USSR
ul. Chkalova 55b
252054 Kiev, U.S.S.R.

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

Mrs. Z.A. Sinitzyna
Bashkir. Geol. Upravl.
ul. Lenina 35-37
Ufa, U.S.S.R.

Mr. V.P. Skvortsov
Upravl. Geol. Kirg. SSR
bul'var Dzerzhinskogo 2
Frunze, U.S.S.R.

Dr. M.N. Solovieva
Geological Inst. AN SSSR
Pyzhevsky per. 7
109017 Moskva, U.S.S.R.

Dr. M.F. Solovieva
N.I.I.G.A. Sevmorgeo
nab. r. Mojki 120
190121 Leningrad, U.S.S.R.

Dr. V.K. Teteryuk
ul. K. Libknekhta 87a
Dnepropetrovsk, U.S.S.R.

Mrs. Z.A. Tjuljandina
Litol-Strat. partiya
-Ministerstva Geol.Uzb.SSR
700087 Tashkent, U.S.S.R.

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

Dr. N.P. Vassiljuk
Donetskij Politekhn. Inst.
ul. Artema 58
Donetsk, U.S.S.R.

Mrs. M.V. Vdovenko
Inst. Geol. Nauk AN SSSR
ul. Chkalova 55b
252054 Kiev, U.S.S.R.

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

Dr. O.V. Yuferev
Inst. Geol. Geofiz. Sibir. Otdel.
AN SSSR
630090 Novosibirsk, U.S.S.R.
Mrs. G.P. Zolotukhina
V.N.I.I.N.G., ul. Lenina 96
400085 Volgograd, U.S.S.R.

VENEZUELA

Dr. G. Benedetto
Ministerio de Energia y Minas
Dir. de Geologia
Merida, VENEZUELA

YUGOSLAVIA

Dr. I. Filipovic
Geozavod Inst. Geol. Geophys. Res.
Karadjordjeva 48
Beograd, YUGOSLAVIA

Prof. A. Ramovs
Askerceva 12
YU-61000 Ljubljana, YUGOSLAVIA

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