

Ordovician NEWS

Thobrak



IUGS COMMISSION ON STRATIGRAPHY
COMMISSION ON ORDOVICIAN STRATIGRAPHY

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INTERNATIONAL UNION OF GEOLOGICAL SCIENCES

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NOTES FOR CONTRIBUTORS

Correspondence, reviews (and lists) of recent publications, brief summaries of current research, notices of relevant local, national and international meetings, and additions, deletions or changes to list of Ordovician workers will be welcomed.

Contributions should be in English, typed single spaced (double space between paragraphs) on white paper - print area should not exceed 18.5 x 26 cm. Copy should be mailed flat (with cardboard protector) to Barry Webby, Department of Geology and Geophysics, University of Sydney, N.S.W. 2006, Australia.

Unless otherwise stated, Chris Barnes and Barry Webby are responsible for statements made in this issue of ORDOVICIAN NEWS

We thank Miss Sheila Binns for providing excellent camera-ready copy of this and previous issues of ORDOVICIAN NEWS, and wish her a long and happy retirement

ANNUAL REPORT OF THE SUBCOMMISSION ON ORDOVICIAN STRATIGRAPHY FOR 1984

The Subcommittee on Ordovician Stratigraphy is pleased to report the following developments and activities during 1984:

1. Ordovician Correlation Chart Series

The Subcommittee is continuing to produce the series of correlation charts for Ordovician strata in major regions of the world, aimed at establishing a data base for later global analysis of Ordovician correlations and events. R. J. Ross Jr. continues to act as Editor of the series.

Several charts are in final stages of preparation and hopefully will be published during 1985 provided funds are available. They include South America (B. A. J. Baldis and others), Central Europe (B.-D. Erdtmann and others), the Soviet Union, Part I - Kazakhstan and the European Platform (I. Nikitin and colleagues), Norway and Sweden (D. L. Bruton and V. Jaanusson), North Africa (P. Legrand and M. J. Destombes), and Greenland (J. Peel). The second part of the Soviet Union which includes the remaining regions will be published later.

2. Ordovician Chronostratigraphy Working Groups

Six Ordovician Chronostratigraphy Working Groups have now been set up in order to focus on problems of correlation and the use of various internal divisions of the Ordovician. This work will lead eventually to the establishment of an internationally accepted world wide chronostratigraphy for the System (and Period). The objectives of each group will be (i) to define its use of Ordovician, including its regional divisions (series and/or stages), (ii) to plot the tie points between the various zonal schemes (iii) to record the lithostratigraphy of its series (and stage) stratotypes, (iv) to outline the nature of lithological and faunal change away from these stratotypes, (v) to recognize major faunal breaks, (vi) to establish which of these faunal breaks have correlative value and (vii) to determine whether the British Series or some other scheme is their most appropriate classification.

The six 'regional' working groups are as follows:

(a) Britain (W. T. Dean as chairman; other members, H. B. Whittington, R. A. Fortey, R. B. Rickards, A. W. A. Rushton and A. D. Wright).

(b) North America (A. Harris and J. Repetski as co-chair persons; other members, C. R. Barnes, S. M. Bergström, W. B. N. Berry, R. L. Ethington, S. C. Finney, R. Ludvigsen, B. Norford, G. S. Nowlan, J. Riva, R. J. Ross Jr., P. M. Sheehan and W. C. Sweet).

(c) Baltoscandia (D. L. Bruton, as chairman; other members, S. M. Bergström, B.-D. Erdtmann, V. Jaanusson, K. Larsson, A. Löfgren, A. W. Owen and S. H. Williams).

(d) Soviet Union (I. Nikitin as chairman, other members N. J. Ancygin, M. K. Apollonov, M. Chugaeva, A. V. Kanygin, A. I. Kim, R. Mannil, P. Misius, M. Oradovskaja, L. E. Popov).

(e) China (Lu Yenhao and Mu Enzhi as advisers; Chen Xu and Zhon Zhiyi as co-chairmen; other members, An Taixing, Chen Junyuan, Lai Caigen, Rong Jiayu, Wang Xiaofeng, Wang Zhihao, Xu Hankui and Yang Shengwu).

(f) Australasia (R. A. Cooper and A. M. H. VandenBerg as co-chairmen, other members, C. Burrett, B. Cooper, R. A. Henderson, J. Laurie, J. Shergold, B. Stait, I. Stewart and B. D. Webby).

Significant progress has already been made by the British, Chinese and Australasian working groups. It is planned to have as a major theme, the presentation of reports by these working groups at the next International Symposium on the Ordovician System in four or five years.

3. Ordovician Geochronology and Geomagnetism Working Groups

In the next year we hope to establish new working groups dealing with Ordovician geochronology and geomagnetism. Contacts are continuing to be made with various specialists with a view to establishing active programs of work in these areas.

4. Subcommission Newsletter

The second issue of 'Ordovician News' was printed and circulated at the end of June 1984. Like the first issue published in the latter part of 1983, it was 32 pages long, and distributed to approximately 400 specialists, with an additional 100 copies available for later distribution on request. The Secretary of the Subcommission is presently acting as the Editor of 'Ordovician News'.

5. Twenty seventh International Geological Congress in Moscow and Subcommission Membership

An official meeting of the Subcommission on Ordovician Stratigraphy was held on 9 August 1984 with the Chairman (C. R. Barnes), Vice Chairman (I. F. Nikitin) and Secretary (B. D. Webby), four other titular members, nine corresponding members and eleven others in attendance. A review of Subcommission activities since the last meeting held at the Fourth International Ordovician System Symposium in Sundvolden, Norway in August 1982, was presented by the Chairman. No firm proposal was presented for the next International Symposium on the Ordovician System except that it should be held one or two years before the next IGC in 1989, and perhaps in proximity of proposed stratotypes for the Cambrian/Ordovician and/or Ordovician Silurian boundaries.

Recommendations of the Nominating Committee (H. B. Whittington, chairman, D. L. Bruton and M. Robardet) were ratified at the meeting that C. R. Barnes and B. D. Webby become the new Chairman and Secretary respectively. This proposal was forwarded to the

Commission on Stratigraphy for approval. Also at the official meeting of 9 August it was unanimously agreed that I. F. Nikitin be the new Vice Chairman, that M. Chugaeva be adopted a Voting Member in place of A. M. Obut, and that the following Corresponding Members be approved:

F. G. Acenolaza	Argentina - trace fossils/graptolites
N. J. Ancygin	U.S.S.R. - trilobites
M. Beresi	Argentina - palaeoecology
M. G. Bassett	Britain - brachiopods
Chen Xu	PR China - graptolites
S. C. Finney	U.S.A. - graptolites
R. A. Fortey	Britain - trilobites
A. Harris	U.S.A. - conodonts
C. H. Holland	Ireland - cephalopods
A. V. Kanygin	U.S.S.R. - ostracods
A. I. Kim	U.S.S.R. - corals
V. B. Lemos	Brasil - conodonts
P. P. Misius	U.S.S.R. - brachiopods
G. S. Nowlan	Canada - conodonts
F. Nullo	Argentina - brachiopods
M. M. Oradovskaya	U.S.S.R. - stratigraphy
L. E. Popov	U.S.S.R. - brachiopods
Rong Jiayu	PR China - brachiopods
A. Roomusoks	U.S.S.R. - brachiopods
A. H. M. VandenBerg	Australia - graptolites
C. Ulloa	Colombia - stratigraphy
Wang Xiaofeng	PR China - graptolites

(see enclosed revised membership list)

In addition to the technical sessions and official meetings, highly successful field excursions were arranged to important areas of Ordovician geology in the Karatau Ranges of Kazakhstan (with leaders including M. Chugaeva and M. Apollonov), the eastern Baltic area (D. L. Kaljo), and the Omulevskiye Mountains in the Kolyma area of the northeastern U.S.S.R. (M. M. Oradovskaya and R. F. Sobolevskaya).

In summary, the Subcommission has had another active year of work and progress. The active program of compilation and publication of a world-wide series of Ordovician correlation with the financial support of IUGS is now in an advanced stage of progress, and it is hoped that within the next few years all significant areas of Ordovician outcrop will be included in one of the series of charts. The new phase of work on Ordovician chronostratigraphy is intended to lead to a better understanding of the existing regional stratigraphic frameworks and their wider applicability to the eventual establishment of an internationally accepted internal subdivision of the Ordovician System. New working groups on Ordovician geochronology and geomagnetism will be established in 1985 to complement the work of the chronostratigraphy working groups, and to provide the basis for setting up a fully integrated Ordovician time scale. Maintaining all the present activities, and additionally establishing these two new working groups will require an increased financial support from the IUGS and the Commission of Stratigraphy in 1985.

November 21, 1984.

SUBCOMMISSION MEMBERSHIP

(1) Titular Members

Dr. Bruno A. J. Baldis
San Lorenzo 1742
1636 Olivos. Argentina

Dr. C. R. Barnes (Chairman)
Department of Earth Sciences
Memorial University of Newfoundland
St. John's, Newfoundland, Canada
A1B 3X5

Dr. W. B. N. Berry
Museum of Paleontology
University of California
Berkeley, CA 94729, USA

Dr. Stig M. Bergström
Dept of Geology and Mineralogy
Ohio State University
125 S. Oval Mall
Columbus, Ohio 43210, USA

Dr. David Bruton
Paleontologisk Museum
Sars gate 1
Oslo 5, Norway

Dr. M. N. Chugaeva
Geological Institute
Acad. Nauk USSR
Pyzhevskii per. 7
Moskva Zh-17, USSR

Dr. W. R. Dean
Department of Geology
University College
Cathays Park
Cardiff CF1 1XL, Wales

Dr. M. J. Destombes
Service Géologique
Direction des Mines et de la Géologie
Rabat, Morocco

Dr. J. K. Ingham
Hunterian Museum
The University
Glasgow G12 8QQ, Scotland

Dr. Valdar Jaanusson
Paleozoologiska sektionen
Nat. Hist. Riksmuseet
Stockholm 50, Sweden

Dr. Kuo Hung-chun
Geol. Dept, Chanchun College of Geology
Changchun, Kirin, People's Republic of China

Dr. Lu Yen-Hao
Nanking Institute of Geology & Paleontology
Academia Sinica
Chi-Ming-Ssu
Nanking, People's Republic of China

Dr. R. Mannil
Geol. Institute, Acad. Sci. Estonian SSR
Estonia pst. 7
200101 Tallinn, USSR

Dr. I. F. Nikitin (Vice-Chairman)
Geological Institute
Acad. Sci. Kasak. SSR
Kalinina 69-a, Alma Ata 480100, USSR

Dr. M. Robardet
Institute de Geologie
Universite de Rennes
Ave du General Leclerc
35042 Rennes-Cedex, France

Dr. Reuben J. Ross, Jr.
Department of Geology
Colorado School of Mines
Golden, Colorado 80401, USA

Dr. Sheng Hsin-fu
Institute of Geology & Mineral Resources
Chinese Academy of Geological Sciences
Peking, People's Republic of China

Dr. B. D. Webby (Secretary)
Dept of Geology and Geophysics
University of Sydney
NSW 2006, Australia

Dr. H. B. Whittington
Department of Earth Sciences
Downing Street,
Cambridge CB2 3EQ, England

(2) Corresponding Members

Dr. F. G. Aceñolaza
Fac. de Ciencias Nat.
Univ. Tucuman
Miguel Lillo 205
4000 Tucuman, Argentina

Dr. N. J. Ancygin
"Uralgeologia"
Vainera 55
Sverdlovsk 620021, USSR

Dr. M. K. Apollonov
Geol. Institute
Acad. Nauk Kazakhstan SSR
Kalinia 69 A
Alma-Ata 480100 USSR

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

Dr. M. Beresi
San Juan 491, TBI, 23
5500 Mendoza, Argentina

Dr. Chen Xu
Nanjing Inst. Geol. & Palaeont.
Academia Sinica
Chi-Ming-Ssu
Nanjing, People's Republic of China

Dr. L. R. M. Cocks
Department of Palaeontology
British Museum (Natural History)
Cromwell Road
London SW7 5BD, England

Dr. R. A. Cooper,
New Zealand Geological Survey
P.O. Box 30368
Lower Hutt, New Zealand

Dr. John W. Cowie
Department of Geology
University of Bristol
Bristol BS8 1TR, England

Dr. Bernd-d. Erdtmann
Geol.-Paläont. Institut
Goldschmidstrasse 3
D-3400 Göttingen, W. Germany

Dr. R. L. Ethington
Department of Geology
University of Missouri
Columbia, Missouri 65201, USA

Dr. S. C. Finney
Department of Geology
Oklahoma State University
Stillwater, OK 74078, USA

Dr. R. H. Flower
New Mexico Bureau of Mines
Socorro, New Mexico 11801, USA

Dr. R. A. Fortey
Dept of Palaeontology,
British Museum (Natural History)
Cromwell Road,
London SW7 5BD, England

Dr. V. J. Gupta
Centre of Advanced Study in Geology
Panjab University
Chandigarh-160012, India

Dr. W. Hammann,
Institut f. Palaeontologie
Universität Würzburg
Pleicherwall 1,
8700 Würzburg, W. Germany

Dr. A. Harris
U.S. Geological Survey
U.S. National Museum E-501
Washington, D.C. 205660, USA

Dr. L. Hintz
Department of Geology
Brigham Young University
Provo, UT 84602, USA

Dr. H. Hofmann
Dépt de Géologie
Université de Montréal
C.P. 6128, Sta 'A'
Montréal, Québec, Canada

Dr. C. H. Holland
Department of Geology
Trinity College
Dublin 2, Ireland

Dr. C. P. Hughes
Department of Earth Sciences
Downing Street
Cambridge CB2 3EQ, England

Dr. A. V. Kanygin
Inst. Geol. Geophys.
Akad. Nauk USSR, Siberian Branch
Novosibirsk 630090, USSR

Corresponding Members (continued)

Dr. A. I. Kim
Tashkent Geol. Corp.
Ministry of Geol., Uzbek SSR
ul. T. Shevchenko 11
Tashkent 700000, USSR

Dr. J. Kovach
Geology Department
Muskingum College
Muskingum, OH 43762, USA

Dr. Lai Cai-gen
Institute of Geology
Chinese Academy of Geological Sciences
Baiwanzhuang Road,
Beijing, People's Republic of China

Dr. P. Legrand
Laboratoires Exploration groupe
TOTAL
114 Cours Marchal-Gallieni
Talence-Cedex 33404, France

Dr. V. B. Lemos
Univ. de Parana
Parana, Brasil

Dr. Rolf Ludvigsen
Department of Geology
University of Toronto
Toronto, Ontario M5S 1A1, Canada

Dr. J. F. Miller
Geography and Geology Department
S.W. Missouri State University
Springfield, MO 65802, U.S.A.

Dr. P. P. Misius
Geol. Inst., Acad. Nauk Kirg. SSR
Dzerjinskogo 30
Frunze 720042, USSR

Dr. R. B. Neuman
U.S. Geological Survey
E-501 U.S. National Museum
Washington, D.C. 20560, USA

Dr. G. W. Nowlan
Geological Survey of Canada
601 Booth Street,
Ottawa, Ontario, Canada K1A 0E8

Dr. F. Nullo
Geological Survey
Buenos Aires, Argentina

Dr. M. M. Oradovskaya
North-East Territory Geol. Survey
Magadan 685000, USSR

Dr. A. R. Palmer
Geological Society of America
3300 Penrose Place
Boulder, CO 80301, USA

Dr. F. Paris
Institut de Géologie
Université de Rennes
Campus de Beaufieu
35042 Rennes-Cedex, France

Dr. L. E. Popov
VSEGEI
Sredni prospekt 74
Leningrad 199026, USSR

Dr. J. E. Repetski
U.S. Geological Survey
U.S. National Museum E-501
Washington, D.C. 20560, USA

Dr. A. A. Roomusoks
Dept of Geology
Tartu State University
Vanemuise 46
Tartu 202400, USSR

Dr. Rong Jiayu
Nanjing Inst. Geol. & Palaeont.
Acad. Sinica
Chi-Ming-Ssu
Nanjing, People's Republic of China

Dr. H. P. Schönlaub
Geol. Bundesanstalt
Rasumofskygasse 23
A-1031 Wien, Austria

Dr. Bryan Stait
Department of Earth Sciences
Memorial University
St. John's, Newfoundland, Canada A1B 3X5

Dr. J. H. Shergold
Bureau of Mineral Resources
GPO Box 378
Canberra, ACT 2601, Australia

Dr. David Skevington
British National Oil Corporation
150 St. Vincent Street
Glasgow G2 5LJ, Scotland

Corresponding Members (continued)

Dr. W. C. Sweet
Dept Geology & Mineralogy
Ohio State University
125 S. Oval Mall
Columbus, OH 43210, USA

Dr. C. Ulloa,
Carrera 30, No. 50-59,
Bogota, Colombia

Mr. A. M. M. Vandenberg
Geological Survey of Victoria
140 Bourke Street,
Melbourne, Vic. 3000, Australia

Dr. Mary Wade
Queensland Museum
Gregory Terrace
Fortitude Valley, Qd 4006, Australia

Dr. Wang Xiaofeng
Yichang Inst. Geol. & Min. Res.
Chinese Acad. of Geol. Sci.
Yichang, Hubei, People's Republic of China

Dr. Henry Williams
Dept of Earth Sciences
Memorial University
St. John's, Newfoundland, Canada A1B 3X5

Dr. A. D. Wright
Department of Geology
Queen's University
Belfast BT7 1NN, Northern Ireland

Dr. Judith Wright-Clark
Geology Department
University of Oregon
Eugene, Oregon, USA

IUGS ORDOVICIAN CORRELATION CHARTS - PROGRESS REPORTS

Central Europe: A draft of the Ordovician correlation chart prepared by Dr. Bernd-D. Erdtmann and his colleagues in March 1984 included a 'left-hand margin' showing the British Series, selected stages and graptolite zones, the Swedish-Estonian series, Stages and substages, the Norwegian Series, Stages and substages, the Czechoslovak Series, formations and Bohemian graptolite zones, and the North Atlantic conodont zones. The chart includes columns 1-3 (Belgium), 4-7 and 22-33 (German Federal Republic), 8-21 (German Democratic Republic), and 34-47 (Austria). It is still hoped that contributions from Czechoslovakia and Poland can be added. Hopefully the chart and explanatory notes will be published during 1985.

Algeria and Tunisia: Dr. Ph. Legrand reports (July 1984) that the chart is complete but 'there are a lot of problems about the list of fossils Otherwise the attention is attracted on the volume West Africa of Lexique Stratigraphique International N.S. no. 1 - J. Fabre (editor), where the reader will find a geological introduction and the definition of stratigraphic terms, particularly about the Paleozoic series.'

ORDOVICIAN CHRONOSTRATIGRAPHY WORKING GROUPS -

RECENT PROGRESS REPORTS

(1) Britain

The principal task of the British Ordovician Chronostratigraphy working Group, chaired by Dr. W. T. Dean (University of Wales, Cardiff) is to redefine and reexamine the classical series of the Ordovician System in Britain. Recently, new data have been reported on the Arenig. The Arenig stratigraphy in south-west Wales was re-examined and new faunas described by R. A. Fortey and R. M. Owens (1978, Bull. Brit. Mus. Nat. Hist. (Geol.), v.30, p.225-294). A restudy of the type Arenig Series has recently been published by J. A. Zalasiewicz (1984, Geol. Journal, v.19, p.105-124). Zalasiewicz had previously published on some features of the sparse graptolite fauna (in Palaeontology, v.27, p.425-429). He notes evidence for a possible unconformity at the base and a probable unconformity at the top. The type succession could not be correlated precisely with what are considered to be Arenig sequences elsewhere. A redefinition of the Arenig series is recommended in a new area and Zalasiewicz suggests that the sections in south-west Wales may be suitable; they bear a sequence of largely shelly faunas, the upper of which are not present at Arenig.

The incomplete nature of the type Arenig and in south-west Wales was further confirmed by A. J. Beckley (Palaeontological Assoc. Ann. Conf., Cambridge, 1984, Abstracts, p.10). He reports that only in the northern Llyn area of north-west Wales are all three divisions of the Arenig present. At the same conference (p.27-28 Abstracts), S. H. Williams reports on the richly fossiliferous Arenig sequence of the Cow Head Group in western Newfoundland. His graptolite studies have allowed a refinement of the North America zonal scheme including the recognition of a new *T. ahzharensis* interval between the *T. approximatus* and *P. fruticosus* zones and the rejection of the "*D. protobifidus* Zone".

(2) China

The Chinese Ordovician Chronostratigraphy Working Group (COCWG) established in the February of 1984 (Ordovician News no. 2, 1984). The COCWG obtained the supports from the Institutes and Universities where the members work for. The COCWG set up in the Nanjing Institute of Geology and Palaeontology, Academia Sinica.

1. During the 13th Conference of the Palaeontological Society of China in the early of April, most of the members of the COCWG gathered in Shaoxin, Zhejiang. It was the first opportunity to exchange and discuss the programs between the members. The programs of the COCWG members in the next couple of years will be:

- (1) the sequences or the zonal schemes of the various faunas, including the graptolite zonation (as a standard), conodont, nautiloid, brachiopod, and possible trilobite sequences or successions.

- (2) the correlation between graptolite and shelly sequences. The conodont study will provide a possibility to solve the problem.
 - (3) Recognition of the levels of major faunal breaks, and its significance for international correlation.
 - (4) Reexamination of series terminology and a series classification formally adopted for China, including the determination of the lower boundary of each series.
 - (5) A scheme of stage terminology based on the graptolite succession.
 - (6) Correlation of the British series with those in China.
2. A symposium of the Lower Paleozoic Rocks in Shangdong including the field excursion, organized by the Palaeontological Society of Jiangsu and Shangdong in September, provided an opportunity to a part of COCWG members to examine the base of the Ordovician and the conodont and nautiloid sequences in North China.
 3. The third graptolite Symposium in Yichang, Yangtze Gorges at the end of October will have another opportunity to discuss the Ordovician graptolite zonation and Ordovician chronostratigraphy. A party of the COCWG members will participate.

(Contributed by Chen Xu)
Oct. 5 1984

With deep regret we report that Dr. Yang Shengwu, a member of the Chinese Ordovician Chronostratigraphy Working Group, died in an avalanche during a field excursion in Alaska on 22 September 1984. He was an enthusiastic worker, only recently having completed an important study of British Ordovician coral faunas.

The Chinese Ordovician Chronostratigraphy Working Group have added a new member to carry out studies of Ordovician conodonts in graptolite-bearing beds. She is Dr. Yao Lun-chi, a specialist on Ordovician conodonts and graptolites from the Dept of Marine Geology, Tongji University, Shanghai.

(3) Australasia

A questionnaire has been circulated to members of the working group by Co-chairman Roger Cooper and Fons VandenBerg. One member of the Working Group is responsible for collecting and collating data in each of four regions (or units) subdivided as follows:- A1 Graptolite facies (Victoria-New South Wales, Queensland, New Zealand) or Lancefieldian-Darriwilian age; A2 Graptolite facies of Darriwilian-Bolindian age; B1 Shelly facies of Tasman Fold Belt; and B2 Shelly facies of Australian Craton. As the contents of this questionnaire may provide helpful approaches for other working groups it is reproduced herein:

QUESTIONNAIRE

1. Summarise or list the biostratigraphic zonal schemes currently in use in your region.
2. Which stage classification is generally used in your region for:
 - a) internal subdivision and correlation?
 - b) external correlation?
 Comment on suitability, ease of application etc.
3. If local stages are used, summarise them with comments on their nomenclature, stratotype, definition, concept and facies; if any or all, of the above are unsatisfactory please specify what is needed to upgrade them.
4. Is there a good succession with diverse faunas in your area on which alternative national or international stage/series divisions could be based?
5. Which major faunal events (dramatic first appearance of extinction events) in your region are valuable for external correlation?
6. International series: state which of the various internationally used series schemes (i.e. British, Scandinavian, North American Chinese etc.) are most readily applied in your region. If other than British, state how readily it can be applied, and at what levels problems arise.
7. How readily can the standard British Series divisions be applied in your region? (The most recent summary of definition and content of the British Series is given by Whittington et al. 1984, *Geol. Mag.* 121: 17-33; I suggest we use this reference as our "starting point").
8. Are local series used in your region? If Upper, Middle and Lower Ordovician are used in lieu of named series, state which or whose definition of these terms is applied. (We know of no formally defined Ordovician series in Australasia but are aware of the widespread use of Lower, Middle and Upper Ordovician).
9. What is your opinion on:
 - a) desirability of adopting a single series classification for all Australasia?
 - b) desirability of adopting a single stage classification for all Australasia?
 - c) desirability of local stages and series or conversely of adopting an international classification?
10. Any other comments.

CAMBRIAN-ORDOVICIAN BOUNDARY WORKING GROUP

The officers of the COBWG are Brian Norford (Chairman), John Shergold (Vice-Chairman) and Jim Miller (Secretary). The contents of Circular No. 19 (dated April 1984) include the following:

1. Annual Report for 1983 to the International Commission on Stratigraphy.
2. Symposium in Nanjing, P.R. China, October 1983.
3. Reports on field trips held in P.R. China, 1983.
4. Plans for International Geological Congress in Moscow and Field Excursion to Kazakhstan, July-August 1984.
5. Plenary meeting in Calgary, Canada, July 1985.
6. Relection of working group officers.
7. New membership list
8. Report on eustatic events near the Cambrian-Ordovician boundary.
9. Members' comments.

Item 5 includes information about the plenary business meeting and conference to be held at the University of Calgary, Alberta, from 14-18 July 1985. The purpose of the conference, as outlined by Jim Miller, is to allow as many members of the working group as possible to hold 'detailed discussions of the various specific horizons and stratotype sections' as candidates for selection of an international stratotype. All the nominated stratotype sections will have been examined by members of the working group, so the time will be appropriate for final discussions of the merits and demerits of each section, and for discussions of appropriate specific horizons within the particular sections. 'The process of achieving a choice will be started, with the final decision to be made by a postal ballot.'

'Plans include two days of meetings and a one-day visit to exposures of the boundary interval near the Columbia Icefields, in Jasper National Park.' Costs will be kept as low as possible, with accommodation in University residences.'

'For those members planning to bring spouses and families, July is one of the best vacation months . . . and the Calgary Stampede (a famous rodeo) is scheduled for July 4-14.'

'The July 1985 Plenary Meeting will be the most important meeting held by the working group. All members are urged to reserve the dates and to make plans to participate.'

There will in addition be meetings of the Subcommittee on Cambrian Stratigraphy and the Working Group on the Precambrian-Cambrian Boundary during the Calgary conference.

Circular no. 20 (dated December 1984) included the following items:

1. Report on field trip to Batyrbay section, Kazakhstan, U.S.S.R. (see NB.3 on p.16 of this Newsletter)
2. Report on 27th International Geological Congress, Moscow.

3. Plenary Meeting of Working Group at University of Calgary, July 1985.
4. Members' comments.

Additional information about the Calgary conference included advice that basic costs (food and accommodation) in University residences from midday 14 July to midday 18 July will be about U.S.\$220. If you plan to attend the meeting contact the Secretary of the Working Group, Dr. James F. Miller, Geosciences Dept, Box 87, Southwest Missouri State University, Springfield, MO, 65804-0089, USA, immediately.

NB.1 'News of Studies on Potential Cambrian-Ordovician Boundary Stratotypes in China'

First issue of a 6-page newsletter (Circular No. 1) prepared by Dr. Chen Junyuan of the Nanjing Institute of Geology and Palaeontology appeared in November 1984. Further issues of this newsletter will appear monthly until two or three months before the Calgary meeting in July 1985.

Circular No. 1 describes Cambrian-Ordovician boundary strata in the Dayangcha section of North China, and in the Taoyuan section of southern China.

Circular No. 2 (dated Jan. 1985) includes descriptions of four sections across the Cambrian-Ordovician boundary in the Hunjiang area of southern Jilin Province, north eastern China.

NB.2 'Preliminary report on graptolite biostratigraphy of four Cambro-Ordovician boundary sections (incl. stratotype candidates), Cow Head Group, western Newfoundland'

The initial field season for this project was between August 20 and September 23, 1984. The principal investigator (Erdtmann) was accompanied by his field assistant stud. geol. Olaf Schmidt. During the investigations Erdtmann and Schmidt were frequently visited by the second principal investigator, Dr. Chris R. Barnes, who also supplied information on conodont occurrences in the measured sections. It was the principal objective of this field project during the 1984 season to concentrate on the Cambrian-Ordovician boundary portions of all coastal sections documenting the proximal to distal paleoslope facies segments of the Cow Head Group. The up-section Tremadoc sequence (to include the Eotetragraptus approximatus Zone) is scheduled for a similar investigation during the 1985 field season.

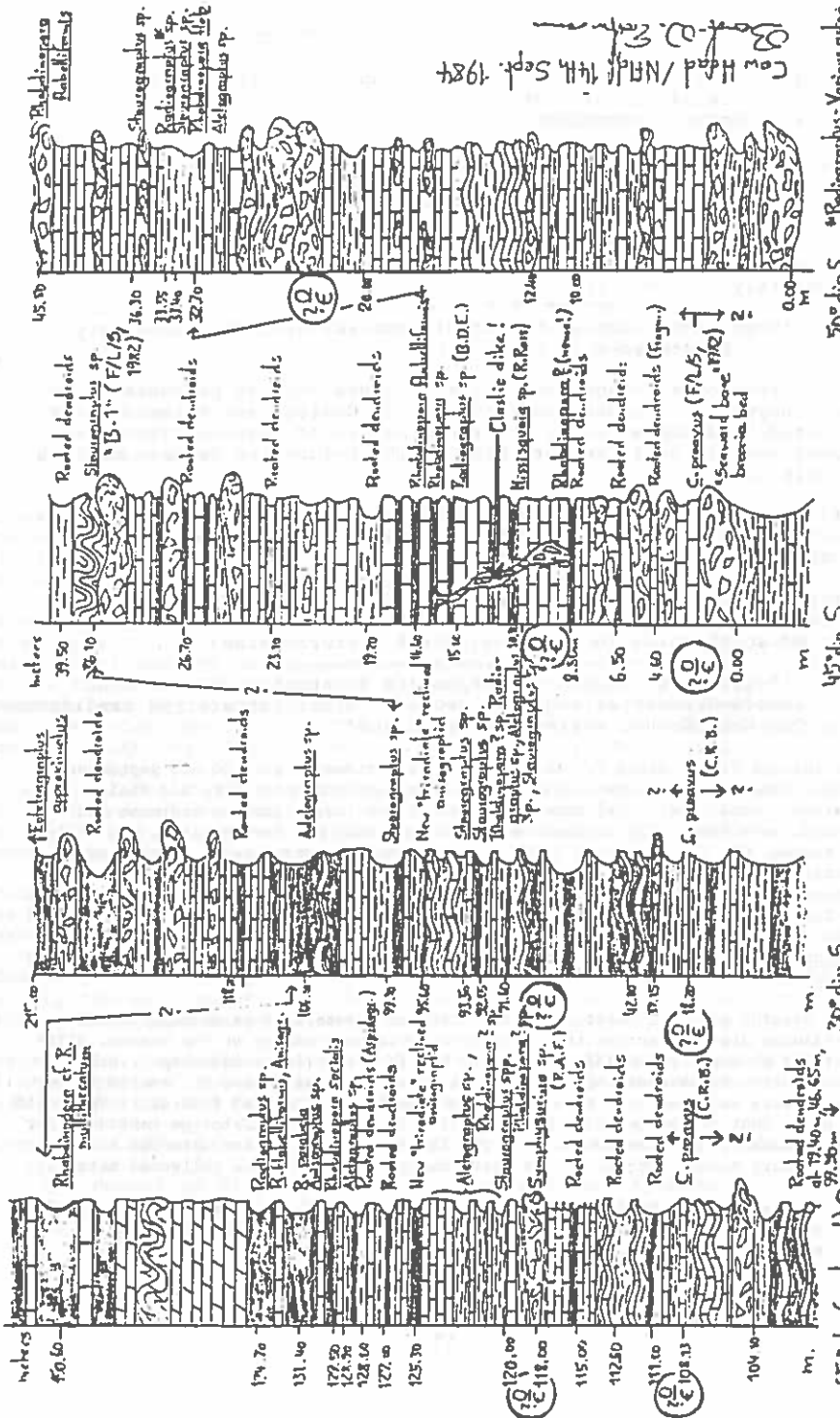
Upon careful pre-consideration of the distinct segments of paleoslope facies and continuous exposure across the Cambrian-Ordovician boundary of the coastal cliff sections at Green Point (distal slope), Martin Point (lower mid-slope), Broom Point North (Upper mid-slope) and at the highway bridge across St. Paul's (upper slope) were selected and investigated in detail (see appended figure). It should be noted that the Broom Point North section is a primary stratotype candidate for the Cambrian-Ordovician boundary. The following comments are intended to be of preliminary nature subject to the forthcoming analysis of the collected material:

1. Graptolites are preserved in coalified film, flattened or in partial relief, or fully in 3-D (in limestones). Most of the material collected is of excellent preservational quality.

GREEN POINT

MARTIN POINT

BROOM POINT NORTH ST. PAUL'S BRIDGE



*Radiograptus: Various other genetic stages were found from a single bedding plane at St. Paul's Quarry (in some stratigraphic positions).

Note: Not drawn to scale. Graptolite identifications and all correlations are preliminary.

- "Quadri"-radiate anisograptids such as *Staurograptus*, *Aletograptus*, some forms of *Rhabdinopora* and *Radiograptus* make their appearance usually earlier than the "tri"-radiate forms of *Rhabdinopora* (of *flabelliformis* type), *Anisograptus* and before the "celebrated" *Radiograptus*.
- Radiograptus* (usually with three primary stipes and very delicate dissepiments) has now been recovered from all significant Cambrian-Ordovician boundary sections in the Cow Head Group. Its stratigraphical position, however, is unexpectedly high! At all investigated sections - even at Broom Point North - *Radiograptus* is either associated with *Rhabdinopora* of *flabelliformis* type or succeeds this form stratigraphically. This is a puzzling but verifiable observation. At Broom Point North a few nematophorous *Rhabdinopora* were not recovered from beds underlying first occurrences of *Radiograptus*. Moreover, a complete assemblage of juvenile, adolescent and gerontic specimens of *Radiograptus* have been found within the same bedding plane at St. Paul's Quarry, ca. 250 meters NE of the northern highway bridge rampart.
- A "tri"-radiate reclined anisograptid (probably a new genus and species) has been found from a 0.30 m interval at Green Point and from a single bedding plane at Martin Point. This "untimely" Arenig-looking graptolite (it somewhat resembles a tri-ramous *Tetragraptus bigsbyi*) precedes the development of *Rhabdinopora*, *Anisograptus* and other "tri"-radiate graptolites at Green Point.
- The "quadri"-radiate unbifurcated *Aletograptus* (so far only known from Taymyr in northernmost Siberia) appears through an almost 9 m interval of section at Green Point but occurs scarcely at Martin Point and at St. Paul's. An evolutionary series of *Staurograptus* to *Aletograptus* is observed at Green Point.
- The first occurrences of any nematophorous graptolites (e.g. *Staurograptus*) postdate the (first ?) appearances of *Cordylodus proavus* (data compliments Dr. C. R. Barnes), of *Missisquoiia typicalis* (found at Broom Point by Dr. R. J. Ross) and of *Symphysurina* sp. (found by Dr. R. A. Fortey in a clast within the second breccia bed at Green Point).
- The Broom Point North section is potentially depositionally incomplete and "unrepresentative" with regard to the graptolite successional record of the lowermost Ordovician elsewhere. This section constitutes a "high" carbonate facies and has a very "low" clastic mud fraction. This unfortunately automatically means a very low yield of graptolites, which probably avoided this environment for ecological reasons and/or could not be preserved due to the presence of well oxygenated bottom conditions during their burial. The unusually high representation of "rooted dendroids" in many of the relatively few mud beds of this well described section (Fortey & Skevington, 1980; Fortey, Landing & Skevington, 1982) may serve to underscore such environmental controls on the occurrences of graptolites. The nematophorous (planktic) graptolites apparently preferred a deeper water environment than represented by the depositional facies outcropping now at Broom Point, St. Paul's and

Cow Head. Furthermore, the depositional instability of the critical portion of the Broom Point North section is also indicated by a series of "neptunian" dykes which cut through about 7 m of section - traversing the currently proposed Cambrian-Ordovician boundary!

9. The Cow Head Group sections, including the more "down-slope" sequences, do not correlate well with the deeper or cooler water black shale sequences of northernmost Newfoundland, northern Wales, Scandinavia, St. John, N.B., Bolivia and NW Argentina, etc. I believe that this is due to primary ecological factors which may have controlled the distribution of pandemic Rhabdinopora in the characteristic black shale sites, but the particular succession within the Cow Head Group may also have been influenced by its characteristic depositional environment which frequently included vacillating chemoclines and debris flows of considerable magnitude. Yet, the "inter-fingering" of (though transported) shelf biota and "paraautochthonous" conodonts and graptolites would render the combination of all "multi-facies" Cow Head Group sections to become most significant "key sections" for the selection of a boundary stratotype.

However, these and other "interpretative" aspects should not be dealt with here but rather be left to future publications which are either pending by my colleagues from Memorial University or intended to be submitted by myself and coworkers ...

(contributed by B.-D. Erdtmann,
5 November 1984)

NB.3 Dr. Brian Norford has made the following comments about the Cambrian-Ordovician boundary interval in the Batyrbay section of the Maly Karatau Range, Kazakhstan (reproduced from Circular No. 20 of the International Working Group on the Cambrian-Ordovician Boundary):

'The depositional environment of the boundary interval appears to be that of a slope of moderate depth adjacent to a basin. Thin wavy-bedded microgranular limestones are characteristic; some of these are nodular. Slump breccias are present but mostly consist of redeposited slope facies with very few cobbles of shallow-water facies. However, a small algal bioherm (Renalcis) is present within the Upper Cambrian Lophosaukia trilobite zone.

The accompanying diagram (see p.24 of this Newsletter) outlines the stratigraphic sequence and indicates the extensiveness of faunal sampling. The section shows a general shallowing upward within the Lower Ordovician. Soviet geologists place the base of the Ordovician at 109 m, at the base of the Cordylodus proavus conodont Zone and coincidentally at the base of the Euloma limitaris-Batyraspis trilobite Zone. Unfortunately the interval 104-133 m is not as well exposed as most of the section, but trenches expose a continuous sequence.

The boundary interval is not very fossiliferous, but extensive and dedicated collecting has provided rich trilobite faunas, mostly deep-water taxa that are very useful for international correlation. Brachiopods and cephalopods are rare. Chitinozoans are reported from 109 m. Dendroid graptolites are known only from near the boundary interval but are benthonic taxa. Conodont faunas are reported as not abundant, but they allow excellent correlation of the Cordylodus proavus Zone with other parts of the world.'

(Further information about this excursion is given on pp.21-22 of this Newsletter)

ORDOVICIAN-SILURIAN BOUNDARY AND LOWEST DIVISIONS OF THE SILURIAN

(1) Ordovician-Silurian Boundary Working Group

As outlined by the Secretary General, Dr. M. G. Bassett, in the Minutes of the Business Meeting of the Commission on Stratigraphy held in Moscow on 13 August 1984, the "Working Group proposed that the Ordovician-Silurian Boundary should be defined at a level 1.6 metres above the base of the Birkhill Shale Formation in a trench section along the north branch of the Linn Branch stream at Dob's Linn, near Moffat, Scotland, U.K.; the proposed stratotype point coincides with the base of the Parakidograptus acuminatus graptolite biozone.

In a postal ballot the Working Group had voted 12 to 5 (2 abstentions) in favour of the locality, and 10 to 5 (4 abstentions) in favour of the horizon.

C. H. Holland summarised the basis for the proposals. Coupled with his written comment on criteria for stratotype (see Agendum 6*) C. R. Barnes considered that the proposed section did not possess most of the qualities required, particularly because it was in a monofacial, condensed sequence. C. H. Holland stressed that the Working Group had taken all factors into consideration, and D. Kaljo also emphasised that it would be difficult to find a better section in the world at this level. W. Ziegler pointed out that it was not the job of the Commission to check the science at this point, but to ascertain that procedures had been carried out correctly, and there seemed to be no problems in this respect; the main criterion should be ease of correlation, and probably no section could ever be perfect in every respect. X. Mu and A. J. Boucot drew attention to new information from sections in China and considered that these should be taken into account. In summarising on behalf of the Working Group, C. H. Holland emphasised the length of time that had been taken to arrive at the proposals following full and democratic discussion. The meeting AGREED (7 for, 2 against, 4 abstentions) that the proposals on the Ordovician-Silurian Boundary should be forwarded to voting members for a postal ballot."

*This refers to recommendations from the Canadian National Committee (1) that the Dob's Linn section be rejected as a boundary stratotype for lacking most of the basic prerequisites for a stratotype (at least as expressed in the International Stratigraphic Guide), and (2) that the Commission ensure that stratotypes not be established where unnecessarily stringent restrictions on future collections will apply. This followed restrictions on sample weight for the Klouk stratotype and parastratotypes for the base of the Devonian in Czechoslovakia.

N.B. C. H. Holland has recently published a fine summary on the status of Silurian chronostratigraphy: Steps to a standard Silurian, 1984, Proceedings of the 27th International Geological Congress, V.1, Stratigraphy, pp. 127-156. See also Holland, C. H., Ross, R. J. and Cocks, L. F. M., 1984, Ordovician-Silurian boundary. Lethaia 17, 1984.

(2) Proposal of the Subcommittee of Silurian Stratigraphy for the lowest Silurian chronostratigraphical subdivisions

SERIES

- a. As the lowest Series of the Silurian 14 titular members of the Silurian Subcommittee were in favour of the name Llandovery from the Llandovery district of South Wales (one of the 14 viewing the Llandovery as a stage); 1 titular member was against.

The basal boundary stratotype is as for the Silurian System - i.e., Dob's Linn, Scotland (see submission on the Ordovician/Silurian boundary).

STAGE

- b. As the lowest stage of the Silurian 10 titular members of the Silurian Subcommittee were in favour of the name Rhuddanian derived from the Cefn-Rhuddan farm in the Llandovery district of South Wales: 3 voting members were against (2 preferring chronostratigraphy to be based on Anticosti, and the third preferring Oslo); and 2 members abstained from voting.

Again the basal boundary stratotype is that of the Silurian System - i.e., Dob's Linn, Scotland.

The Commission of Stratigraphy meeting in Moscow agreed (with no votes against and no abstentions) that this and other proposals on Silurian chronostratigraphy should be forwarded to voting members for a postal ballot.

N.B. New Chairman of Silurian Subcommittee: D. Kaljo (USSR)

New Secretary of Silurian Subcommittee: T. Koren' (USSR)

A. Subcommittee activities

Official meeting of the Subcommittee on Ordovician Stratigraphy, held in the University Building No. 2 of the Moscow State University, U.S.S.R., on the evening of 9 August 1984.

There were present: The Chairman (Dr. C. R. Barnes), Vice Chairman (Dr. I. F. Nikitin) and Secretary (Dr. B. D. Webby), other titular members (Drs. B. A. J. Baldis, S. M. Bergström, M. N. Chugaeva, and R. Mannil), corresponding members (Drs. M. K. Apollonov, B.-D. Erdtmann, J. Kovach, A. I. Kim, J. F. Miller (also Secretary, Cambrian/Ordovician Working Group), P. P. Misius, M. Oradovskaja, A. Roomusoks, J. Wright). Also present were D. Kaljo (Chairman, Silurian Subcommittee), G. P. Abaimova, W. Bednaiczuk, J. E. Dmitravskaja, S. Dubinina, T. P. Fletcher, R. Kalacheva, S. V. Melnikov, T. A. Moskalenko, A. V. Rosova and K. S. Rozman.

Introductory words of welcome by the Chairman were followed by approval of the Minutes of the last Subcommittee meeting in Sundvollen, Norway, 22 August 1982, and a brief report of the very successful Fourth International Symposium on the Ordovician System, organised by Drs. David Bruton, Henry Williams and others in the Sundvollen Hotel in August 1982, and its accompanying field excursions to the main classical Ordovician areas of Norway and Sweden.

IUGS Ordovician correlation chart series: Status reports on those in preparation:

(i) South America

Dr. Bruno Baldis presented an almost completed draft of the chart and explanatory notes for South America, and raised the questions of whether the manuscript might be published by IUGS in both English and Spanish. He indicated that a final draft would be sent to the Chairman after the Latin American palaeontological conference to be held in Mexico City in October 1984.

(ii) Central Europe

Dr. Berndt-D. Erdtmann gave an outline of progress towards a chart of central Europe. He displayed the virtually completed chart and indicated that the explanatory notes were presently being prepared - hopefully completed by the end of the year, with publication by end of 1985 or early 1986.

(iii) Soviet Union

Dr. Igor Nikitin indicated that Subcommittee charts for the Soviet Union would be based on charts already published in Russian. They would be prepared in two parts, the first including Kazakhstan and the East European platform to be submitted in April 1985, and the second covering the other four regions of the Soviet Union (Urals, Siberian Platform, Far East and Altai Sayan) at a later date. All

Soviet specialists would be invited to participate in the project and the work would summarize all available data. The Chairman thanked Dr. Nikitin for agreeing to take on the large task of co-ordinating work on the Soviet correlation charts.

The Chairman also mentioned that correlation charts for North Africa, Norway and Sweden were in advanced stages of preparation, and attempts should be made to get them submitted for publication in the very near future.

Ordovician Chronostratigraphy Working Groups

After outlining the need for establishing these regional working groups to assess the internal divisions of the Ordovician including applicability of the British Standard Series, the Chairman listed the various terms of reference which need to be assessed (see lists in previous issues of Ordovician News). The Chairman noted that an additional working group had been set up - a regional Ordovician chronostratigraphy for the Soviet Union with Dr. Igor Nikitin as chairman and other members to include Drs. N. J. Ancygin, M. K. Apollonov, M. Chugueva, A. V. Kanygin, A. I. Kim, R. Mannil, P. Misius, M. Oradovskaja and L. E. Popov. This was the sixth regional working group to be established since 1982. Possibly a seventh South American group with Dr. Baldis as Chairman may be formed later.

The work of these groups is of the utmost importance to the Subcommittee, and is to form the basis of a major theme at the next International Symposium on the Ordovician System in 4 or 5 years time.

Geochronology and Geomagnetism Working Groups

The Chairman noted the need to establish working groups in geochronology and geomagnetism, and to get more scientists with these interests to participate in our activities. It was hoped that these working groups could be established in the next year or so.

Working groups to study Ordovician palaeoceanography, palaeogeography and palaeoclimatology should perhaps be established when we have made more progress.

Ordovician Boundaries

The Chairman briefly mentioned work of Ordovician-Silurian Boundary Working Group, and that it has recommended to the Commission of Stratigraphy and IUGS that the stratotype boundary be at the base of the acuminatus zone in the section at Dob's Linn, Scotland. The final decision would be made by postal ballot of the Commission after the IGC meeting, and if approved would be published in the January 1985 issue of Episodes. If it was rejected you would hear earlier.

Dr. Jim Miller (Secretary of Cambrian-Ordovician Working Group) provided an outline of progress towards establishing the Stratotype boundary for the base of the Ordovician. He drew attention to the very important business meeting to be held in July 1985 in Calgary to choose the most suitable locality and horizon for the boundary.

V International Symposium on the Ordovician System

The Chairman indicated that it would be logical to have the meeting a year or two before the next International Geological Congress, to be held in Washington D.C. in 1989. It therefore seemed appropriate to hold a meeting in 1987 or 1988. In a year or two we should know where the Cambrian-Ordovician and Ordovician-Silurian boundaries are to be defined, and a meeting place could be near one of them. Other accessible sites, areas not visited recently or where the work of a Chronostratigraphy working group is well advanced could be considered as alternatives. Possibilities might include the United Kingdom, Newfoundland or China. There was also a suggestion of a subsequent meeting in 1993 or 1994 to Argentina.

Election of Officers and Titular Members of the Subcommittee

A full report of changes of membership is given elsewhere in this issue of ORDOVICIAN NEWS - see the Annual Report for 1984 (and accompanying membership list).

Future Activities

The Chairman indicated that Ordovician News has been established to promote the work of the Subcommittee and studies of the Ordovician System, and it should be supported by all with active interests. Information should be sent to the Secretary, Dr. Barry Webby. The next issue will appear early in 1985. Most important of our various tasks was to maintain progress of the Ordovician chronostratigraphy working groups with a view to integrating zonal schemes and establishing an internationally accepted chronostratigraphy for the Ordovician System, and the fullest possible understanding of Ordovician geochronology, magnetostratigraphy, palaeoecology, palaeogeography and palaeoclimatology.

B. Official Field Excursions

- (1) Geology and phosphorite deposits in Maly Karatau Ridge, Kazakhstan (Excursion 045A: 24 July - 3 August 1984)

This 11-day excursion commenced with a 3½ hour flight from Moscow to Dzhambul. We were welcomed by members of the Institute of Geological Sciences of the Kazakh Academy of Sciences and Productive Geological Yuzhkazgeologia of the Kazakh Ministry of Geology, and next day after a scenic tour of Dzhambul and a splendid lunch in a traditional Kazahki yurt we travelled by Intourist and mini buses north westwards to the Kyrshabakty camp in the Maly Karatau Range 28 km east of the phosphorite town of Zhanatas. This was a very well appointed field camp with 3-man air-conditioned huts, washrooms, restaurant, bar, open-air theatre, swimming pool and medical facilities. On the 26 & 27 July Dr. G. Kh Ergaliev conducted us through the Vendian Kurgau and Lower Cambrian Chulaktau suites, the latter with economically important phosphorite horizons, and then through the remarkably complete, and fossiliferous, Middle-Upper Cambrian carbonate succession (Shabakty suite) with its rich agnostid faunas. Most of the group remained in camp on the 28 July. The 29 July included visits to sections near the Koksau River with Vendian

Lower Cambrian (Tommotian) phosphorites, and Botomian limestone with *Redlichia* and *Kootenia*. On 30 July the Ordovician specialists of the group had their first opportunity to study the well exposed and complete Upper Cambrian-Lower Ordovician carbonate sequence in the Batyrbay ravine under the guidance of Drs. M. K. Apollonov and M. N. Chugaeva. The 30 July was again devoted to Vendo-Cambrian successions. First a visit to the local mining town of Zhanatas and a reception at the local geology club, then a brief stop to view sequence in an open cut phosphate mine, and then visits to a number of additional localities west of Zhanatas. Specimens were packed in boxes for posting in the morning of 1 August, and much of the afternoon and evening spent by participants giving lecture presentations. These continued on the morning of 2 August. After lunch and farewells we left the camp to return to Dzhambul by evening, with the flight back to Moscow arriving in the early hours of 3 August.

A number of evenings were given over to lectures by both the overseas participants and Soviet specialists. Among the latter were important discussions of the Ordovician geology of Kazakhstan by Dr. I. Nikitin, of the Altai-Sayan region by Dr. Z. E. Petrunina, and of the Siberian Platform by Dr. G. P. Abaiova. There were also films, banquets and a concert by an orchestra from Zhanatas.

Excursion O45A was very well organized. This was due to the efforts of the following Kazakhstan geologists:

(1) Institute of Geological Sciences of the Kazakh Acad. of Sciences (Kalininn 69^a, Alma Ata 100, 480100, USSR) - Acad. A. A. Abdulin, Drs. G. Kh. Ergaliev (Cambrian trilobites), M. A. Kasymov (Precambrian metamorphics), N. K. Ivshin (Cambrian trilobites), I. F. Nikitin (Ordovician brachiopods), D. T. Tsai (graptolites), M. K. Apollonov (Ordovician trilobites), S. P. Koneva (Cambrian inarticulates), T. B. Baitorina (Cambro-Ordovician conodonts), K. T. Kosanov (Cambro-Ordovician lithology), A. Zhilkaidarov (conodonts), V. Zhemchuzhnikov (sedimentology), Zh. Sargashaev (lithology) and A. Nesipbaev (phosphorites); and (2) Productive Geological Yuzhkazgeologia (Furmanova 110, Alma Ata 91, 480091, USSR) - V. V. Ovchinnikov (general geology), M. A. Chimbulatov (Director), A. A. Kusainov (Chief organizer of camp) and M. Yu Beizot (stratigraphic geology - based in Zhanatas). Other Russian participants included Drs. M. N. Chugaeva, Z. Petrunina, D. Kaljo, G. Abaimoiva.

Those attending from overseas, included Drs. J. Wright, R. Malcuit (and Mrs. Malcuit), J. Kirschvink, J. Miller, R. A. Robison and A. R. Palmer (U.S.A.), C. R. Barnes and B. Norford (Canada), B.-D. Erdtmann (W. Germany), G. Sustrac (France), E. Ortega (Spain), T. Fletcher (U.K.) and B. D. Webby (Australia).

(Guide-book and relevant palaeontological atlas is listed in 'Bibliography' of this issue of ORDOVICIAN NEWS)

(2) Geology and mineral deposits of the Lower Palaeozoic of the Eastern Baltic area (Excursion 28C: 15-21 August 1984).

The twenty participants were given an excellent view of the Lower Palaeozoic of Estonia. Situated on the south slope of the Baltic Shield, the Lower Palaeozoic strata outcrop in east-west bands across

northern Estonia. Cambrian and Ordovician rocks occur within the city limits of Tallinn, our headquarters for the week. The strata have been studied intensively, both in outcrop and subsurface, and subdivided into many thin to moderately-thick formations. For example, the Ordovician of central and northern Estonia has 29 formations, ranging in maximum thickness from 2 to 36 m, with an average of 12 m. In recent years, a comprehensive drilling programme has allowed determination of facies relationships throughout the basin, and the interpretation of the strata on a regional basis.

The party visited 18 localities, about half in quarries, beginning in the Lower Cambrian and working up section into the Lower Silurian. Half of the excursion was devoted to the Ordovician. Of particular interest was the unconsolidated state of the Cambrian and Tremadoc sands and clays. The famous Lower Cambrian "blue clay" (it is green) is mined in Tallinn for brick-making. The well-known lower Ordovician "Obolus conglomerate", which is unconsolidated sand, is mined (800,000 tons per year) in large open-cut pits as a "shelly phosphorite", concentrated, crushed and used to make fertilizer. Above the Tremadoc, the Ordovician is composed of carbonate and shales. The former includes well-preserved fossils, especially molluscs, brachiopods, bryozoans, corals and trilobites, as does the latter, particularly in the oil shales of the Kukruse stage. These Middle Ordovician oil shales are mined in large open-cut pits in northeastern Estonia, 80% used as fuel in large thermal electric powerhouses, and 20% in petrochemical products. Thus, with its contained oil shales and phosphorites, rocks of the Ordovician are by far the most economically important in Estonia. Above the Ordovician are carbonates of the Lower Silurian, some including carbonate mounds, and corals and brachiopods, such as those of the *Pentamerus oblongus* fauna, familiar in other parts of the world.

The excursion was well organized and led by D. Kaljo, E. Klamann and V. Petersell, with specialist leaders for the various systems K. Mens, E. Pirrus (Cambrian), L. Hints, S. Mäji, J. Nolvak, L. Polma (Ordovician), H. Nestor (Silurian), E. Mustjogi (Minerals) and V. Korvel (Organizer). Presentations were made in Russian at each stop, with English translation. All localities were well marked stratigraphically, and often had specially made steps, platforms and access roads to them. The guidebook (Excursions 027, 028) in either Russian or English, is well written and informative.

The participants, with a wide variety of interests, came from 8 countries: A. G. Araujo, M. F. R. Guimaraes, I. S. Kaholo, A. Mankenda, A. M. Neto (Angola); D. H. Collins (Canada); Luo Huiliu, Wei Jiayong, Xing Yusheng (China); R. Sallum (E. Germany); M. Shirav (Israel); En Hak Junt, Kim Sok Toe (N. Korea); A. N. Istomin, L. P. Istomina, V. N. Makarov, L. P. Makarova, M. I. Poliakova (USSR); R. Krantz and H. H. Schmitz (W. Germany).

(Contributed by D. H. Collins, Toronto)
Sept. 10, 1984

(3) Ordovician-Silurian Boundary in the Omulevskiy Mountains
(Excursion 069C: 14-22 August) - directors M. M. Orodovskaya
and R. F. Sobolevskaya.

It is hoped to have a report on this excursion in a future issue of
ORDOVICIAN NEWS.

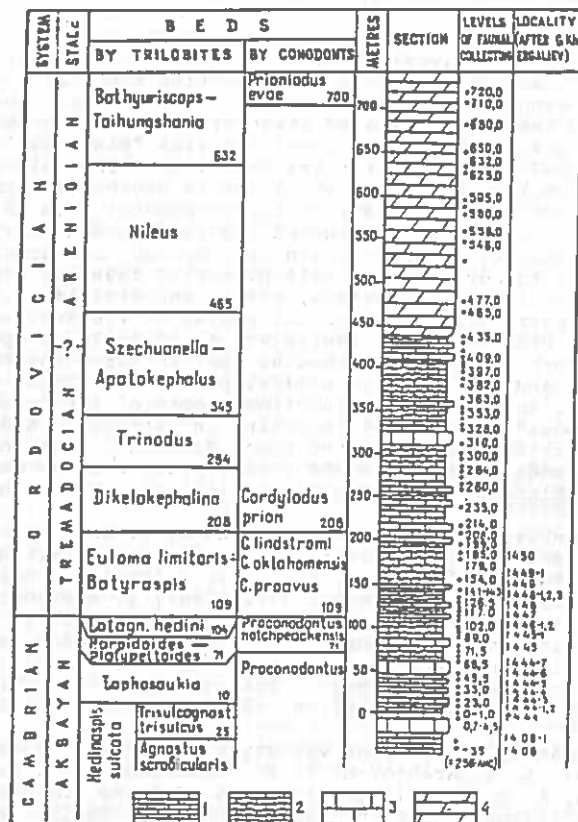


Fig B-11 Stratigraphic column of the Upper Cambrian-Lower Ordovician section in the Batzbov ravine. 1 - dark line- and microgranular parallel-bedded thin-laggy limestones; 2 - dark line- and microgranular wave-like bedded thin-laggy limestones; 3 - thick-bedded and massive limestones, 4 - dolomites and dolomitic limestones.

(From Guidebook to 27th IGC Excursion 045A-C)

A. Individuals

N. J. Ancygin
"Uralgeologia"
Vainera 55, Sverdlovsk,
620021, U.S.S.R.

D. Fillon,
Dept of Geology
Univ. of New Brunswick
PO Box 4400, FREDERICTON, N.B.
CANADA E3B 5A3

V. B. Lemos
Fac. de Ciencias nat.
Univ. de Parana
PARANA BRASIL

C. Aramburu
Departamento de estratigrafia
Facultad de Geologia
Universidad de Oviedo
33071 OVIEDO SPAIN

J. C. Garcia-Ramos
c/Matemático Pedrayes 19-8^oA
33005 OVIEDO,
SPAIN

M. Longman
701 Harlan, #E-69
LAKEWOOD, CO. 80214
U.S.A.

S. Aronoff
Dept of Geology
Western Washington University
BELLINGHAM, Washington 98225
U.S.A.

D. D. Hides
Dept of Geological Sciences
Univ. of Southern California
LOS ANGELES, Calif. 90089-0741
U.S.A.

I. McDougall,
Res. School of Earth Sciences
Australian National University
GPO Box 4,
CANBERRA ACT 2601 AUSTRALIA

D. J. Benson
Dept of Geology
University of Alabama
P.O. Box 1945, University
AL 34586 U.S.A.

W. D. Huff
Dept of Geology,
University of Cincinnati
CINCINNATI, OH 45221, U.S.A.

E. A. Measures
Dept of Geology
University of Idaho
823 East A St.,
MOSCOW, Idaho 83843, U.S.A.

R. Buyce,
Geology Dept
Mercyhurst College
Glenwood Hills
ERIE PA 16546 U.S.A.

D. Johnstone
Dept of Earth Sciences
Memorial University
ST. JOHN'S, Newfoundland
A1B 3X5, CANADA

P. P. Misius
Geol. Inst. Akad. Nauk. Kirg. SSR
Dzerzhinskogo 30
Frunze, 420040, USSR

C. Cingolani
Fac. de Ciencias nat. y Mus.
Paseo del Bosque
La Plata (B. Aires)
ARGENTINA

A. V. Kanygin
Inst. Geol. Geophysics
Siberian branch Akad. Sci.
NOVOSIBIRSK 630090 USSR

I. F. Nikitin
Geological Institute
Akad. Sci. Kazakh SSR
Kalinina 69-a
Alma Ata 480100, USSR

M. Coniglio
Dept of Earth Sciences
Memorial University
ST. JOHN'S, Newfoundland,
A1B 3X5 CANADA

D. J. Kennedy
Dept of Geological Sciences
Brock University
ST. CATHERINES, Ont.
L2S 3A1, CANADA

F. Nullo
Geological Survey
BUENOS AIRES
Argentina

P. Dravage
Geology Dept
University of Cincinnati
CINCINNATI OHIO 45221 USA

A. I. Kim
Tashkent Geol. Corp.
Ministry of Geol., Uzbek SSR
ul. T. Shevchenko 11
TASHKENT 700000, USSR

I. G. Percival
Esso Australia Ltd.
G.P.O. Box 4047,
SYDNEY, NSW 2001, AUSTRALIA

M. Droser
Dept of Geological Sciences
Univ. of Southern California
LOS ANGELES Calif. 90089-0741
U.S.A.

D. R. Kobluk
Earth & Planetary Science
Erindale Campus, Univ. Toronto
MISSISSAUGA, Ont. L5L 1C6
CANADA

S. Pohler,
Dept of Earth Sciences
Memorial University
ST JOHN'S, Newfoundland
A1B 3X5 CANADA

G. Kh. Ergaliev
Geol. Institute
Akad Sci. Kazakh SSR
Kalinina 69^a
Alma-Ata, 480100 USSR.

P. D. Kruse
N.T. Geological Survey
G.P.O. Box 2901
DARWIN, N.T. 5794, AUSTRALIA

L. E. Popov
VSEGEI
Sredni prospekt 74
LENINGRAD 199026 USSR

J. A. Reinemund
U.S. Geological Survey
National Center MS 917
RESTON Virginia 22902 USA

A. V. Rosova
Institute of Geol. & Geophys.
Universitetsky 3,
NOVOSIBIRSK 630090 USSR

Kh. S. Rozman,
Geol.Inst., USSR Acad. Sci.
Pyzhevsky per. 7, 109017
MOSCOW. USSR

S. F. Rudine
Dept of Geology
Box 6612, Sul Ross State Univ.
ALPINE. TX 79832. USA

B. Institutions

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Memorial University
ST. JOHN'S, Newfoundland
A1B 3X5, CANADA

G. A. Stukalina
VSEGEI
Sredni Prospekt 74
LENINGRAD 199026 USSR

D. Valenico
Depto Ciencias Geologicas
Fac. de Ciencias Exact. y Nat.
Pabellón 2-Ciudad Universitaria
BUENOS AIRES. ARGENTINA

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A1B 3X5 CANADA

H. Williams
Dept of Earth Sciences
Memorial University
ST. JOHN'S, Newfoundland
A1B 3X5 CANADA

Xiang Liwen
Inst. of Geology
Chinese Acad. Geological Sci.
Baiwanzhuang Rd.
BEIJING. P.R. China

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Dept of Marine Geology
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CURRENT RESEARCH OF ORDOVICIAN SPECIALISTS (additional to those included in ORDOVICIAN NEWS No 2)

BRITISH ISLES

G. Kelling, Keele, Staffs: Sedimentology of Ordovician-Silurian sequences in South Scotland and Central Wales.

SPAIN

C. Aramburu and J. C. Garcia-Ramos, Oviedo: Sedimentology of clastic sequences in Cambro-Ordovician of the Cantabrian Mountains (N. Spain)

SOVIET UNION

A. V. Rosova, Novosibirsk: Lower-Middle Ordovician trilobites of the Salair.

G. A. Stukalina, Leningrad: Ordovician echinoderm faunas of the U.S.S.R.

UNITED STATES

D. J. Benson, University, AL: Facies analysis and palaeogeography of the Lower-Middle Ordovician of Alabama, and diagenesis of Middle Ordovician carbonates of the southern Appalachians.

P. Dravage, Cincinnati, OH: Palaeoecology of some Upper Ordovician edrioasteroids.

R. H. Flower, Socorro, NM: Early Palaeozoic Nautiloidea of the United States, Scotland, Spitzbergen Baltic region, Bolivia and Australia; monographs of the Endoceratida and Tarphyceratida (including the former Barrandeoceratida); cephalopods in stratigraphy and climates; colonial Ordovician corals.

W. D. Huff, Cincinnati, OH: Regional studies of Middle Ordovician K-bentonites in the eastern midcontinent region of North America, and of (with A. Spears, Univ. of Sheffield, U.K.) K-bentonites in the British Ordovician type sections.

F. C. Shaw, Dobbs Ferry, NY: Lower Palaeozoic trilobites of Ladakh and Kashmir (with V. J. Gupta), and Ordovician trilobite systematics of the Mingan Formation, Quebec.

AUSTRALIA

C. Burrett, Hobart: Lower Palaeozoic geology of S.E. Asia, Australia (mainly Tasmania), and Antarctica. Carbonate sedimentology, palaeoenvironments, biogeography and conodonts. Tectonic reconstruction of Palaeozoic palaeoclimatology and palaeoceanography. Ordovician phosphatic problematica and fish. Ordovician palaeomagnetism.

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- Contains (i) 'Geological outline of Kazakhstan' by A. A. Abdulin and A. E. Shlygin (pp. 7-19).
and (ii) 'Excursion 045A - Geology and Phosphorite deposits in Maly Karatau Ridge' by A. A. Abdulin, M. A. Chimbulatov, G. Kh. Ergaliev, F. Ya. Valeev, V. V. Ovhinnikov, M. A. Kasymov, K. T. Kosanov, G. V. Strakhov, A. N. Nesipbaev, M. K. Apollonov, M. N. Chugaeva and S. V. Dubinina.
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- Contains (i) 'A Review of the Geology of the Estonian SSR' by D. Kaljo and E. Mustjõgi (pp. 5-22).
and (ii) 'Excursion 028 - Geology and Mineral Deposits of the Lower Palaeozoic of the Eastern Baltic Area', by E. Pirrus, L. Põlma, S. Mägi, E. Mustjõgi, L. Hints, O. Morozov, J. Nõlvak
- Stratigraphy and Palaeontology of Systemic Boundaries in China - Ordovician-Silurian Boundary (1). 18 contributions by 20 authors; 518 pages, 79 plates; English edition 1984. (Price U.S. \$35 from Nanjing Inst. of Geology and Palaeontology, Academia Sinica, Chi-ming-Ssu, Nanjing, People's Republic of China).

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ANNOUNCEMENTS

ORDOVICIAN TRILOBITES OF ARGENTINA

H. J. HARRINGTON & A. F. LEANZA, 1957
 UNIVERSITY OF KANSAS SPECIAL PUBLICATION NUMBER 1
 UNIVERSITY OF KANSAS PRESS, 276 pp.

Research workers concerned with trilobites and Ordovician stratigraphy will be pleased to learn that this classic monograph might soon be available again after many years out of print.

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 Pearl House, Bartholomew Street,
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PALEOZOIC GEOLOGY OF ALASKA AND NORTHWESTERN CANADA NEWSLETTER

Issue Number 1 of this very useful newsletter is dated May 1984, and 43 pages in length. The Editor is Robert B. Blodgett of the Dept of Geology, Oregon State University, Corvallis, Oregon 97331, U.S.A. The Newsletter is sponsored by the Alaskan Geological Society (P.O. Box 101228, Anchorage, Alaska 99510, U.S.A.). Robert Blodgett hopes that the Newsletter will appear on an annual basis - the next issue early in 1985. Issue Number 1 includes numerous references to Ordovician sequences and faunas.

Symposium: SHALLOW TETHYS - 2

To be held from 15-17 September 1986, at the Riverina-Murray Institute of Higher Education, Wagga Wagga, Australia.

It will include a Palaeozoic session with speakers including A. J. Boucot reviewing the Tethyan concept during the Palaeozoic.

Dates have been arranged so that overseas participants at the World Sedimentological Congress in Canberra in late August 1986 can also attend this symposium.

Contact Dr. K. G. McKenzie,
School of Applied Science,
Riverina-Murray Institute of Higher Education
Wagga Wagga, N.S.W. 2650, Australia

for further details.