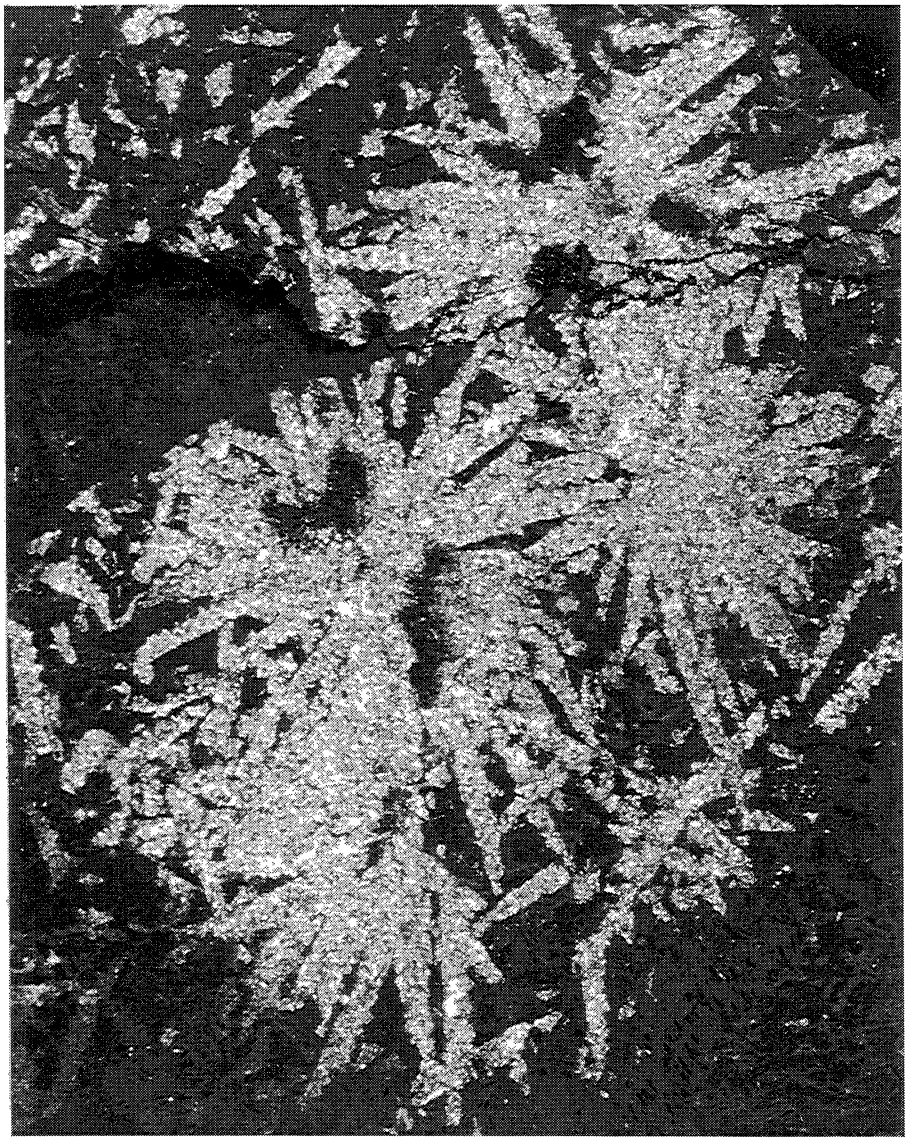
SILURIAN TIMES

No. 5 January 1997

A NEWSLETTER OF THE SILURIAN SUBCOMMISSION



SUBCOMMISSION ON SILURIAN STRATIGRAPHY

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INTERNATIONAL UNION OF GEOLOGICAL SCIENCES

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COVER PICTURE: Synrhabdosomes of the late Wenlock graptolite *Colonograptus deubeli* (Jaeger) from the northwestern Hesperian Massif, northwestern Spain. (x3). (Courtesy of Juan Carlos Gutiérrez-Marco, Madrid, Spain)

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EDITORIAL

Happy New Year and welcome to Silurian Times #5! This is my second newsletter, and while producing the newsletter requires considerable time and effort, I rather enjoy the task, since it permits me to learn what at least some of the Silurian workers are doing worldwide. Perhaps I might even be the only person who reads the newsletter from cover to cover??

This year something novel has been included in the newsletter; that is, the revised and now-official "Guidelines for the Establishment of Global Chronostratigraphic Standards by the International Commission on Stratigraphy". This was sent to me by Dr. J. Remane, Chairman of the International Commission on Stratigraphy as an effort to publicize the Guidelines as much as possible and because (to quote part of Dr. Remane's letter) "SSS is a good deal in advance with regard to other Subcommissions of ICS". I feel it is worthwhile for all to be aware of, and to see the Guidelines.

This year Silurian Times is being produced and mailed without any input from my personal research grant (unlike last year), thanks once again to some financial support from my own department and its chairman, and to voluntary contributions made by many participants at the James Hall Symposium. It was agreed at the Symposium, following the suggestion of Markes Johnson, that participants contribute US$10.00 (for two years) to offset the costs of the newsletter production and mailing. I thank those who contributed and would, needless to say, be happy to receive contributions from others!

Information for the newsletter was compiled from regular mail, faxes and email. I especially appreciate email submissions since they are easily downloaded and relieve me of retyping.

Finally, please continue informing me of activities, address changes and, of course, of email addresses.

A.C. Lenz

NOTES TO CONTRIBUTORS

Contributions should be in English, typed single-spaced, and sent by mail, fax, email, or computer disk (Word for Windows, Wordperfect, ASCII: IBM type computer) to:

Dr. Alfred C. Lenz
Department of Earth Sciences
University of Wester n Ontario
London, ON
CANADA N6A 5B7

Phone: 519 661 3195
Fax: 519 661 3198
email: aclenz@julian.uwo.ca

Requests for information for Silurian Times #6 will be sent out in early November, 1997.

ANNUAL REPORT OF THE SUBCOMMISSION ON SILURIAN STRATIGRAPHY (SSS) OF THE INTERNATIONAL COMMISSION ON STRATIGRAPHY FOR 1996

(Submitted by M.E. Johnson)

1. **Title of constituent body**

Subcommission on Silurian Stratigraphy (SSS)

2. **Overall objectives**

a) Elaboration and improvement of the standard global stratigraphical (SGS) scale for the Silurian System, including definition of boundaries and the selection of Global Stratotype Sections and Points (GSSP) under IUGS guidelines.

b) Refinement of international correlation within the Silurian System, with particular emphasis on development of a generalized scheme of zonal fossils (left-hand column) for global applications.

c) Stimulation of research and international cooperation, with particular emphasis on the coordination of working groups focussed on various zonal fossils such as graptolites, conodonts, chitinozoans, etc.

d) Evaluation and integration of new approaches to the correlation of Silurian strata on a global scale.

The Subcommission's assignment to establish GSSPs on a series and stage basis is essentially complete. The final task of subdividing the Pridoli Series into two stages has been indefinitely tabled (see details below) and there are no

immediate prospects to advance this line of inquiry. Foremost among other tasks requiring international attention is the establishment of a generalized left-hand column of biostratigraphic zones which may be applied to the development of correlation charts with global coverage. A graptolite working group was activated in 1994 and other study groups are coming on line. In order to better integrate our biostratigraphic correlations, we are particularly anxious to foster a closer working relationship among specialists studying different groups, such as the graptolites, conodonts, and Chitinozoa.

A variety of auxiliary approaches to the correlation of Silurian strata need to be tested and evaluated with regard to their global significance. Eustatic sea-level fluctuations and climatic cycles are among the possible patterns to be systematically researched in our ongoing program to produce global correlation charts. Another important theme is the relationship between stratigraphy and paleogeography. These issues were highlighted during the 2nd International Symposium on the Silurian System, which coincided with the recent biennial meeting of the SSS this year (August 4-10, 1996).

3. **Organization**

The SSS is a subcommission of the Commission on Stratigraphy, consisting of 15 Voting and 48 Corresponding members. Voting members are selected to achieve regional representation and a balanced stratigraphic expertise. Corresponding membership is open to all individuals demonstrating a commitment to scholarship in Silurian stratigraphy.

Officers:

Chairman: M.E. Johnson (Dept. of Geosciences, Williams College, Williamstown, Massachusetts, 01267 USA).

Secretary: A.C. Lenz (Dept. of Earth Sciences, University of Western Ontario, London, Ontario N6A 5B7, Canada).

Contact with Subcommission on Geochronology: L.R.M. Cocks (British Museum of Natural History, London, United Kingdom).

The SSS Treasury is maintained as a separate organizational account at Williams College.

4. **Extent of national/regional/global support of projects**

Membership in the SSS is represented by specialists from 28 countries and from all continents except Antarctica. Most of the major regions of the world with extensive exposures of Silurian strata are covered, especially Eurasia, North America, South America, and Australia.

The recently concluded 2nd International Symposium on the Silurian System (convened in Rochester, N.Y. under primary sponsorship of the SSS) enjoyed significant financial support in the amount of $15,650 USD from educational institutions, private science foundations, and corporate sponsors. Substantial national-based support was contributed for previous SSS field meetings in Austria (1994), the Czech Republic (1992), Estonia (1990), Australia (1986), the Ukraine (1983), Norway (1982), Canada (1981), and the United Kingdom (1979, 1989).

5. **Interface with other international projects**

Due to the significant occurrence of thelodonts in Silurian strata, members of the SSS have participated in IGCP Project No. 328 (Paleozoic Microvertebrate Fossils). That project is now superseded by IGCP 406 (Circum-Arctic Lower-Middle Palaeozoic Vertebrate Palaeontology and Biostratigraphy" -which is scheduled to run from 1996-2000. SSS member, Tiiu Marss (Estonia) is a co-leader of the project. Other SSS members are very active in the IPA international research groups on graptolites and conodonts.

6. **Accomplishments and products generated in 1996**

With a press run of 192 mailings, the fourth issue of "Silurian Times" -the official newsletter of the Silurian Subcommission (edited by Secretary Alf Lenz) -was circulated in January 1995 to all subcommission members as well as a broad constituency of Silurian researchers around the world. This issue featured information on registration for the 2nd International Symposium on the Silurian System. That conference (also known as the James Hall Meeting) was convened in Rochester, N.Y. on August 4, 1996. All registered participants received a 116 page program that included a set of 84 abstracts. A 230 page guidebook entitled "Sedimentary Environments of Silurian Taconia" was published as University of Tennessee Department of Geological Sciences Studies in Geology 26 (edited by Thomas W. Broadhead) for the pre-conference field trip through the Silurian of the Appalachian Basin.

The initial report of the task force on "High-resolution Silurian Graptolite Zonation" led by Tatyana Koren was republished in Lethaia (vol. 29, pp. 59-60) under the title: "Generalized graptolite zonal sequence defining Silurian time intervals for global paleogeographic studies." This report includes a chart with 27 zonal intervals for the Silurian.

7. **Chief problems encountered in 1996**

The biennial meeting of the SSS occurred during the James Hall Meeting in Rochester, N.Y. on August 5, 1996. A proposal represented by Jiri Kriz from the Czech Republic on subdivision of the Pridoli Series into two stages (based primarily on the graptolite bouceki Biozone) was discussed and tabled. As this has been the only credible proposal to

emerge during the last four years and no other competing proposals are expected in the near future, the issue is indefinitely postponed pending new global research.

8. **Work plan for 1997**

a) Publication of two volumes based on presentations at the James Hall Meeting. All manuscripts for the 1st volume entitled "Silurian Cycles: Linkages of Dynamic Processes in Atmosphere and Oceans" will be in hand by January 1, 1997. Over 20 possible submissions are anticipated, mainly based on poster presentations at the James Hall Meeting. All manuscripts for the 2nd volume entitled "Silurian Lands and Shelf Margins" are due on March 31, 1997. Twenty possible submissions are anticipated, based on the keynote presentations at the James Hall Meeting. The New York Geological Survey will sponsor publication through the New York State Museum.

b) Publication under SSS sponsorship of a volume on "Correlation Chart and Biostratigraphy of the Silurian Rocks of Canada" -submitted by corresponding member Brian S. Norford.

c) Production of the fifth issue of "Silurian Times."

d) Organization for the next biennial field conference in Spain.

9. **Potential funding sources outside IUGS**

A publication fund, based on revenues raised for the James Hall Meeting, is established. These funds will be released to the New York Geological Survey in order to cover initial editing costs of the symposium volumes. Other potential funds through the New York State Museum may facilitate publication based on anticipated reimbursement from sales of the symposium volumes. Other sources for publication of the Canadian correlation chart are under investigation.

10. **Anticipated work plan for 1998-1999**

1998: Final preparations for the next biennial field conference, expected to be held in Spain in conjunction with an international graptolite conference.

Continued work by the task force on "High-resolution Silurian Graptolite Zonation" led by Tatyana Koren.

Annual production of "Silurian Times."

1999: Advance work on the 3rd International Symposium on the Silurian System by the Australian organizing committee for a conference in Queensland on "Silurian climate change" in the year 2000.

11. **Financial statement for 1995**

a) Income (U.S. dollars)

1. Carryover from 1994	$ 0.00
2. 1995 ICS subvention	1,150.00
Total operating funds	1,150.00

b) Expenditures

1. Registration fees for James Hall Meeting		760.00
2. Postage	390.00	
Total expenditures	1,150.00	
Net balance at the end of 1996	$ zero	

12. **Budget for 1995**

Subvention toward production and mailing of newsletter $500.00

ALLOTMENT REQUESTED FROM ICS FOR 1997 - $500

M.E. Johnson

CHAIRMAN'S CORNER

Looking back on those hectic months leading up to the James Hall Meeting and the intense preparations it entailed for organizers and participants alike, it is a wonder to me that life could return to normal after August 10, 1996.

As the symposium grew ever closer and there remained always more tasks to be done, it seemed there was no time for tomorrow. Now, of course, new deadlines loom on the horizon. My highest priority during the next two years will be to bring the James Hall Symposium volumes to publication through our partner, the New York Geological Survey. We fully anticipate the publication of two separate volumes. The first to appear will be the volume on "Silurian Cycles: Linkages of Dynamic Processes in Atmospheres and Oceans" -based on papers resulting from the posters presented at Rochester. This will be followed by a volume on "Silurian Lands and Shelf Margins" -based on papers from the keynote presentations on Silurian geography. With any luck at all, the first volume may appear in late 1997 and the other in 1998.

For the moment, however, there is time enough to relish a sense of accomplishment in all that the symposium achieved. My greatest satisfaction was derived from watching an infusion of new faces brought together to mix with our membership and exchange fresh insights on old Silurian problems. Carl Brett and I certainly want to thank all of you who took the time to write to us after the meeting to express your enthusiasm over the program and the stimulation it encouraged.

The effectiveness of the symposium will only be evident to the outside world once our volumes are edited and published. When I look at some of the textbooks now in the hands of introductory level historical-geology students and advanced stratigraphy students, I find that it is high time for the Silurian System to earn better coverage. Take, for example, the inadequate expression of Silurian eustasy. Historical geology textbooks, such as those by Stanley (1993, p. 270) or Wicander and Monroe (1993, p. 314) and stratigraphy textbooks, such as that by Prothero and Schwab (1996, p. B3) show the eustatic curves derived from the work of Peter Vail and others associated with sequence stratigraphy. Vail's work during the 1970s was largely based on Exxon's exploration of the continental shelves (where Paleozoic strata are negligible). Textbooks tend to gloss over the Silurian story as a single, prolonged marine onlap post-dating the Ordovician glaciations. Such treatment makes the Silurian world appear bland and uneventful.

Shortly after the James Hall Meeting, I had the leisure to browse the September issue of Geotimes and find an article by Richard A. Kerr (1996) on academia's growing confirmation of the "ancient sea-level swings" proclaimed by Exxon. The essence of Kerr's report is that "even some early doubters are now won over." It seems that eustasy, once more, is respectable. But the Exxon people never really tried to detail the Paleozoic story (publicly, at least) at the level of 3rd order cycles. As we know from the symposium workshop on Silurian cycles, there were many complex interactions, both physical and biological, which conspired to make Silurian stratigraphic cycles a fascinating window on the past. The concept of Silurian eustasy is rapidly expanding with a plethora of data on Brazilian glaciations, isotope studies, extinction patterns, recurrent ironstones, and the extent of drowned coastal paleotopographies. I look forward to seeing this mass of data refined and correlated in a well designed research volume. We might then expect to see some of the fascinating stories recorded by Silurian cycles find their way into the textbooks. New members will be attracted to our organization, only if the next generation of students perceives the Silurian as an archive of exciting research possibilities.

References cited:

Kerr, R.A., 1996. Ancient sea-level swings confirmed. Geotimes. vol. 41, p. 9-11.
Prothero, D.R. and Schwab, F., 1996. Sedimentary Geology. W.H. Freeman & Co., New York, 575 p.
Stanley, S.M., 1993. Exploring Earth and Life through Time. W.H. Freeman & Co., New York, 538 p.
Wicander, R. and Monroe, J.S., 1993. Historical Geology, Evolution of the Earth and Life through Time (2nd edition). West Publishing Co., Minneapolis/St. Paul, 640 p.

MINUTES OF THE MEETING OF THE SSS, UNIVERSITY OF ROCHESTER, AUGUST 5, 1996

In chair: Markes Johnson, Chairman of SSS; recording secretary: Alfred Lenz

Membership

1. Titular Membership: Mario Caputo, Brazil, introduced as new member. He was welcomed unanimously.
Resignation of Godfrey Nowlan, Canada, and Charles Holland, Ireland, from titular membership was announced. (Charles remains as a Corresponding Member).
2. Titular membership numbers: will remain at 15
3. Leadership: Because of the lateness in the year, it is too late by ICS rules to have an election/nomination. Markes Johnson will, therefore, remain chairman; Alfred Lenz remains secretary.

Future of SSS

There had been some discussion in the ICS about the possibility of discontinuing SSS. Voting members had been canvassed and voted unanimously that it should continue. Michael Bassett, first vice-president of ICS, discussed the matter with R. Brett in Neuchâtel. IUGS has now backed off and has accepted the idea that conferences such as this are valuable.

Note: The Ordovician Subcommission has suggesed linking their group to an official IGC project to assure their continuance and to tap IGCP funds. Question: should SSS propose an IGCP project?? (*See* report from Tania Koren, below)

Silurian Times newsletter- It was agreed that the newsletter is an very valuable medium of information exchange. It was agreed therefore that there be a voluntary contribution of $5.00 US per person per year to partially offset the cost of

the newsletter printing and mailing. It was agreed that the money be given in person to A. Lenz, or mailed to him. (A. Lenz was/is happy to receive further contributions!!).

Projects and publications

1. Editing and publication of the proceedings of the Rochester conference is to be vigorously pursued by Markes Johnson who will act as editor, and to whom all manuscripts should be sent. He anticipates publication of possibly two volumes, and hopes to have them published within two years.
2. High resolution graptolite biozonal biostratigraphy- Tania Koren commented on this that the next issue of Lethaia should carry the complete paper on the generalized biozonal scheme. Some discussion arose from Lech Teller and Adam Urbanek, suggesting the scheme was not adequate, especially in the upper Ludlow and Pridoli, and that some authors were employing it as a standard, rather than generalized biozonal scheme. Tania agreed that the latter word must be consistently used in the publication of the Proceedings, and M. Johnson agreed.
3. "Silurian of Canada"- Brian Norford commented briefly on the project and noted it is essentially ready for publication. He raised the question of whether it should be published as a Geological Survey of Canada publication, or whether as an IUGS publication. Mike Bassett suggested the IUGS route; this was accepted unanimously. Markes Johnson will discuss publishing of the "Silurian of Canada" with the IUGS publication secretary.

Future meetings

1. **Iberia**: J.M. Piçarra, on behalf of the field conference chairman J.C. Gutiérrez-Marco, presented a proposed program and itinerary for a field conference in June, 1998. The proposed itinerary comprised 4 days in the Ossa Morena region, 2 days of meetings/talks in Madrid, and 3 days in the Western Iberian Cordillera. Comments and questions suggested that the field trips were too graptolite-oriented, and that to attract other workers, they would require examination of other litho- and biofacies. Piçarrra agreed to take the suggestions and concerns back to Gutiérrez-Marco who will revise the itinerary. The field conference organizers will be given a free hand on the content and time of the field conference, and the updated itinerary will be published in Silurian Times #5 (*See below).*
2. **Siberia**: Evgeny Yolkin suggested the possibility of a field conference in Siberia possibly in 2000, including an examination of Ashgill to Wenlock graptolites and shelly fossils in the Central Altai and Salair Mountains. Duration of the field trip would be about 2 weeks. Consideration was being given to the possibility of joint field meeting with the Subcommission on Devonian Stratigraphy. The general consensus of our meeting group was that the trip might best be delayed for a somewhat later date.
3. **Australia**: Jack Jell (supported by John Talent) proposed a Silurian Symposium in Australia, for probably August, 2000. Possible themes of the symposium might include the use of fossil and paleomagnetic analyses, and of biogeography and biofacies studies in the understanding of the positions of continental and subcontinental blocks, as well as climate change through the Silurian. Suggested field trips would be in northern New South Wales and the Broken River area, northern Queensland, with meetings and talks to take place on Heron Island (part of barrier reef complex). This proposal was enthusiastically accepted, and further information is to appear in the newsletter.

Pridoli Series

Re: proposal of Jírí Kríz and colleagues that the Pridoli be divided in to two parts, the upper part being recognized by the base of the bouceki- transgrediens biozonal interval. There were two possibilities: go ahead with a postal ballot to vote on the proposal, or to table the proposal. Lively discussion followed, some involving the suggestion that the division was too crude and that the bouceki Biozone could be globally recognized (most agreed this was not possible), and that the Series was too short already. It was agreed by the large majority that the proposal be tabled and that, therefore, the Pridoli remains undivided for the time being.

Corresponding members

Jiri Kriz nominated Annalisa Ferreti, Italy, as corresponding member- carried
Dim Kaljo nominated Rein Einasto, Estonia, as corresponding member- carried
Brian Norford was accidentally left off the list of corresponding members. His position was reconfirmed.

New business

1. Peter Sheehan, USA, suggested the possibility of using electronic mail, particulary world-wide-web for exchange of ideas, news, requests and, even illustration of fossils. He is looking into the possibility of setting up such a web page at the Milwaukee Museum. Expect more information from him in the future.
2. Mark Harris, USA, commented that Silurian biostratigaphy and correlations are in good shape. He feels, however, that more stress should now laid on sequence stratigraphy, tectonic timing, sedimentology and paleoclimatology, as media for continuing progress in understanding Silurian earth history. *(Editor's comment*: In other words, he proposes a more holistic approach!)

Voting members present at the meeting:

Caputo, Cocks, Hänsch, Jell, Johnson, Kaljo, Koren, Kríz, Lenz, Teller.

JAMES HALL SYMPOSIUM (SECOND INTERNATIONAL SYMPOSIUM ON THE SILURIAN SYSTEM) (Summarized by A. Lenz)

The James Hall Symposium, appropriately named after the pioneering New York State geologist James Hall, was held at the University of Rochester, August 4-9. The theme o f the symposium was 'Silurian Cycles'.

The symposium, attended by participants from 16 countries, began on Sunday with a poster display, mainly devoted to Silurian cycles. Talks commenced Monday and ended on Friday afternoon, and took place during some of the hottest weather of the summer. The talks were interspersed by an all-day field trip culminating at the Niagara Falls, on Tuesday, and by a late, rainy Thursday afternoon trip to see the local Rochester sections. The former trip examined Silurian rock units and facies along the route, and ended at the Niagara River where for most non-North Americans (as well as some North Americans), the highlight of the trip was seeing the Niagara Gorge, Whirlpool Rapids and, finally, the Falls.

The hour-long keynote talks were begun, fittingly, by a lecture on James Hall and his contribution to the geosynclinal concept (Dott). This was followed by a series of regional paleogeography lectures on Avalonia (Cocks), Baltica (Bassett and Kaljo), Northern Gondwana and Perunica (Kríz et al.), Kazakhstan (Koren et al.), East Siberia (Tesakov et al.), Altai and Tuva (Yolkin et al.), Australia (Talent et al.), North Africa (Legrand), South America (Caputo), and Indian Subcontinent (Talent and Bhargava). A separate series of talks on Laurentia comprised Maine and Maritime Canada (Roy), Anticost Island (Long), Arctic Canada (de Freitas), western North America (Sheehan et al.), mid-continent North America (Barrick), Ozark area, and Kansas and Iowa (Witzke), western Great Lakes (Mikulic et al.), and Cincinnati Arch area (Andrews and Ettensohn). The key note talks were rounded up by an excellent talk on Silurian plant evolution.

Keynote talks were interspersed with short talks on reef stromatolites, algae and stromatoporoids (8 talks), recovery from Ordovician extinction (5 papers), a graptolite-dominated series on graptolites, Chitinozoa and acritarchs (9 papers), and palynology, conodonts, fish and paleoecology (6 papers).

Carlton Brett, University of Rochester, was the chief organizer for the conference. He, assisted by a small group of very dedicated volunteers, ran a very fine show. Carl is to be congratulated for his fine and efficient organization, his tireless efforts and, above all, for his boundless enthusiasm, all of which made this a very successful Silurian symposium!

JAMES HALL SYMPOSIUM POST-MEETING FIELD CONFERENCE REPORT (submitted by Joanne Kluessendorf and Don Mikulic)

The post-meeting field conference of the James Hall Symposium organized and led by Donald Mikulic (Illinois State Geological Survey) and Joanne Kluessendorf (University of Illinois) was a great success. The weather was outstanding and everyone enjoyed the geology and each other's company. In ten days the participants travelled 4000 km across the carbonate platform of the central U. S. to explore more than 50 Silurian localities. An additional thirty individuals joined the trip for one or more stops along the way. Many of the localities visited were selected for their historical importance in Silurian studies, others for their contribution to new ideas about Silurian sequence stratigraphy and biostratigraphy. Among the highlights were the abundantly fossiliferous Waldron Shale in Indiana, the famous Thornton Reef in Illinois, and the Waukesha soft-bodied locality and scenic Niagara Escarpment along the Lake Michigan shore in Wisconsin. A comprehensive guidebook for the region is being produced.

The diverse geological experience of the field conference participants provided much insight, global comparisons were made, and lively discussions of the geology took place. Participants were: Anna Antoshkina (Russian Academy of Sciences), Rein Einasto (Estonian Academy of Sciences), David Loydell (University of Portsmouth), Stuart McKerrow (Oxford University), Tingshan Zhang (China Southwest Petroleum Institute), and Anna Kozlowska-Dawidziuk, Lech Teller & Adam Urbanek (Polish Academy of Sciences). Rod Norby and Zak Lasemi of the Illinois State Geological Survey provided able assistance on the trip.

The post-meeting field conference was made possible primarily by contributions from the aggregate industry in Illinois, Indiana and Wisconsin, and the generosity of the following contributors is gratefully acknowledged: Prairie Materials Co., Lannon Stone Products Inc., Halquist Stone Co., Vulcan Materials Co., Martin-Marietta Inc., Western Lime & Cement Co., S.E. Johnson/Stoneco Inc., the Society of Mining Engineers, and Raimonde Drilling Co. The Illinois State Geological Survey kindly provided vehicles for the excursion.

SILURIAN SUBCOMMISSION FIELD MEETING and SIXTH INTERNATIONAL GRAPTOLITE CONFERENCE, SPAIN AND PORTUGAL, (planned for June 1998)

(Submitted by Juan Carlos Gutiérrez-Marco)

The proposed Field Meeting of the Silurian Subcommittee (**June 15-18, 1998**) is to be held in southwestern Iberian Peninsula (Spain and Portugal), in conjunction with the Sixth International Graptolite Conference (**Madrid, Spain, June 19-24**), and the European Conodont Symposium (**Bologna and Modena, Spain, June 24-26**).

The Iberian Peninsula contains the most extensive outcrops of Silurian rocks in Europe, mostly representative of shallow-water deposits of the north-African type of the Gondwanan innershelf, but includes areas covered by deeper, outershelf facies of Mediterranean character, where the Silurian succession shows an especially complete biostratigraphic record very useful for international correlation. The absence of classic studies of the Iberian Silurian has resulted in a general lack of information about this large part of southwestern Europe, being almost unknown among Silurian specialists. The purpose of the meeting is to offer to members of the Silurian Subcommission a first exposure to some of the most complete sections of this System in southwestern Spain and southeastern Portugal, outcropping within the so-called Ossa Morena Zone of the Hesperian Masssif, and forming a large part of the Variscan Orogen in Iberia. In addition, the field trip will be available and of interest to, participants of the Sixth International Graptolite Conference, as a pre-conference trip.

Responsibilities for the organization of the Field Meeting will be in the hands of SSS Corresponding Member José Manuel PIÇARRA (Beja, Portugal), and Juan Carlos GUTIÉRREZ-MARCO (Madrid, Spain). Others involved in the organizing committee will be Michel Robardet (Rennes, France), Petr Storch (Prague, Czech Republic), Alfred Lenz (London, Canada), Isabel Rábano (Madrid), Graciel Sarmiento (Madrid), and Tomás Oliveira (Lisbon, Portugal).

The program for the meeting includes a technical session in Madrid for the presentation of recent advances in Silurian research, as well as 3 days of field work in selected Spanish and Portuguese sections with a rich biostratigraphic record (mainly graptolites, but also molluiscs and conodonts which are common in some levels). Additionally, the possibiltiy for visiting an exceptionally continuous Central Iberian shallower-water Silurian succession will be available on a one-day trip on June 22, in coordination with the activities of the Graptolite Conference.

All of the activities for the meeting begin and end in Madrid. The registration fee will include the Abstracts volume and the excursion guidebook, travel costs (main travel by bus, but also travel by high-speed train, Madrid to Sevilla on June 16), and meals and accomodations both in Spain and Portugal during the meeting. Extra nights in Madrid, immediately before and after the meeting will also be provided to the participants. An estimated cost is difficult to predict now, but based on places contacted so far, prices including <u>all</u> meals, drink, and accomodation, should range between 6500 and 8000 pesetas per person per day (or the equivalent in Portuguese escudos). These costs convert to 52-64 US dollars per day, depending on the exchange rate in 1998.

The preliminary schedule for the meeting is as follows:

Monday, June 15, 1998. Technical sessions of the Silurian Subcommission, including oral and poster presentations, to be held in the historical head office of the Athenaeum of Madrid, or in another interesting place in the city centre. In the early evening, participants will take the high-speed train (AVE) to Sevilla in Andalucia (538 km, 3 hours travel). From there, a bus will transport the group to a refurbished monastery in the mountains near the town of Cazalla de la Sierra, in the heart of the Sierra Norte National Park (within Sierra Morena).

Tuesday, June 16. Start of the joint field trip of the Silurian Subcommission and Graptolite Working Group. Spectacular Lower Silurian to Lower Devonian sections north of El Pintado reservoir (west of Cazalla de la Sierra) with continuous exposure of black, graptolitic shales. Sections include two calcareous intervals with Ludlow and Pridoli condonts and shelly fossils (bivalves, cephalopods, echinoderms, trilobites, ostracodes, brachiopods). More than 18 graptolite biozones can be examined, including those around major crisis boundaries such as the O/S and S/D boundaries. Workers with interest in Upper Ordovician conodonts and micro-brachiopods will also have a special stop.

In our second night at the monastery, we will enjoy a genuine flamenco spectacle, generously provided by the kind people of Cazalla de la Sierra.

Wednesday, June 17. Study of similar Silurian sections in the nearby Cerrón del Hornillo syncline (same facies along roadside exposures), as well as Ashgill limestones (conodonts) overlain by Hirnantian shales, and Lochkovian graptolitic black shales south of El Pintado reservoir. After lunch, travel by bus to visit the early Ordovician Bariga shales near Areceña with Hunnebergian graptolites. In late evening we will reach Moura (Alentejo region, Portugal), where we spend the night, once again within a traditional Portuguese setting.

Thursday, June 18. In the morning, we will study the best Silurian sections in the Barrancos region (Wenlock to Pridoli along roadcuts). After lunching in the very picturesque town of Barrancos, we will spend the afternoon travelling a short distance (139 km) to the 2000 year old city of Mérida (Spain), followed by a 340 km journey to Madrid (entirely by superhighway). End of Silurian Field Trip.

On Friday and Saturday, **June 19 and 20**, the main technical sessions of the **SIXTH INTERNATIONAL GRAPTOLITE CONFERENCE** will be held in Madrid. (theme: **Graptolite Evolution and Extinction:** their relationships with other Paleozoic biotic and enviromental crises, and biochronological applications for high-resolution stratigraphy). After that, we have programmed two different trips to study spectacular Silurian graptolite sections in central Spain (Telychian to Homerian black shales at Calzada de Calatrava: **June 21**), and the Iberian Cordillera (Aeronian to complete Telychian at Checa and El Pobo de Dueñas: **June 23-24**). Monday, **June 22**, will be a day for worksops, demonstrations and a business meeting for the Graptolite Working Group. The first of these trips is also of interest to Silurian conodontologists, and immediately precedes the beginning of the technical sessions of the ECOS in Italy (planned to begin June 24th). A Conference Dinner is planned for Tuesday, **June 23.**

The following Organization Committee for the Sixth International Graptolite Conference is proposed:
J.C. Gutiérrez-Marco (Madrid)--Chairman
S.C. Finney (Long Beach)--Vice-chairman (Past President)
C.E. Mitchell (Buffalo)—Secretary of GWG and newsletter editor
I. Rábano (Madrid)—Secretary of the conference
G.F. Aceñolaza (Tucumán, Argentina)—Secretary of the conference
X. Chen (Nanjing, China)—Demonstrations convenor
B-D. Erdtmann (Berlin, Germany)
T.N. Koren (St. Petersburg, Russia)—Workshops convenor
Ph. Legrand (Grandignan, France)
A.C. Lenz (London, Canada), and J.M. Piçarra (Beja, Portugal)—Pre-conference field trip leaders
R.B. Rickards (Cambridge, UK)—Big G link
P. Storch (Prague, Czech Republic)—Post-conference field trips convenor

WORKING GROUP ON THE ORDOVICIAN GEOLOGY OF BALTOSCANDIA (WOGOGOB)- 1997 (Submitted by Tania Koren)

Time: Mid-August, 1997, St-Petersburg, Russia
First circular:
This is the first call for participation in the WOGOGOB-97 meeting and field excursion in the vicinity of St. Petersburg. It gives general information and aims to estimate the participation of Ordovician workers in this event.

1. Terms

The Vth WOGOGOB meeting is planned to be held in St.Petersburg, All-Russian Geological Institute (VSEGEI) from August, 10 to 16, 1997.

2. Preliminary program

The first two days will be devoted to lectures on the following topics: A. Palaeontology and Biostratigraphy, B. Sedimentology and Sequence Stratigraphy and C. Palaeogeography.

This will be followed by the three or four days within the area of classical Ordovician localities in the neighbourhood of St.-Petersburg (distance from the center of the city 30 to 100 km).

Though this meeting traditionally focusses on the Baltic area, non-Baltic and non-European Ordovician workers are welcome to participate both in the meeting and field excursion. S. Finney and B. Webby have asked that a business meeting of the SOS be scheduled for at least oneevening during the WOGOGOB event in St.-Petersburg.

3. Approximate costs

Because of uncertainties of the economic situation in the country costs will be given in detail closer to the event in the Second Circular (February, 1997). However, we are aiming at an approximate cost of $100US per day including accomodation. To cover administration costs and field trip transportation the registration fee will be approximately $150US. An attempt will be made to make price differentiation between students/nonstudents. Until now no sponsors have been found; any advice concerning sources of financial support would be greatly appreciated.

5. Participation and abstracts

In order to start planning ahead of time, please send the following information:
1. Name and address, including email and fax address. 2. Whether you will, may, or will not give a talk,
3. the tentative title of your talk, and 4. whether on topics A,B, or C.
Deadline for abstracts is May 31, 1997.
Please, return information to:
T. Koren. Email: **tkoren@dronov.usr.pu.ru** Fax: (812) 213 57 38 Phone: (812) 213 95 37 (Institute) (812) 291 41 24 (home)
Address: T. Koren, VSEGEI, Srednii 74,
199026 St.Petersburg, Russia

WORKSHOP and PROPOSED IGC PROJECT (from meeting held at James Hall Symposium)

(Submitted by Tania Koren)
" High-resolution Silurian Graptolite Zonation: refining global correlation", the Subcomission on the Silurian System Project

A workshop of the Graptolite Working Group took place on August, 8 , 1996 during the J. Hall Meeting in Rochester. 12 members were present , among them B. Berry (USA), D. Kaljo (Estonia), T.N.Koren (Russia), A. Kozlowska-Dawidzuk (Poland), Ph. Legrand (France), A.C Lenz,.(Canada), D.K. Loydell (Gt. Britain), M.J.Melchin (Canada), B.S. Norford, J.M.Piccara (Spain), Storch, P.(Czech Republic), Teller, L. and A. Urbanek (Poland), as well as several observers.

The main topic of discussion was the generalized graptolite biozonation (Koren et al., 1996) which has been tested and successfully used for defining Silurian time intervals for global correlation and paleogeographic studies during preparation for the J.Hall Meeting on the Silurian System. Resulting from discussions a consensus was reached by the graptolite workers that we will keep this zonation for the purposes of global correlation of the graptolite and neritic facies until better biostratigraphical precision is attained.

A decision was made to continue our work on the refinement of regional biozonations with a special attention to the stratigraphical ranges of the diagnostic species and definition of zonal boundaries by the first appearance of the index-fossils in the best studied sections around the world. For these purposes it was recommended to establish regional teams for the main Silurian paleocontinents and terranes.

The suggested preliminary working groups are as follows:
Gondwana: Africa (Ph. Legrand), South America (E. Brussa); Australia (J. Talent, R.B. Rickards, and A. Wright), South China (Chen Xu), Peri-Gondwana (P.Storch, J.C. Gutiérrez-Marco, J.M. Piçarra, and A. C. Lenz); Avalonia (D.K. Loydell; M.J. Melchin, J. Maletz, J.A.Zalasiewicz, and S.H. Williams); Laurentia (W.B.N. Berry, S.Finney, A.C. Lenz, M.J. Melchin); Baltica (D. Kaljo, T.N. Koren, J. Paskevicius, L. Teller, A. Urbanek, and A. Kozlowska-Dawidzuk); Siberia and Central Asian terranes (T.N. Koren, N.V. Sennikov, and R.F. Sobolevskaya).

All graptolite workers who have useful biostratigraphic data on regional sequences are welcome to join these teams. Please, send your suggestions to T. Koren.

POTENTIAL IGC PROJECT:

During the workshop, D. Kaljo suggested that the International Graptolite Working Group submit an application in 1997 on a five year IGC Project dealing with high resolution graptolite biostratigraphy for the Silurian System. Following discussion it was then suggested that the project would be better broadened to include other pelagic organisms, such as Chitinozoa and acritarchs. Jacque Verniers (Belgium), who was present at the meeting, will raise the possibility of participating in this application with his palynological colleagues.

T.N. Koren, D.K. Loydell and M.J. Melchin volunteered to prepare a draft of an application for the IGC Project and to circulate it among the members of Graptolite Working Group for comments during the first part of 1997.

Anyone wishing to provide suggestions or contributions to the draft proposal please contact any of the following:
Tatjana Koren
All-Russian Geological Research Institute (VSEGEI)
Sredny pr. 74
199 026 St. Peteresburg, Russia
e-mail: tkoren@dronov.usr.pu.ru

Michael Melchin

Department of Geology
St. Francis Xavier University
P.O. Box 5000
Antigonish, NS, B2G 2W5, Canada
e-mail: mmelchin@stfx.ca

David Loydell
Geology Department,
University of Portsmouth,
Burnaby Building, Burnaby Road,
Portsmouth
PO1 3QL, UK
e-mail: David.Loydell@port.ac.uk

PALAEOBIOGEOGRAPHY OF AUSTRALASIAN FAUNAS AND FLORAS

(NOTICE OF MEETING) (Submitted by Tony Wright, Wollongong, Australia)
FIRST CIRCULAR:
DATES: December 8-11, 1997.
STEERING COMMITTEE: Tony Wright, John Talent, Gavin Young.
VENUE: School of Geosciences, University of Wollongong, New South Wales, Australia.

A conference with the above major theme is planned for the approximate period of Sunday December 7 - Wednesday 11, 1997. As for recent conferences at Macquarie University, this meeting will be run under the auspices of the Association of Australasian Palaeontologists. Because this will be the only AAP-sponsored conference in 1997, papers on other themes (precision in biostratigraphy, perhaps some general sessions) will be appropriate. All interested scientists are cordially invited to attend and submit titles for oral presentation and publication. The rationale behind the conference is the urgent need for a comprehensive monographic publication summarising the changing patterns of biogeographic affinities of various biotas in the Australasian region through geological time.
CONFERENCE FORMAT. Sessions will be organised around a series of themes, with pivotal papers focussing on major aspects or time slices and other papers dealing with associated topics. Depending on the number of contributions, we hope to have as few simultaneous strands as possible.

ACCOMMODATION. Good quality student-style accommodation will be available, and we are optimistic that there will be a special rate for bona fide students. This is within easy walking distance of the on-campus lecture theatres, the University Union, bar, general shop, banks, food outlets and bus transport to the city of Wollongong.

WOLLONGONG. The city of Wollongong, with a population of greater Wollongong is about 183,000, is located about 80 km south of Sydney on a very attractive coastline. The expected December daily maximum is about 25° C, and the prevailing wind is from the NE. Wollongong is easily reached by car, bus and train from Sydney.

CONCURRENT FIELD TRIPS.
1. The Illawarra region is ideally situated for us to offer a short (1-day) field trip, probably during the conference, when attendees can examine typical Permian, shallow marine Shoalhaven Group exposures; rainforest at Minnamurra Falls; and (possibly) present-day rocky coastal communities.
2. We also seek responses from likely attendees as to interest in a longer (approximately 5 days) field trip through the southern Alps of NSW and the Wee Jasper-Taemas-Yass district of NSW, examining, in particular, Silurian-Devonian sequences. In particular we need to know if this should be pre- or post-conference, and what likely interest there would be in such a field trip. Your early response to this inquiry by e-mail will be greatly appreciated.

PUBLICATIONS. The steering committee hopes that publications resulting from this conference (PAFF) will go some way to fill the gap in consolidated published information on biogeography of biotas of the Australasian region. Published results will depend on responses to our requests for submissions, and the reaction to our proposed format.
Two likely modes of publication are envisaged:

Rigby, J.K., Gutiérrez-Marco, J.C., Robardet, M. and Piçarra, J.M. In press. First articulate Silurian sponges known from the Iberian Peninsula (Spain and Portugal). Journal of Paleontology (Submitted).

Rodriguez Canero, R. 1993. Contribution to the study of the Palaeozoic conodonts from the Malaguide Complex (Betic Cordillera). Ph.D. thesis, University of Malaga, 404 pp. (in Spanish, unpubl.).

Sanz Lopez, J. & Sarmiento, G.N. 1995. Conodont assemblages from the Ashgill and Llandovery carbonatic horizons in the Freser Valley (Girona, Pyrenees). In Lopez, G, Obrador, A. and Vicens, E., eds.: Proceedings XI Jornadas de Paleontologia, Tremp, 157-160 (in Spanish).

Sarmiento, G.N., Mendez-Bedia, I., Arbizu, M., Aramburu, C. and Truyols, J. 1994. Lower Silurian conodonts from the Cantabrian Zone, Northern Spain. Geobios 27, 507-522.

Valenzuela Rios, J.I. 1996. Wenlock and Ludlow (Silurian) conodonts from the Tena Valley (Aragonian Pyrenees). Geogaceta 19, 91-93 (In Spanish, with English abstract).

Villas, E. and Cocks, L.R.M. 1996. The first Early Silurian brachiopod fauna from the Iberian Peninsula. Journal of Paleontology 70, 571-588.

2. NEWS FROM SIBERIA (submitted by E.A. Yolkin)

(Editor's note: I have made a large number minor improvements in the English; I hope I was able to retain the intended meaning)

I would like to tell to colleagues what we are trying to do to keep up biostratigraphical studies in Siberia. Financial support of geological researches in the world (including in our country) is not the best, as you know. Most of the paleontological and stratigraphical centers in Siberia are destroyed. The Department of Paleontology and Stratigraphy of our Institute has managed to survive but it has lost many workers. In this situation we find it difficult to carry out joint works inside Department and Institute as well as collaborative studies with colleagues of different Russian Institutes and even with foreign colleagues. Following this way it is easier to get financial support from different Foundations, particularly from RFBR (Russian Foundation for the Basic Researches).

To reach these aims we work together with our regional geologists and accumulate revised biostratigraphical data on electronic devices. We also believe it is important to inform our foreign colleagues about scientific results that could initiate collaborative studies. These guide ideas are realized in: (1) development of a biostratigraphical database as RFBR project Information-research complex (IRC) "BIOCHRON", (2) organizing a special periodical edition "New fossil taxa of Siberia", and (3) participation in a special UNESCO-UIGGM project SIBERGEN - Siberian and Far East Geology and Environment electronic Database of abstracts.

Point (1). This is a large-scale REBR project. Its main goal is to create an electronic system for accumulation and processing of the clarified biostratigraphic data that could be used in current and future studies on regional and global bases. If this work is not done now many data will be lost for ever.

The purpose of the IRC BIOCHRON is as follows: (1) to organize in a common database the paleontological data of global character as a system of the selected fossil groups from species (subspecies) to higher taxonomic levels as well as distribution of these taxa in real Siberian sections, (2) to develop special software enabling a rational "pack" of huge, diverse paleontological and lithological information as well as to give it out by request in a form convenient for the user, (3) to adapt to the created database already developed Data Analysis software and to add it to the new one to solve the problems of biostratigraphy, zonal biochronology, paleoecology and paleobiogeography with elements of geodynamics.

The main components of the IRC are three interconnected systems: TAXON, STRATON and Data Analysis System (DAS) connected by a global menu bar, which is accessible from any mode of operations and permitting an address to additional subsystems.

It is supposed that the complex BIOCHRON will operate in two modes: information and research. The information mode assumes various methods of operative reception, by user request, of necessary information of paleontological, stratigraphical character, as well as reference information for various types of geochronological scales and complete bibliographical information. It is provided by basic systems TAXON and STRATON as well as by additional subsystems accessible from global menu bar.

The research mode will be connected to functioning of the Data Analysis System and is intended for formalization, acceleration and automatic fulfillment of main operations, which the expert makes at analysis of taxonomic diversity of organisms and changes of their associations in time and space, at giving conclusions about age of rocks, biofacial and paleobiogeographical zonation, and other. The system TAXON is a paleontological information system consisting of a series of associated data tables. Each table contains a set of necessary formal and global items of

information (name, author and data of publication, stratigraphical and geographical location, diagnosis, description and other) on any taxon of hierarchical system of chosen fossil groups (for first stage of development of the IRC - conodonts, brachiopods, non-marine bivalvia and graptolites). The photoimages of species holotypes represent scanned photos from different paleontological sources and paleontological objects themselves. Processed then by graphic program COREL-PhotoPaint, they link to the necessary field of table. Data Base Management System (DBMS) ACCESS gives access to object application, where the object file was created. The user can open the object application, make his changes and keep on working. The basic part of the system STRATON is the biostratigraphy database containing the information about stratigraphical subdivisions and objects (formations, members, beds, boreholes, sections), as well as geological analysis of taxonomic diversity of organisms and changes of their associations in time and space, at giving conclusions about age of rocks, biofacial and paleobiogeographical zonation and other problems.

The IRC BIOCHRON is being developed to work in Microsoft Windows 95 (or Windows NT) under management the DBMS Microsoft Access. The graphic information (species images, stratigraphical schemes and other) and bibliographical data (the optical recognition of marks for text data transformation to edited text) are prepared for input in database using the graphic package CorelDraw.

Point (2). We have now more limited possibilities than previously for the publication of regional paleontological monographs. In this situation we intend to organize a new periodical - "New fossil taxa of Siberia", to keep up a flow of new paleontological data. We already have 12 papers for the first issue. In future, our foreign colleagues might publish here their papers that are based on Siberian collections.

Point (3). Our Institute was invited by UNESCO to start (with financial support for the first years) the preparation of a special electronic database of annotated geological literature. It has been done. Below you can find the Editorial Board information.

UIGGM and UNESCO Joint Project
"Siberian and Far East Geology and Environment"
Annotated Bibliographic Database
SIBERGEN

Russian Academy of Sciences, Siberian Branch, United Institute of Geology, Geophysics & Mineralogy - UNESCO

The vast territory of Siberia with its fascinating geological phenomena and rich and varied mineral resources, such as oil, gas, diamonds, gold, and many others, is the subject of extensive geologic investigation. The results of these studies, however, are scattered in various journals, monographs, open-file reports, and other sources, often published only in Russian. Information, thus, remains largely unavailable to the majority of the non-Russian researchers.

To fill this gap, UIGGM and UNESCO have created a searchable annotated Bibliographic Database SIBERGEN. The main purpose of the database is to accumulate professional geological and environmental information about the Siberian region and to make it available to the international scientific community.

Materials to be included in the SIBERGEN Database are carefully selected. Abstracts are prepared by the authors or by our experts and translated into English. Collections of electronic records containing, besides abstracts, detailed bibliographic information appearing as quarterly issues.

Geographic coverage: Siberia, Russian Far East, plus some other regions of Asia (Central Asia, Kazakhstan, Urals, Mongolia, etc.)

Subject coverage:
Geochemistry, Stratigraphy, Mineralogy/Petrology, Geomorphology, Structural Geology/Tectonics, Paleontology/Paleobotany, Sedimentology, Geophysics/Tectonophysics, Igneous Geology, Hydrogeology, Metamorphic Geology, Engineering Geology, Geochronology, Environmental Geology, Petroleum Geology, Natural Hazards, Economic Geology, Permafrost

Time coverage:
monographs - from 1990 onward; journal articles - from 1993 onward; theses; open-file reports - from 1993 onward; maps - from 1985 onward.

Features:

no analogues; more than 2.000 records per year; abstracts and full bibliographic information in English; quarterly updates; coverage of different sources such as books, open-file reports; non-regular publications; journal papers, serial articles, theses, reviews; maps, etc.

Database is searchable; based on the standard UNESCO search system CDS/ISIS/M; photocopies of source articles are available upon request; complete translations into English can be ordered

Coming soon: mid 1997 - version for Windows platform

Addresses:

"SIBERGEN"
UIGGM SB RAS
Universitetsky prosp., 3
Novosibirsk, 630090
RUSSIA
Fax: (3832) 35-26-92
e-mail: **olga@uiggm.nsc.ru-"SIBERGEN"**

"SIBERGEN"
RMCA
Steenweg op Leuven, 13
B-3080 Tervuren
BELGIUM
Fax: 32-2-769-54-32
e-mail: **jklerkx@vub.ac.be**

To get more information, please visit our WWW Homepage at **http://geology.uiggm.nsc.ru/engl/uiggm/cen-bib.htm**

The database is created with the financial support of UNESCO

Media:

Quarterly issues of the database is shipped on diskettes 3.5" 1.44 Mb. Cumulative volume (four quarterly issues in one) can be sent either on diskettes or on compact disk. Standard format is DOS.

Software and Hardware Requirements:

MS DOS 6.0 is required to load and run the database. Suggested minimum hardware is 386 processor running at 25 MHz with 4 megabytes of RAM, 1 diskette drive, hard disk (with at least 2 megabytes free space).

Subscription to the Database SIBERGEN - 1997: with cumulative volume on diskette US$ 300.00, with cumulative volume on compact disk ... US$ (*this figure not supplied*)

Back issue of the Database SIBERGEN - 1996 on diskette US$ 300.00, on compact disk ... US$ (*this figure mot supplied*)

Of course, the subscription cost is rather high. But this is the cost of enlarged abstracts for all indicated sections of 4 issues per year that could be very useful for big Institutions. A subscription for a separate section (or group of sections) could be much less. We intended to include in this edition the abstracts of all paleontological monographs and papers with illustrated fossils since early 60s.

3. CIMP SUBCOMMISSION ON CHITINOZOA (Submitted by Stuart Sutherland)

Following a ballot earlier this year Stuart Sutherland and Esther Asselin were voted Chairman and Secretary of the Chitinozoan Subcommission.

The Silurian Chitinozoan Global Biozonation has now been published:

Verniers, J., Nestor, V., Paris, F., Dufka, P., Sutherland, S.J.E. & Van Grootle, G. 1995. A global Chitinozoa biozonation for the Silurian. Geological Magazine, London. 132(6), pp651-666.

It is hoped to further refine the biozonation which already stands as a very useful correlative tool. Further details of Chitinozoan workers active in the Silurian can be found in Chitinozoan Newsletter 16 which was published in December.

4. IGCP 406: "CIRCUM-ARCTIC PALAEOZOIC VERTEBRATES"

(Submitted by Co-leader Mark V. H. Wilson)

Thank you for your support of IGCP 406 during its first year, which was very successful and a promising beginning. Now we must do several things in order to finish our reporting for 1996 and plan for 1997:

Actions required

1. Immediately if not already done, all participants should (i). Report to your national IGCP 406 leader your project-related activities during 1996, and (ii). Submit a list of all 406-related publications dated 1996 or in press, including refereed papers, books, chapters, abstracts, newsletter articles, and conference presentations, to Mark Wilson, e-mail mark.wilson@ualberta.ca.

The co-leaders must send the complete list to IGCP Paris in January: Apply to your national IGCP 406 leader for funding to help you attend one of the 1997 meetings described in the attached information: either Buckow, Germany July 5-6; or St. Petersburg, Russia Sept. 23-26.

National leaders: should (i) Report your country's 406-related activities to your national IGCP committee and to the project's co-leaders Mark Wilson and Tiiu Marss. (ii) Apply to your national IGCP committee for funding to support attendance by participants from your country at 1997 meetings, especially by student/unemployed/third-world participants.

2. Before February 28, 1997:

Submit abstract for the Buckow meeting.
Register at the hotel in Buckow.
Register for the Buckow meeting.

3. As soon as possible: Indicate your interest in the St. Petersburg meeting by post or e-mail to A. Ivanov, e-mail: **anna@dean.geol.lgu.spb.su**

IGCP 406 Meetings for 1997:

Meeting #1. "Circum-Arctic Palaeozoic Vertebrates: Biological and Geological Significance"

Contributions invited on: biostratigraphy, correlation, paleoecology, biogeography, evolution, and systematics of Ordovician, Silurian and Devonian vertebrates and associated fossils from Arctic regions
At: Buckow (near Berlin), Germany, July 5-6, 1997
Abstract Deadline: February 28, 1997
Abstract Submission: to M. V. H. Wilson, e-mail mark.wilson@ualberta.ca
Hotel Registration: by February 28, 1997
Hotel Payment Deadline: March 31, 1997
Meeting Registration: Early Deadline is February 28, 1997
Contact Mark Wilson for more details (a package is being mailed within the week to everyone listed as a participant in IGCP 406).
(This meeting is immediately before another meeting at the same place: "Mesozoic Fishes - Systematics and the Fossil Record" July 7-11, 1997.Contact Gloria Arratia, e-mail gloria.arratia@rz.hu-berlin.de)

1997 Meeting #2.
"Palaeozoic Strata and Fossils of the Eurasian Arctic"
With workshop on Severnaya Zemlya monograph, St. Petersburg, Russia
Organizing Committee: A. Ivanov, T. Mozdalevskaya, I. Evdokimova, A. Zhuravlev

Contact Address:
Alexander Ivanov Laboratory of Paleontology
Institute of Earth Crust
St. Petersburg University
16 Linija 29
St. Petersburg 199178
Russia
E-mail: **anna@dean.geol.lgu.spb.su**

5. LUDLOW RESEARCH GROUP (Submitted by Phil Lane, University of Keele)

This group, founded by Vic Walmsley, Charles Holland and Jim Lawson in the 1950s has annually held a (sometimes long) weekend field meeting to look at Silurian Geology in the British Isles. For many years these field meetings benefitted from the attendance of non-UK colleagues - for example those on study leave in the UK or those visiting UK researchers or museums - but in recent years such attendance has fallen away. This note serves to make old and new non-UK Silurian researchers aware that the annual field meeting of the LRG continues to be held in mid-September, and that anyone is welcome to attend. Normally, about 25-30 UK scientists, ranging from graduate students to established (and retired) workers, and their spouses make up the attendance list. Costs are usually modest.

Details for 1997 are in the process of being worked out, but we have the prospect of a visit to either Dingle Peninsula, Ireland (to be lead by Prof Charles Holland, Trinity College, Dublin), or the Southern Uplands of Scotland (lead, at least in part, by Dr. Howard Armstrong, University of Durham).

Will anyone interested in the 1997 meeting, or who requires any further information about the LRG please contact Dr Phil Lane, Department of Earth Sciences, University of Keele, ST5 5BG, UK, preferably by email (gga15@keele.ac.uk).

6. APPALACHIAN BASIN GUIDEBOOK STILL AVAILABLE (submitted by M.E. Johnson)

A limited supply of guidebooks from the 1996 pre-symposium field trip on "Sedimentary Environments of Silurian Taconia" are still available. This 230 page guidebook was commissioned expressly for a 13 day field trip that took participants along the Silurian shoreline of Taconia from Birmingham, Alabama to Rochester, New York. This valuable resource includes chapters by 15 experts on the Silurian geology of the Appalachian Basin.

Obtain your copy by sending a check or money order in the amount of $15.00 US to Markes Johnson at the Department of Geosciences, Williams College, 947 Main Street, Williamstown, MA 01267, USA. Your check should be made out to Markes Johnson. All income from sales of this guidebook will be added to the publication fund for the James Hall Symposium volumes.

7. SUBJECTIVITY IN BIOZONE METHODOLOGY: (Submitted R.B. Rickards, Cambridge)

In a recent paper dealing with graptolite zones, Legrand (1996) stresses what he considers to be problems concerning the applications of biozones. The purpose of this paper is not to argue that there are no problems, but to suggest that some of the statements made by Legrand are incorrect or are at least worthy of further discussion. In stratigraphy there will always be problems: no section or analysis of it is ever perfect, and the objective is to obtain the best fit posible that makes it useful for subsequent workers.

Legrand's first category of problems is palaeontological. He argues that in Silurian stratigraphy many forms are insufficiently well-described and that there are numerous taxonomic errors. This is not a problem in reality, in the sense that it will always be there. Taxonomy is dated the day it is published, and is largely a matter of opinion anyway. Skilled and experienced opinions last longer, that is all. Each generation of research workers produces refinements and corrections- usually splitting species (and redefining old species) rather than lumping species. Taxonomy is thus, by definition, always an approximation sufficient to the stratigraphic needs of the day: refinement of the two goes more or less hand-in-hand. Therefore these "problems" will remain with us until such time as we can plot sequences of geographical populations, of races, and until we can subdivide the Silurian geological column into units averaging one or two years, as opposed to the approximately ¼ million years at the moment!

In his section headed "Biostratigaphic and chronostratigraphic problems" Legrand distinguishes between the assemblage biozonal approach recently outlined by me (Rickards 1996) and the "index species" concept used by other continents than North America, and by British workers. He states that "interpretations of assemblage zones tend to be subjective------". So they are: but so also are "index-species" zones. They each depend upon species identifications which are themselves subjective. As an example of just how subjective and "index-species" biozone can be, consider the *parvus* Biozone of Jaeger (*in* Barca and Jaeger 1990). As conceived, this represents a short time in the late Wenlock, and it is certainly useful in some areas, but the species occurs first a great deal earlier, halfway down the Wenlock. Considered globally, such a concept is useless. Only in particular sections, where a framework of other parameters exist, can a *parvus* Biozone have any value, and even then I would be doubtful.

Legrand also states that assemblage zones are not amenable to refinement. This is quite wrong. As an example, consider the original assemblage zones of Elles and Wood (1901-1918). These have been considerably refined and redefined and are now greatly more numerous (more subdivided) than they were originally. It might be sensible to tie in to the rock the bases of biozones when they are originally defined, in the same way as in chronostratigraphy, because this would certainly facilitate redefinitions, but assemblage biozones are easily redefined however they are set up originally. Can this argument be used for "index-species" biozones? I very much doubt it, not without adopting an assemblage biozonal approach incorporating overlapping ranges!

Legrand criticizes the Llandovery stages on the grounds that they lack precision *with reference to Llandovery graptolite biozones*. This is perfectly correct and was made clear enough in the original definition of the Llandovery stages (Cocks et al. 1984). It is, however, an irrelevant criticism in the present context, because the Llandovery stages are chronostratigaphic divisions, rested in the rock. The Silurian Subcommission subcommittee voted strongly in favour of the scheme devised and the area chosen, because, amongst other factors, they were aware that chronostratigraphic divisions are not biostratigraphic divisions..

I think Legrand also slips into a similar misconception when he asks that zonal boundaries be "---made to coincide, wherever possible, with stage boundaries". This would be very nice, but is unrealistic and unnatural. And consider this: if

you are able to say such-and-such a biozone straddles a particular stage boundary, *you have been able to correlate* or you would not be able to make the statement in the first place! Q.E.D. Of course, you could then subdivide the original biozone into two sub-biozones - or you could if it were an assemblage biozone to start with!

It seeems to me that Legrand, whilst stimulating useful discussion is perhaps, making problems unnecesarily. It must be recognized that *no* section is perfect, no one group perfect for correlation, and no on systematic analysis the last word. All that really matters from the stratigrapher's point of view is that it works, and is useful for the researchers of the day. No amount of wishful thinking will result in all species being beautifully and clearly defined, and their ranges unarguably known. I think it was the recognition of these realities that enabled the Silurian Subcommission to complete its definitions of the Silurian in a reasonable time period. Let's not throw away those achievements.

References

Barca, S. and Jaeger, H. 1990. New geological and biostratigaphical data on the Silurian in N.E. Sardinia. Close affinity with Thuringia. Bol. Soc. Geol. It., 108:565-580.

Cocks, L.R.M., Woodcock, N.H., Rickards, R.B., Temple, J.T., and Lane, P.D.1984. The Llandovery Series of the Type Area. Bull. Br. Mus. nat. Hist, 38:131-182.

Elles, G.L., and Wood, E.M.R. 1901-1918. Monnograph of British Graptolites. Palaeontographical Society (Monograph), 3:1-536.

Legrand. P. 1996. Etage et zones de graptolites: definition et validité; l'example du Silurien inferior. Bull Soc. géol. France, 167:29-38.

Rickards, R.B. 1996. Utility and precision of Silurian graptolite biozones. Lethaia, 28:129-137.

GUIDELINES FOR THE ESTABLISHMENT OF GLOBAL CHRONOSTRATIGRAPHIC STANDARDS BY THE INTERNATIONAL COMMISSION ON STRATIGRAPHY (ICS)

(REVISED)

by

J. REMANE, M. G. BASSETT, J. W. COWIE, K. H. GOHRBANDT, H. R. LANE, O. MICHELSEN & WANG Naiwen, with the cooperation of members of ICS

1. INTRODUCTION

The Silurian-Devonian Boundary Committee was the first to put into practice (in 1960) the principle to define chronostratigraphic units by their lower boundary only, which thus becomes automatically the upper boundary of the underlying unit. The Silurian-Devonian boundary-stratotype at Klonk in the Czech Republic was ratified on the 24th International Geological Congress (IGC) at Montreal, 1972. During this process, the Committee developed the principles of chronostratigraphic boundary definition. These "lessons learned" (McLAREN, 1977:23) constituted the basis of the first Guidelines of ICS, where the concept of the Global Standard Stratotype-section and Point (GSSP) was introduced: **"This Boundary Stratotype Section and Point is the designated type of a stratigraphic boundary identified in published form and marked in the section as a specific point in a specific sequence of rock strata and constituting the standard for the definition and recognition of the stratigraphic boundary between two named global stratigraphic (chronostratigraphic) units"** (COWIE et al. 1986:5). This definition is still valid for the Phanerozoic: A GSSP voted by the Full Commission of ICS (the Bureau of ICS and Chairpersons of all ICS Subcommissions, see also BASSETT, 1990) and confirmed by the Executive of the International Union of Geological Sciences (IUGS) represents a ratified boundary definition.

The necessity of a precise Global Chronostratigraphic Scale is obvious. Research on global events means comparison of stratigraphic documents from distant regions - but how can we be sure to deal with the same event throughout, without having a precise and reliable chronostratigraphic scale? The same is true for the establishment of eustatic sea-level curves or the reconstitution of global climatic changes in the past. Progress in these and many other fields of geologic research is only possible if progress is also made in the definition of chronostratigraphic units.

2. AIMS AND PRINCIPLES

2.1. Aims of the Revision

The original Guidelines were issued by the Bureau of ICS (COWIE et al. 1986) and summarized by COWIE (1986) in *Episodes,* the official publication of IUGS, and by COWIE (1990, 1991). They have guided uniformity of definition for twenty chronostratigraphic boundaries during ten years of successful application. The experience gained in this process has confirmed the basic principles of the original Guidelines. Nevertheless, a cautious revision of the Guidelines appears useful for different reasons:

(1) The Precambrian Subcommission of ICS has proposed a global stratigraphic subdivision for the Proterozoic where boundaries are defined in terms of absolute ages (see sect. 2.2), with entirely new names for the nine Proterozoic systems created on this basis. The resultant new subdivision of the Proterozoic was voted by ICS and ratified by IUGS on the 28th IGC in Washington, 1989; it is thus formalized (and should therefore not have been omitted in the 2nd edition of the ISG).
(2) During the last years, great progress has been made in the field of non-biostratigraphic methods of correlation (See sect. 3.1). These should therefore be given more weight in the choice of boundary levels and type-sections.
(3) Certain problems concerning the philosophy of boundary definition came up repeatedly in recent discussions of GSSP candidates, such as the necessity to respect priority, to have natural boundaries (see sect. 2.4), the rôle of fossils in boundary definition (see sect. 3.1), and the degree to which global correlation has to be exact before defining a boundary (see sect. 2.3).
(4) Since the publication of the original Guidelines (COWIE et al., 1986) important publications on the principles of stratigraphy have appeared, especially the 2nd edition of the International Stratigraphic Guide (ISG) (SALVADOR, 1994), or HARLAND (1992). The position of the Guidelines in this new context had to be clarified.

The rôle of the Guidelines remains, however, unchanged. They regulate the procedures of boundary definition, the selection of an appropriate boundary level, and the corresponding voting procedures (also partly dealt with in art. 3 and 7.1 of the statutes of ICS). They further define the requirements to be fulfilled by the stratotype-section housing the boundary point.

2.2. The Precambrian Standard

The new boundary-type definition, first introduced for the Proterozoic in 1989, was necessitated by the lack of adequate fossils in most of the Precambrian. It is termed herein the **Global Standard Stratigraphic Age (GSSA).** Defining boundaries in terms of absolute ages means that the numerical value of the boundary age is a theoretical postulate independent from the method applied to obtain numerical ages. But, as in the case of boundaries defined by a GSSP, an explicit motivation for the choice of the proposed numerical value should be given, clarifying in the same time its relation to traditional boundary definitions. GSSAs have the same status for boundary definition in the Precambrian as GSSPs have in the Phanerozoic.

2.3. Correlation Precedes Definition

Except for the Precambrian, this principle is still valid. To define a boundary first and then evaluate its potential for long-range correlation (as has been proposed in some cases) will mostly lead to boundary definitions of limited practical value. On the other hand, it would be unrealistic to demand that a given boundary be recognizable all over the world before it can be formally defined. In each case we must find the best possible compromise, otherwise the search for the Holy Grail of the perfect GSSP will never end.

2.4. Priority and Natural Boundaries

Our main task for a number of years will be to develop precise boundary definitions for traditional chronostratigraphic units. Most of them were defined in the last century by their characteristic fossil contents, and their boundaries coincided with spectacular biostratigraphic and lithologic changes. These were "natural" boundaries, in perfect agreement with the catastrophist philosophy of that time. In reality, rapid faunal turnovers are to a certain extent artefacts due to stratigraphic gaps or condensation. Most of the classic type-localities are thus unsuitable for a precise boundary definition: we have to look for new sections where sedimentation is continuous across the boundary interval; but then boundaries will rarely correspond to a lithologic change.

The idea that chronostratigraphic boundaries should always correspond to something "visible" has also led to conflicting regional "definitions" of international chronostratigraphic boundaries, which were adapted to regional lithostratigraphic boundaries of different ages.

There is no formal priority regulation in stratigraphy. In redefining boundaries, priority can therefore be given to the level with the best correlation potential. The redefinition will give us the opportunity to use fossil groups (such as conodonts) and methods of chronocorrelation (such as magnetostratigraphy) which were unknown or poorly developed at the time of the original definition. This does not mean that priority should be totally neglected. Practical considerations will incite us to limit changes to the necessary minimum. If, however, the interregional correlation potential of a traditional boundary does not correspond to the needs of modern stratigraphy, its position has to be changed.

Chronostratigraphic boundaries are conventional boundaries. They are a matter of normative science and can be decided by a majority vote (COWIE et al., 1986). To a certain degree, this principle can be reconciled with the demand for natural boundaries. As stated above, most of the classical boundaries are not clear-cut but correspond to critical biotic and/or climatic transitions. Placing a boundary within such an interval will preserve the advantage of having successive

units which are distinguished by their contents. But where exactly the boundary is to be placed, is a matter of convention and practical considerations.

Once a boundary is (re)defined by a GSSPor a GSSA, it should be used in all published figures and tables. Such an obligation will not hinder any authors from expressing their personal opinions.

2.5. Boundary-stratotypes instead of Unit-stratotypes

If chronostratigraphic units were defined by unit-stratotypes, the boundary between two adjacent units would be defined by two separate GSSPs: as upper boundary of the lower unit in one unit-stratotype and as lower boundary of the succeeding unit in the other. The Global Chronostratigraphic Scale must, however, be constituted of strictly contiguous units, without overlaps and with no gaps between them. But there is no method of correlation which would guarantee a perfect isochrony of two separate boundary points, even at a short distance apart (HARLAND, 1992).

This problem was already recognized in the 1st edition of the ISG (HEDBERG, 1976), but unit-stratotypes for chronostratigraphic units were still admitted as an alternative possibility. In the 2nd edition (SALVADOR, 1994), boundary-stratotypes are given a stronger preference, but as a whole, the position remains ambiguous: "Since the only record of geologic time···lies in the rocks themselves, the best standard for a chronostratigraphic unit is a body of rocks formed between two designated instants of geologic time." (SALVADOR 1994: 88).

The Guidelines of ICS are unambiguous: **Chronostratigraphic units of the Phanerozoic Global Standard can only be defined through boundary stratotypes.** Even should the situation arise (e. g. as in the Silurian stratotypes in Britain) that the GSSPs defining the lower and upper boundaries of one and the same unit are located in the same section, this does not imply that the stratigraphic interval and its biota between the the two GSSPs represent a unit stratotype.

For several systems, upper and lower boundaries are now defined by GSSPs. Following the choice of the best type-section these are located in distant regions: the base of the Silurian in Scotland, UK; that of the Devonian in the Czech Republic; that of the Carboniferous in the Montagne Noire, France; of the Permian in Kazakhstan; and the base of the Quaternary in Italy.

The lower boundaries of chronostratigraphic units of higher rank (series, systems etc.) are automatically defined by the base of their lowermost stage. In other words: the lower boundary of a system is always also a series and a stage boundary.

A GSSP cannot be compared to the holotype of Zoological Nomenclature; it corresponds rather to a standard of measure in physics (HARLAND, 1992). The use of terms like holostratotype, parastratotype etc. should therefore be avoided (COWIE et al., 1986). If reference sections and points seem necessary in order to give a better understanding of the boundary in another facies or paleobiogeographic context, an auxiliary stratotype point may be defined. Such auxiliary points are subordinate to a GSSP.

3. THE CHOICE OF THE BEST BOUNDARY LEVEL

3.1. Some General Considerations about Chronostratigraphic Methods

Chronostratigraphy and chronocorrelation have been discussed at length in the ISG (SALVADOR, 1994). We may thus limit the following discussion to selected topics which are of particular importance for the choice of the boundary level.

Considerable progress has been made during the last years in developing and in improving methods of non-biostratigraphic chronocorrelation. Some of them are based on geochemical signals, like the famous Ir-spike used as guidance for the definition of the Cretaceous/Paleogene boundary, or on shifts of stable isotopes which should be helpful in the definition of the Permian/Triassic boundary (BAUD et al., 1989).

Reversals of the Earth's magnetic field are important, because they are a worldwide phenomenon and practically instantaneous, thus providing a precise and reliable means of chronocorrelation. Late Jurassic to Recent reversals have been calibrated to the Magnetic Polarity Time Scale based on oceanic anomalies (HAILWOOD, 1989).

Geophysical and geochemical events are, however, repetitive and do not allow an unequivocal determination of the age. They need calibration through radioisotopic or biostratigraphic dating. Unfortunately, radioactive isotopes are rarely available where needed so that stratigraphic routine work depends mostly on other methods. But radioisotopic datings are very important for the quantitative calibration of relative ages. Biostratigraphic boundaries, i. e. the boundaries of the material stratigraphic occurrence of species, are diachronous (ISG). This fact has, however, been overstated. A species exists for a finite span of time and is therefore characteristic of a certain geologic interval. In rapidly evolving lineages this may be less than 1 million years, so that most biostratigraphic datings attain a higher degree of resolution than the use of radioisotopes.

The use of fossils for calibrating chronostratigraphic units does not only involve tracing of biostratigraphic boundaries. It is indeed less a matter of correlation than of determining relative ages within a biochronologic standard of reference. Biochronology is the reconstruction of the succession of species in time through the synthesis of local and regional biostratigraphic data (for a recent overview, see REMANE, 1991). The chronostratigraphic reliability of biostratigraphic boundaries can thus be tested by comparing data from different species. In this process, mathematical approaches (Quantitative Stratigraphy) play an increasingly important rôle (GRADSTEIN et al., 1985; GUEX, 1991; MANN & LANE, 1995).

Fossil species depend on the environment and are biogeographically limited. An appropriate choice of wide spread species may diminish but never totally eliminate these shortcomings. Radioactive isotopes do not suffer from these geographical restrictions; but their resolution diminishes with increasing age. Therefore, non-biostratigraphic markers like magnetic reversals and stable isotopes have gained increasing importance in long range lateral correlation.

3.2 The Best Boundary-level

With the above considerations in mind, the correlation potential of any boundary level should be tested through a detailed study of several continuous successions covering the critical interval, if possible on different continents. The most suitable of these sections can then be selected for definition of the GSSP. If two boundary levels of equal correlation potential are available, the better candidate (see chapter 4) will decide the choice of the boundary level.

This implies the integration of data from different facies and paleogeographic provinces in a global synthesis. The perfect GSSP, where all elements of such a synthesis are well represented, will often not be available. Flexibility is therefore necessary in order to make a timely decision.

The boundary definition will normally start from the identification of a level which can be characterized by a marker event of optimal correlation potential. This marker event may be a magnetic reversal, some kind of geochemical or isotopic signal, or the first appearance or last occurrence of a fossil species. However, only the boundary point in the section, the GSSP (COWIE et al., 1986) formally defines the boundary. This means that an occurrence of the primary marker does not automatically determine the boundary. Other markers should therefore be available near the critical level, in order to support chronostratigraphic correlation in sections other than the GSSP. If the primary marker is a fossil species, first appearances are generally more reliable than extinction events, especially if the gradual transition between the marker and its ancestor can be observed.

4. REQUIREMENTS FOR A GSSP

The danger of eternalizing the search for the best type-section has already been addressed in sect. 2.2. **The stratotype-section should contain the best possible record of the relevant marker events.** In this sense, the requirements listed below characterize the ideal section. Not all of them can be fulfilled in every case, but the fact that all GSSPs are voted by ICS in accordance with the present Guidelines insures that flexibility will not degenerate to arbitrariness.

4.1. Geological Requirements

4.1.1. **Exposure over an adequate thickness** of sediments is one requirement to guarantee that a sufficient time interval is represented by the section, so that the boundary can also be determined by interpolation, using auxiliary markers close to the boundary.

4.1.2. **Continuous sedimentation:** no gaps, no condensation in proximity of the boundary level.

4.1.3. The **rate of sedimentation** should be sufficient that successive events can be easily separated.

4.1.4. **Absence of synsedimentary and tectonic disturbances.**

4.1.5. **Absence of metamorphism and strong diagenetic alteration** (identification of magnetic and geochemical signals).

4.2. Biostratigraphic Requirements

4.2.1. **Abundance and diversity of well preserved fossils** throughout the critical interval. Diversified biotas will offer the best possibility of precise correlations.

4.2.2. **Absence of vertical facies changes** at or near the boundary. A change of litho or biofacies reflects a change of ecologic conditions which may have controlled the appearance of a given species at the boundary level. A sharp lithofacial change may also correspond to a hiatus. "An obvious boundary should be suspect" (COWIE et al., 1986).

4.2.3. **Favourable facies for long range biostratigraphic correlations**; this will normally correspond to an open marine environment where species with a wide geographic range will be more common than in coastal and continental settings. The latter should therefore be avoided.

4.3. Other Methods

Magnetostratigraphy, sequence stratigraphy, cyclostratigraphy, analysis of stable isotopes should be given due weight in the selection of a GSSP. If a choice has to be made between candidates having more or less the same biostratigraphic qualities, the one offering the better applications of non-biostratigraphic methods should be preferred.

4.3.1. **Radioisotopic dating**. Whenever possible, it is important to achieve direct quantitative calibration (numerical age) of a chronostratigraphic boundary at the GSSP.

4.3.2 **Magnetostratigraphy**. A reproducible magnetic reversal stratigraphy is a desirable requirement in order to know where in the magnetostratigraphic sequence the GSSP is located.

4.3.3. **Chemostratigraphy**, including the study of vertical changes of the proportions of stable isotopes, which may be indicative of global events.

4.3.4. The regional paleogeographical context and the facies relationships of the stratotype-section should be clarified. Knowledge of the sequence stratigraphy will contribute to an understanding of these relations.

4.4. Other Requirements

4.4.1. The GSSP should be indicated by a permanently fixed marker.

4.4.2. Accessibility: Candidate sections in remote regions which can only be visited by organizing costly expeditions should normally be excluded from the selection.

4.4.3. Free access for research to the type-section for all stratigraphers regardless of their nationality.

4.4.4. When making a formal submission to ICS, the concerned Subcommission should try to obtain guarantees from the respective authority concerning free access for research and permanent protection of the site.

5. PROCEDURE FOR THE SUBMISSION OF A GSSP

5.1. Editing of the Submission

Submissions must be prepared in English. In order to provide a clear picture of the qualities of the proposed GSSP candidate, the formal submission to ICS or to the concerned Subcommission should give the following information:

(1) name of the boundary;

(2) indication of the exact location (coordinates) of the stratotype-section on a detailed topographic map or aerial photograph, if possible at a scale not less than 1 : 50.000;

(3) location on a detailed geologic map;

(4) detailed description of the stratotype-section including a litholog and photos of the section, indicating the bed in which the boundary-point is defined and the key-levels for all physical and biostratigraphic markers;

(5) motivation for the choice of the boundary level and the stratotype-section, with a discussion of failed candidates and their ease of intercontinental correlation;

(6) any comparison with former usage should be discussed fully;

(7) discussion of all markers used in the determination of the boundary level;

(8) illustration of important fossils;

(9) results of radioisotopic dating, indicating clearly what method has been used;

(10) results of all votes within the Working Group and the Subcommission.

Note: Within these procedures, only items 1, 6, 7, 9, 10, and the motivation for the choice of the boundary-level are relevant to the establishment of a GSSA.

Following acceptance of the submission within these Guidelines, the Chairperson or the Secretary of ICS will arrange a vote by the Full Commission within a period of no more than 60 days.

5.2. Voting Procedure

In accordance with the ICS statutes, all formal votes must be conducted by postal ballot, giving a deadline of 60 days for the receipt of votes. Voting members (of the Working Group, Subcommission or Full Commission) may vote "YES", "NO", or "ABSTAIN". The last step in the selection of a final candidate for a boundary level and/or a GSSP should always be a vote on one single candidate (COWIE et al., 1986).

In outline, this procedure includes the following steps:

(1) Successive votes of the concerned Working Group leading to the choice of a boundary level and final vote on a single GSSP or GSSA candidate.

(2) If this obtains the statutory majority in the Working Group, vote on the GSSP or GSSA candidate in the respective Subcommission.

(3) In case of a statutory majority, formal submission of the candidate to ICS for vote.

(4) Again, in case of a statutory majority, submission of the GSSP or GSSA candidate to the IUGS Executive Committee for ratification, together with an abstract of the submission, prepared by the responsible ICS body.

ICS should attempt to finalize, within 3 years after IUGS ratification, any remaining official steps for the protection of the site with the authorities of the country where the GSSP is located.

6. REVISION OF A GSSP

A GSSP or GSSA can be changed if a strong demand arises out of research subsequent to its establishment. But in the meantime it will give a stable point of reference. Normally, this stability should be maintained and the practical value of the boundary definition tested for a minimum period of ten years. Revisions for other reasons should be made only in exceptional circumstances, such as:

(1) The permanent destruction or inaccessibility of an established GSSP,

(2) a violation of accepted stratigraphic principles discovered only after the ratification of a GSSP.

7. SELECTED REFERENCES

The 2nd edition of the ISG (SALVADOR, 1994) contains a comprehensive list of publications dealing with the principles and techniques of stratigraphy. The present list of references was therefore limited to papers providing further information on the principles underlying these Guidelines, adding some titles not mentioned in the ISG.

Bassett, M. G., 1990, International Commission on Stratigraphy, *in* : Briggs, D. E. G. & Crowther, P. C. (eds.), Paleobiology, a synthesis, Blackwell, p. 468-469.

Baud, A., Magaritz, M., and Holser, W. T., 1989, Permian-Triassic of the Tethys: Carbon isotope studies, Geol. Rdsch., v. 78, p. 649-677

Cowie, J. W., 1986, Guidelines for Boundary Stratotypes, Episodes, v. 9, p. 78-82.

Cowie, J. W., 1990, Global Boundary Stratotypes, *in* : Briggs, D. E. G. & Crowther, P. C. (eds.), Paleobiology, a synthesis, Blackwell, p. 471-482.

Cowie, J. W., 1991, Opening speech, 11e Congr. Internat. Stratigr. Géol. Carbonifère, Beijing 1987 v. 1, p. 16-20, Nanjing, 1991.

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 Forschungsinst. Senckenberg, v. 83, p. 1-14.

Gradstein, F. M., Agterberg, F. P., Brower, J. C, and Schwarzacher, W. S. (eds.), 1985, Quantitative Stratigraphy, Unesco /Paris, Reidel, 598 p.

Guex, J., 1991, Biochronological Correlations, Springer, 252 p.

Harland, W., B., 1992, Stratigraphic guidance and regulation: A critique of current tendencies in stratigraphic codes and guides, Geol. Soc. Am. Bull., v. 104, p. 1231-1235.

Hedberg, H. D. (ed.), 1976, International Stratigraphic Guide - A guide to stratigraphic classification, terminology and procedure: New York, John Wiley and Sons, 200 p.

Hailwood, E. A., 1989, Magnetostratigraphy, Geol. Soc., Spec. Report No. 19, Blackwell, 84 p.

Mann, K. O. and Lane, H. R. (eds.), 1995, Graphic Correlation, SEPM Soc. sedim. Geol., Spec. Publ. No. 53, 263 p.

McLaren, D. J., 1977, The Silurian-Devonian Boundary Committee - A final report, *in* : Martinsson, A. (ed.), The Silurian-Devonian Boundary: Stuttgart, IUGS Series A, no. 5, p. 1-34.

Odin, G. S., 1992, New stratotypes for the Paleogene, the Cretaceous/Paleogene, Eocene/Oligocene and Paleogene/Neogene boundaries: Neues Jahrb. Geol. Paläont. Abh. v. 186, p. 7-20.

Remane, J., 1991, From biostratigraphy to biochronology: Time correlation by fossils, 11e Congr. Internat. Stratigr. Géol. Carbonifère v. 1, p. 187-200.

Salvador, A. (ed.), 1994, International Stratigraphic Guide - A guide to stratigraphic classification, terminology and procedure, 2nd edition, Internat. Union of Geol. Sciences and Geol. Soc. of America, 214 p.

Conclusion by J. Remane, Chairman of ICS

The text of the Revised Guidelines as presented above, is the result of a close cooperation between the Bureau and the Subcommissions of ICS. A first provisional draft was prepared by J. Remane, Chairman of ICS, taking into account proposals made by K. H. Gohrbandt, then Secretary General of ICS. A more formal draft was established on this basis by the Bureau of ICS on its meeting at Neuchâtel (Switzerland) in March 1994. This was circulated to all Subcommissions for comments and criticism. That draft was also presented for discussion on the International Symposium on Permian Stratigraphy at Guiyang (China) in September 1994, the 4th International Symposium on Jurassic Stratigraphy at Mendoza (Argentina) in October 1994, and on the 2nd International Symposium on Cretaceous Stratigraphy at Brussels (Belgium) in September 1995. The final version, which incorporated as far as possible oral and written comments received from members of ICS bodies, was worked out on the meeting of the Bureau of ICS at Neuchâtel in April 1996, attended by J. Remane (Chairman), M. G,. Bassett (1st Vice-chairman), O, Michelsen (Secretary General), and H. R.

Lane (1st Vice-chairman elect), and was then submitted for vote to the Full Commission of ICS (consisting of the 5 members of the Bureau of ICS and the 16 Chairpersons of ICS Subcommissions).

In this vote, the Revised Guidelines were approved by the Full Commission with an overwhelming majority, with only one opposing vote. The Revised Guidelines have thus become a formal and mandatory document regulating the procedure to be followed in the definition of chronostratigraphic boundaries. The particular importance of this text lies also in the fact that this is the first document on stratigraphic procedures issued by ICS which represents a voted formal agreement.

CURRENT RESEARCH OF SILURIAN WORKERS

A. Achab and A. Soufiane (Canada)

A biostratigraphical study on the Silurian chitinozoans from sections of the Beechhill Cove, Ross Brook, French River, Doctors Brook and McAdam Brook formations, Arisaig Group, Nova Scotia, is being carried out under supervision of Aicha Achab at the Centre Geoscientifique de Quebec (INRS-Georessources). Paul Strother provided us with thirty samples, ten in 1992 on the initiative of Geert Van Grootel, and twenty in 1995. These samples yielded a well preserved chitinozoan fauna. These results were encouraging and led us to investigate these sections by further sampling at 1 to 2 metre intervals. A total of 132 samples were collected in 1996 from the upper part of Beechhill Cove Formation (Llandovery) to the lower part of McAdam Brook Formation (Ludlow) with the help of Mike Melchin. To date, no diagnostic macro or microfossils have been collecetd from the Beechhill Cove Formation and the lower member of Ross Brook Formation. Chitinozoans are being used as a biostratigraphical tool to date this interval, especially where diagnostic macrofossils are lacking. It is hoped that the preliminary results of this study will be published in 1997.

Richard J. Aldridge (U.K.)

Outline of research: Little new Silurian work of my own to report this year, although Gary Mullins successfully completed his PhD Thesis on early Ludlow palynomorphs from the type area. Wang Cheng-Yuan visited for three months and we worked together on a monograph of Silurian conodonts of South China. Finally, together with several other UK specialists, I am involved in compiling the Silurian volume of the national Geological Conservation Review.

Anna I. Antoshkina (Russia)

Outline of research: Silurian geology of the Timan-Urals region and Paleozoic reefs of the Pechora Urals.

Howard A. Armstrong (UK)

Brief summary of current activities regarding conodonts Continuing work on Southern Upland chert biostratratigraphy and REE geochemistry. Have recently started processing limestone Ordovician limestone clasts from Devonian conglomerates in the Midland Valley. Still supervising Gail Radcliffe on biotic recovery after the end Ordovician mass extinction and Caroline Smith on deep water (Ordovician) conodont palaeobiology. New masters student just started work on Namurian conodonts. In addition I am also supervising a graduate student on the sequence stratigraphy and palaeooceanography of the Upper Cretaceous chalk sea. At present I am heavily involved in the second addition/revision of "Microfossils" (Brasier).

James E. Barrick (U.S.A.)

Continues his research on Silurian conodont biostratigraphy and depositional sequences in the southern United States. The project nearest completion work on the biostratigraphy of conodonts of the Henryhouse Formation (Lulow-Pridoli) in Oklahoma with G. Klapper.

Richard Batchelor (UK)

Richard A. Batchelor had a good field season uncovering yet more bentonites from the Silurian inliers of the Midland Valley of Scotland. Variations in the chemical composition of the Telychian volcanogenic clays suggest that all the inliers may not share the same provenance. A new project is underway to determine the Sr isotopic compositions for apatite microphenocrysts extracted from bentonites, in an attempt to refine their geochemical fingerprint and improve the potential for correlation of individual beds.

D.E.B. Bates & N.H. Kirk (UK)

An attempt to test the theories of automobility, and secretion of graptoloids beneath extrathecal tissue, begun in 1976. Publication of the first two papers of the work (Modern Geology (1991, 1992) has been extended. The third, and probably the most important publications, on *Stomatograptus* and *Retiolites* (submitted in May 1994 is still held up by the refereeing). The fourth part, on *Paraplectograptus, Gothograptus nassa, Eisenackograptus eisenacki* and *Holoretiolites* is in preparation.

Stig Bergström (USA)

Warren Huff, Dennis Kolata,and I have continued work on various aspects of Llandoverian K-bentonites in Europe and North America. An interesting discovery just before Christmas last year was a complex of beds in the Llandoverian Clinch Formation in the southern Appalachians. This is the first confirmed Llandoverian K-bentonite occurrence in the southern and central Appalachians and the most extensive Silurian K-bentonite complex known in the US. Further fieldwork in northeastern Tennessee and southwestern Virginia this past summner led to the discovery of this K-bentonite complex at a few additional localities. We are now doing a variety of geochemical studies on these ash beds. Otherwise, we are in the process of finishing reports on Llandoverian K-bentonites in northwestern Europe (two papers) and Nova Scotia. With Jan Bergstrom I finally finished a report on the Ordovician-Silurian boundary in southern Sweden that was published in GFF. Recently, Oliver Lehnert and I cooperated on a small paper describing the first Llandoverian conodont fauna recorded from the Precordillera of Argentina.

Merete Bjerreskov (Denmark)

Merete Bjerreskov and Tatjana Koren have completed their project on the evolution of the Early Llandovery monograptids.

Henning Blom (Sweden)

Ph.D. studies on Middle Palaeozoic microveretbrates, with special reference to late Silurian vertebrate remains from the Franklinian Basin, North Greenland.

Olga K. Bogolepova (Russia)

Continues her work on Silurian biostratigraphy and paleogeography, and on the systematic, phylogeny, evolution, paleogeography and biostratigraphy of Lower Palaeozoic cephalopods, and the development of cephalopod limestones. The project on Silurian cephalopod limestone biofacies from the Carnic Alps, together with H.P. Schönlaub, A. Ferretti, J. Kríz and K. Histon is still in progress.

Art Boucot (USA)

1. with Chen Xu and Chris Scotese--very close to final drafts of Cambrian through Miocene paleogeographic map revisions based on climatically sensitive deposits. 2. paper, with Robert Blodgett and John Stewart on Late Silurian from northeastern Mexico (mostly brachiopods and lithostratigraphy); the fauna is of Venezuelan-European rather than North American (Laurentian) affinities, i. e., piece of South America that got "stuck" to North America and left behind during the formation of the Gulf of Mexico (possibly got "stuck" sometime during the Devonian). Will appear in the GSA memorial volume for Jess Johnson.

Margaret Bradshaw (New Zealand)

Has recently completed a memoir (under review) on Lower Devonian bivalves from Reefton, and is currently studying the Early Devonian Baton Formation in North West Nelson. Although best known for fossils in the Baton River valley, the Devonian outcrop is considerably more extensive, but is difficult to study due to thick bush cover. Special attention is being paid to the relationship of the Baton Formation to the underlying Silurian Hailes Quartzite to resolve whether there was continuous sedimentation between the two formations, or whether there was a major pre-Baton tectonic event as suggested by some workers.

Richard Cave (UK)

Richard Cave continues work on the Silurian of Wales and the Welsh Borderland.

Carole Burrow (Australia)

As part of my Ph.D. research, I am studying some Australian Silurian microvertebrate assemblages from the Broken River area, north Queensland (Burrow & Simpson, 1995) and from a borehole in Western Australia, and also a partial articulated acanthodian from Yea, Victoria. I have prepared a list and map of known Australian Silurian sites for inclusion in the Silurian chapter being prepared by Dr Tiiu Marss for incorporating in the final IGCP 328 papers. I am also studying scales of poracanthodid acanthodians from Late Silurian sites on Cornwallis Island, Canadian Arctic, which are part of Tom Uyeno's collection.

Mikael Calner (Sweden)

Outline of research: Carbonate sedimentology on Gotland, Sweden, for my doctoral thesis. Present interest focus on non-reefal environments.

Chen Xu (China)

Projects: The Chinese version of the final report of the Transhemisphere Telychian joint project, which is supported by Academia Sinica and the Royal Society, will be published by Science Press, Beijing, by the end of this year. Charles Holland informs me that the English version will also be published in the UK this coming Spring. I am working mainly on Ordovician in the recent years. However, I am the second author of an invited paper for the James Hall Symposium (Rong Jia-yu et al.) on the Silurian paleogeography of China. From last year, my colleagues and I are working again on a continuous Ordovician-Silurian section from Yichang. The highest Ordovician chronostratigraphic unit, the Hirnantian

Substage will be defined as a candidate section. The Silurian and entire Paleozoic section of the Yangtze Gorges will be re-collected and restudied since a high dam will be built there. I am involved in this work and I am the leader of the Lower Paleozoic part.

Euan Clarkson (UK)

We hope shortly to submit a more popular paper to the Proceedings of the Geologists Association, with four colour paintings of Silurian sea-floor scenes (done by me!), entitled Silurian faunas and floras in the Caledonian mountain belt and its margins. I have a Spanish graduate student Vicenza Carrio-Lluesma, who is now working on the Silurian gastropods of the Pentland Hills and other parts of Scotland, and John Cope intends to monograph the bivalves of the Pentland Hills also.

Carlo Corradini (Italy)

Outline of research: conodont taxonomy of Late Silurian of Sardinia; biostratigraphy of SE Sardinia, where formal units will be introduced soon (with S. Barca, A. Ferretti & E. Serpagli).

Stephen K. Donovan (Jamaica)

I and co-workers continue to study the systematics and taphonomy of Silurian crinoids. Current projects include description of crinoids of the Upper Llandovery Kilbride Formation of western Ireland (with David. A.T. Harper), a review of the British Silurian crinoids (with Christopher R.C. Paul) and redating of Lower Paleozoic sequences in central Newfoundland on the basis of columnal evidence (with W.L. Dickson, W.D. Boyce and J.S. Ash). A paper in press (co-authored by Ron. K. Pickerill, Don. G. Mikulic and Joanne Kluessendorf) discusses the taphonomy of pluricolumnals preserved in perpendicular to bedding in the Wenlock Thornton Reef Complex of Illinois, USA.

Steven G. Driese (USA)

My stable isotope colleague Claudia Mora and I published a paper, including an estimation of Late Silurian pCO2 using the stable carbon isotope paleobarometer of Cerling (1991) applied to Upper Silurian Bloomsburg Formation paleosols from central Pennsylvania. At this time I am engaged in a detailed study of the morphology of Late Silurian pedogenic carbonate from both the Bloomsburg Fm. and the Moydart Fm. of Nova Scotia. The study focusses on reconstructing the rhizomatous mat-like systems utilized by primitive plants, which are exceptionally well-preserved in the calcretes. Earlier this summer, I led a three-day leg of the pre-meeting field trip associated with the 2nd International Silurian Symposium. The trip showcased biostratigraphy and paleoenvironments of Lower Silurian terrigenous clastic rocks exposed in eastern Tennessee and southwestern Virginia.

Mats Eriksson (Sweden)

Outline of research: Scolecodonts, mainly the polychaete families Ramphoprionidae and Polychaetaspidae from the Silurian strata of Gotland and Upper Ordovician of North America.

Annalisa Ferretti (Italy)

Research continues on Silurian paleoenvironments in the Mediterranean area. In particular, a collaborative study on the cephalopod limestone from the Austrian Carnic Alps is going on. An integrated sedimentologic and paleontologic analysis of Silurian graptolite limestones from SW Sardinia with E. Serpagli will try to interpret this peculiar facies. Formal lithostratigraphic units for the Silurian-early Devonian of SE Sardinia will be soon proposed (with E. Serpagli, S. Barca and C. Corradini).

Fu Lipu (China)

Continues her work on Ordovician in Ordos and is cooperating with Rong Jiayu in the study of Ordovician and Silurian brachiopod communities and paleogeography in China. A news item is that the study of the stratigraphy and tectonics of North mountain in Gansu Province reveals Ordovician and Silurian.

Maurizio Gnoli (Italy)

At present he continues the previous proposed topics and with K. Histon he is starting a new one concerning Silurian nautiloid cephalopods from the Carnic Alps.

Alexander P. Gubanov (Russia)

Continues work on Lower Palaeozoic gastropods (taxonomy, systematics, paleoecology, paleogeography).

Charles Holland (Ireland)

My present Silurian research is largely on the British cephalopods. I have now gathered data from all the main collections and am producing a computer data base, so that I can gradually complete the taxonomy and its implications. A paper on the British Silurian actinocerids is in press. This follows upon treatment of the very rare Silurian Endopcerida by David Evans and me. Sven Stridsberg and I are planning to work on the Discosorida of the British Isles and Sweden and comparisons. In addition, after a long delay, the expanded second edition of 'A Geology of Ireland' is planned for completion early in 1997. It will, of course, include a chapter on the Silurian. Similarly, the long delayed book on the

results of our joint project 'Transhemisphere Telychian', undertaken with Chinese colleagues from Nanjing, is to be published by the National Museum of Wales in Spring 1997. Otherwise, I am writing a book on 'The Idea of Time'.
I was very glad to hear that nothing was done about erecting stages for the Pridoli Series. These are not yet necessary.

Mikael Jacobsson (Sweden)

Present research: 1. Tempestites showing an upwards proximality and shallowing-deepening trends in one 110 m long drilling core (Slite Beds, Wenlockian). Further create a sea level curve for this area and compare it with other sea level curves. 2. Investigate trends in Geochemestry (same core). 3. Compare Biostratigraphy and Sedimentology (same core). 4. Correlation between this core (standard section) and several other drilling cores (70) from the same area, using Cyclostratigraphy (different scales of cycles: 0.5 to 1m thick and 5 m thick cycles).

Lennart Jeppsson (Sweden)

Research: Silurian sequence of oceanic episodes and events, precise identification of their boundaries using high resolution biostratigraphy, chiefly a new conodont zonation. Application of the latter permits correlations of carbonate sequences with the same precision as achieved by the best graptolite zonations in dark shales. In some cases the result is substantial changes in hitherto accepted correlations.
I still have a few copies of Fossils and Strata 6. Please send a line if you have good use for that or reprints or any other of my publications.

Fredrik Jerre (Sweden)

I am interested in all aspects of conulariid research.

Markes E. Johnson (U.S.A.)

Outline of research: I am particularly interested in using exhumed Silurian shorelines, especially rocky shorelines, as "meter sticks" to measure relative sea-level changes in a test of the global Silurian sea-level curve. A summary of all known Silurian rocky shores and coastal valleys with paleotopographic relief has been prepared in draft form as a contribution to the James Hall Symposium volume on "Silurian cycles." If you know of any promising Ordovician-Silurian unconformities or intra-Silurian unconformities which may represent paleovallies or rocky shorelines, let me know about them.

Stephen Kershaw (UK)

Work on stromatoporoids has developed with a review of taphonomy with Frank Brunton, and application of stromatoporoids in reefs to Silurian sea Level change with Markes Johnson and Rong Jia-yu. New projects on Silurian reef and basin sequences in central China were begun in the summer of 1996, with Zhang Tingshan and co-workers at the Southwest Petroleum Institute, in Sichuan, China. New work also began with Graham Young on growth rates in Ordovician stromatoporoids in Manitoba.

Mark Kleffner (USA)

Continues to work on Silurian conodonts in the midwestern basins and arches region of North America. At present he is concentrating his efforts on conodont distribution and zonation relative to sequence stratigraphy of the Appalachian Basin. Mark also continues to update and revise a conodont- and graptolite-based Silurian chronostratigraphy with Jim Barrick, including information from new and resampled sections and making necessary modifications due to taxonomic revisions. He also continues to work on Lower Silurian conodonts from Nevada (with Mike Murphy) and Wisconsin (with Rod Norby). A recent visit by Lennart Jeppsson will likely result in a joint project or two, the first of which would be an application of Lennart's and Mark's Wenlock conodont zonation on a portion of the classic North American Niagaran Series. Mark reports that most of his research is proceeding at a slightly slower pace than usual, for he and his wife became parents of twins last June.

Joanne Kluessendorf (U.S.A.)

Continues her work on Silurian sedimentology, paleontology, reef paleoecology and depositional environments. Presently she is concentrating on sequence stratigraphy and Llandovery paleokarst throughout the central U.S. Her work with Silurian Fossil Konservat Lagerstätten also continues (see D. G. Mikulic contribution).

T.N. Koren (Russia)

Present research is devoted to the taxonomy, phylogeny and diversity dynamics of the early Llandovery monograptids and diplograptids (the *ascensus-acuminatus* to *vesiculosus* biozones. They are based on the graptolite collections from the Urals, Kazakhstan and northeast Russia. Comparative studies with the contemporaneous fauna from Bornholm (jointly with M. Bjerreskov) and Canadian Arctic (with M.J.Melchin) are in progress.

Anna Kozlowska-Dawidziuk (Poland)

I am continuing my research on Silurian retiolitids: morphology, biostratigraphy, evolution and phylogeny.

Jiri Kriz (Czech Republic)

Present and proposed research on Silurian topics - The Silurian volcanic archipelago in the Prague Basin and its importance for the evolution of the Silurian early land plant and shallow water marine communities.
Opinion - I am very pleased that the Pridoli was not yet subdivided into the stages.

Philippe Legrand (France)

Philippe Legrand is working on the lower Silurian Diplograptides of the Middle East, the lower Silurian Monograptides of the Algerian Sahara and the Middle East. He is also working on Tremadocian graptolites in the world and the graptolites of Montagne Noire in France.

Alfred Lenz (Canada)

Work continues on Wenlock to Ludlow retiolitids, and Ludlow to Lower Devonian graptolites of Arctic Canada. I expect to collect much more material for the former next summer, and to begin study of the latter early in the new year. International collaborative projects include studies of graptolite synrhabdosomes with Gutiérrez-Marco (Spain); Pridoli graptolites of southwestern Europe with Gutiérrez-Marco, Piçarra (Portugal), and Robardet (France); Ludlow to Lower Devonian graptolites of Yunnan Province, China with Y-d Zhang (China); and late Wenlock to Ludlow retiolitids from the Vseradice section outside Prague with Kozlowska-Dawidziuk (Poland) and Storch (Czech Republic).
Graduate student projects comprise 1. Llandovery Radiolaria from Arctic Canada (E. MacDonald, MSc student), 2. Late Wenlock *Lagerstätten* fauna and flora from central Ontario (D. Tetreault, PhD student), and 3. Ordovician to Devonian maturation studies, including reflectivity of chitinozoans, of southern Ontario (M. Obermajer, PhD student). All are expected to be complete by the end of next year.

Steven LoDuca (USA)

I am continuing study of the taphonomy, systematics, and evolution of Silurian noncalcified thallophytic algae, especially the dasyclads. Currently, I am investigating the geochemistry of these fossils with L. Pratt, and I am describing two newly discovered Silurian thallophytic-alga-dominated biotas from Canada with D. Tetreault and M. Melchin. As a result of this work, a very detailed picture of marine floras immediately prior to and concomitant with the emergence of terrestrial vascular plants is beginning to develop. Research also continues on the Silurian stratigraphy of the Michigan and Appalachian basins.

David Loydell (UK)

Current and proposed research work continues on the relationship between Silurian climate, sea level change and graptoloid diversity. Work (jointly with Dim Kaljo) has begun on a revision of the Silurian graptolite biostratigraphy of Estonia. Other projects include (1) theWenlock-Ludlow stratigraphy of eastern mid-Wales (with R. Cave), (2) a revision of Telychian-Sheinwoodian monoclimacids, and (3) the Telychian graptolites, biostratigraphy, sedimentology and structure of the Southern Uplands of Scotland (with the British Geological Survey).

Robert Lundin (USA)

With Harry Birkmann, the shape analysis of nonpalaeocope ostracodes from the Silurian of Gotland using confocal microscopy. With Elana Michailova, comparison of late Silurian nonpaleocope ostracodes from Central Asia with those of the North American midcontinent. Continued description of the nonpaleocope ostracodes from the type Wenlockian.

Georg Maletz (Germany)

I started working on Silurian graptolites and biostratigraphy, currently investigating Llandovery graptolites from a core (G-14) in the east Baltic sea, north of the island of Ruegen. A paper on lowermost Silurian graptolites from Belgium (together with Thomas Servais, Liêge, Belgium) is nearly finished. My plans include work on isolated Silurian graptolites from the Llandovery of Dalarne (Sweden), and Silurian graptolites of the Harz Mountains in Germany, as well as isolated graptolites from glacial boulders from northern Germany. I am highly interested in the evolution of monograptids.

Peep Männik (Estonia).

Outline of research: Evolution, ecology and taxonomy of Llandovery and Wenlock conodonts from Baltic and Russian Arctic. High-resolution stratigraphy and reflection of oceanic changes in conodont faunas.

Tiiu Märss (Estonia)

A major problem in Lower-Middle Palaeozoic vertebrate study is the difficulty of correlating strata and fossils across the Circum Arctic region, caused insufficient study, inconvinience and expense of doing appropriate field work, insufficient international collaboration, and apparent examples of provincialism and endemism of faunas. We proposed a project to research Lower and Middle Palaeozoic vertebrates from remote northern areas; to study their taxonomy, succession and the most important stratigraphic levels of biological changes and events in vertebrate evolution; to determine their evolutionary relationships; to improve knowledge of stratigraphic and geographical ranges of vertebrates using also data on conodonts, chitinozoans, spores, and other associated fossils; to elaborate regional vertebrate biozonal schemes; to correlate sedimentary rocks within and among northernmost parts of the Laurentian, Baltican, Barentsian and Siberian paleocontinents; and to contribute to compilation of paleogeographic maps for the Silurian and Devonian..

During 1996 we had workshops in Uppsala (convenor J. Peel), Edmonton (M. Wilson), Tallinn (T. Marss) and Vilnius (V. Talimaa), and we participated in the James Hall Meeting in Rochester. In these workshops we dealt with the paleontology and biostratigraphy of different faunal groups, and palaeogeography of Arctic regions

Monika Masiak (Poland)

I am continuing my research on Silurian acritarchs.

Alexander (Sandy) McCracken (Canada

Conodont biostratigraphy, *in* Silurian of Canada (correlation chart co-ordinated by B.S. Norford; multiauthored ms).

Michael Melchin (Canada)

Is working mainly on graptolites (especially early Silurian) from arctic and eastern Canada. His research is focusing on morphology, systematics, biostratigraphy, autecology (especially hydrodynamics), biodiversity and extinction patterns, and new study methods such as infrared video microscopy.

S.V. Melnikov (Russia)

I am finishing a manuscript on a monographic study "Ordovician and Silurian conodonts of the Timan - North Urals region". The conodonts are studied both from borehole sections and key outcrop sections of Sub-Polar Urals, the Chernyshev Ridge and Kanin Peninsula. The conodont taxa will be decribed and the problems of ecology and stratigraphy discussed. I also participated in IGC Project 406 "Circum Arctic Lower- Middle Palaeozoic vertebrates". 7-12 October I was in Tallinn at the workshop of the Project 406, and Baltic Stratigraphical Conference.

Donald G. Mikulic (U.S.A.)

Continues his work on Silurian trilobites and Fossil Konservat Lagerstätten. He and Joanne Kluessendorf found a second locality for the Waukesha soft-bodied biota and they are currently working on a new Silurian soft-bodied locality with Bill Hickerson (Augustana College), which he discovered in Iowa. In addition, Mikulic and Kluessendorf are making substantial progress on determining the sequence stratigraphy of the central U.S. with biostratigraphic assistance from Rod Norby (Illinois State Geological Survey) and Mark Kleffner (Ohio State University).

Giles Miller (UK)

Present and proposed research on Silurian topics: at present I am working on samples collected for conodonts and fish scales/remains from Welsh Borderland sections (Wenlock to Pridoli). This work is in conjunction with Tiiu Marss (Estonian Academy of Sciences) who visited Britain in June 1995. Samples are still being processed in Britain (Natural History Museum and National Museum of Wales) and Estonia. With the data we hope to improve the global biozonal scheme for conodonts and other vertebrates.

T.L.Modzalevskaya (Russia)

Tatjana Modzalevskaya continues her researches on Ordovician (with L.R.M.Cocks), Silurian and Lower Devonian (with F.Alvarez, M.A.Rzonsnitskaya, V.I.Pushkin) brachiopods, including their morphology and biostratigraphy. She is currently studing on Silurian brachiopods of the Severnaya Zemlya archipelago and their paleogeographical significance, and of Kazakhstan (with L.E.Popov).

Mike Murphy (USA)

I am engaged in a cooperative study with Peter Carls and Nacho Valenzuela of the high Silurian and low Devonian conodont faunas from Nevada, Spain, Germany, Austria and the Czech Republic with Chlupac, Schönlaub, Walliser and Weddige as consultants. We hope to revise some of the taxonomy of the difficult taxa and to comeup with some tighter correlations in the Lochkovian and high Silurian.

L. Nekhorosheva (Russia)

My present work: Llandoverian Bryozoa of Taimyr.

Some months ago I completed the report: Silurian paleobiogeography of the northern regions of Russia

Heldur Nestor (Estonia)

Present research: Composing chapters on Silurian stratigraphy, development of basin and life for a regional geological monograph "Geology and mineral resources of Estonia".

Viiu Nestor (Estonia)

Present research: Silurian chitinozoans of Baltoscandia: taxonomy and biostratigraphy, reflection of oceanic and climatic cyclicity in chitinozoan assemblages.

Godfrey Nowlan (Canada)

Present Research: Most current work is on the Cambrian and Ordovician. Sadly Alberta lacks Silurian rocks, as a recently completed study of the Lower Paleozoic in the subsurface of the Western Canada basin has confirmed (Nowlan et al., 1995). Some Silurian work is still in progress: taxonomic study of Early Silurian conodonts from eastern Canada and study of Llandovery conodonts from boreholes in the Williston Basin as part of a study of the Ordovician -Silurian boundary interval.

Proposed Research: With the severe financial cutbacks felt in all areas of scientific research in Canada more cooperative research is a necessity because of the advantage of pooling funds from different sources. At the moment, planning is under way (by Nowlan, deFreitas and Melchin) for a project to start in April 1998 on biostratigraphy of the Cape Phillips Formation and adjacent platformal units in the Arctic Islands. Much work has been done in the past on graptolites from this region, but the focus of this project would be to tie together the excellent graptolite zonation developed by Alf Lenz, Mike Melchin and others with conodont, radiolarian, acritarch, chitinozoan and other fossil group's biostratigraphy. The idea is to select the best sections and collect them for as many fossil groups as possible in a single coherent stratigraphic framework. The benefits of this project will be mainly the intercalibration of the different zonations which has proved so difficult because graptolites are found in so many places without many associated fossils. The Cape Phillips Formation provides an excellent opportunity to solve some of the problems of intercalibration of the various zonal schemes that became apparent in the recent attempts by the Subcommission to develop a globally useful left hand column for correlation charts.

Renata Olivieri (Italy)

She continues her studies on conodont taxonomy and biostratigraphy of Silurian and Devonian sequences from South Sardinia.

Florentin Paris (France)

My recent activity on Silurian material focussed mainly on chitinozoan biostratigraphy of early Silurian strata of Saudi Arabia (collaboration with S. Al-Hajri, Saudi ARAMCO) and of latest Silurian deposits of Ukraine (with Y. Grahn, Sweden) and Algerian Sahara (with K. Boumendjel, SONATRACH). In collaboration with Ch. Lecuyer (ENS Lyon, France) I made also preliminary investigations on the stable carbon isotope ratios of various organic walled microfossils preserved in marine sediments of Silurian age (sorted populations of chitinozoans, graptolites, Eurypterids, leiospheres...). The aim of this study was to evaluate the significance of global $d^{13}C$ records of marine sediments through time.

José Manuel Piçarra (Portugal)

Research: Stratigraphy of the Lower Paleozoic of south Portugal (Ossa Morena Zone); Silurian graptolites of Portugal (with A. Lenz, P. Storch, and J.C. Gutiérrez-Marco); involved in the IGCP Project 351 "Early Paleozoic evolution of NW Gondwana".

John B. Richardson (UK)

Marine-nonmarine correlation at the Ludfordian-Pridoli and Silurian-Devonian boundaries. Work in Britain has yielded a sequence of rich cryptospore - miospore asemblages through Silurian and Lower Devonian sections. In collaboration with Rodriguez of Leon University spore sequences are currently under study from sections in the Cantabrian Mountains where a similar but expanded spore zonation can be recognized to those previously made in North Africa by Richardson and Ioannides (1973) and Al-Ameri (unpublished) and Britain (Richardson et al. 1982, 1984, Burgess and Richardson 1995). We hope to test the marine - nonmarine correlation and extend the work into other parts of the world. In addition to spores, the Spanish sections also contain chitinozoans, well-known through the works of Cramer, but in need of considerable revision, and these fossils will be used to link the spore sequences to the Czech stratotypes and Podolian sections, where chitinozoan distributions are known through the works of Paris, to the sequences of Britain and Spain. Thje project is financed for three years by a NERC grant which pays for my Research Assistant Stuart Sutherland and a Senior Research Technician Ms. Denise Darwin. S. Sutherland has worked previously on the chitinozoans from the Silurian type sections from the Welsh Borderland. Work has continued with Dianne Edwards on *in situ* spores from the Pridoli - Lochkovian especially in the Anglo-Welsh area. So far no plants have been found in the Spanish sequences but spore masses occur in some of the sections.

J. Keith Rigby (USA)

JoAnn Nelson, British Columbia Geological Survey, Brian Norford, University of Calgary, and I are currently working on the description of Silurian sponges from northern British Columbia. The faunas are largely hexactinellid sponges that have been collected from siltstones of the early Silurian of the Upper Road River Group. The collections add considerably to the known Silurian sponges from western Canada, partincularly from the outer continental margin black shale facies. Our work is nearing completion and we'll submit a manuscript to the Journal of Paleontology soon.

Claudia Rubinstein (Argentina)

Claudia V. Rubinstein is continuing her studies of Silurian and Devonian palynomorphs (acritarchs, cryptospores, spores and chitinozoans) from the Precordillera basin and the Macizo de San Rafael of Argentina, their taxonomy, biostratigraphy and paleogeography. Other projects include a research project together with Philippe Steemans (Liege, Belgium) and Alain Le Hérissé (Brest, France) on palynology of the Silurian-Devonian boundary of the Paleozoic basins from Brazil. In 1997 she will continue studies on Silurian and Silurian-Devonian boundary strata of Argentina, mainly on

spores and cryptospores, in collaboration with P. Steemans. Other works are planned with Edsel Brussa (Cordoba, Argentina) on Silurian palynomorphs and graptolites.

Olof Sandstrom (Sweden)

Present research: Silurian reefs on Gotland, Sweden, sedimentology and paleoecology; event stratigraphy

Enrico Serpagli (Italy)

Topics: Biostratigraphy and paleoenvironments in the Mediterranean area. A study on taxonomy and evolution of some conodont groups is in progress. Lithostratigraphic units for the Silurian-early Devonian of SE Sardinia will be soon proposed (with S. Barca, C. Corradini & A. Ferretti). An analysis on Silurian graptolite limestones from Sardinia with A. Ferretti is in progress.

Derek Siveter (UK)

Work continues on Silurian trilobites. In 1997 Briggs, Siveter and Siveter (see Nature, 1996) hope to begin detailed work on the recently discovered soft-bodied fauna. Also isotope work on Silurian material, with colleagues from Oxford, is maintained.

R.F. Sobolevskaya (Russia)

A manuscript on Ordovician and Silurian graptolites of Novaya Zemlya with a description of 113 species (with T.N. Koren) is in press. Work on Ordovician and Silurian graptolites and stratigraphy of Taimyr is continuing, and plans are to publish an atlas of the faunas in 1998.

Constance Soja (USA)

Present and proposed research on Silurian topics: A supplement to my NSF-Alaska grant enabled me to begin a research collaboration this year with Dr. Anna Antoshkina, Russian Academy of Sciences, Syktyvkar. Over the next two years, we will be visiting each other's field sites in Alaska's Alexander terrane and the Ural Mountains to continue investigating similarities and differences in Silurian stromatolite and reef-related deposits.

Carl Stock (USA)

Research on all aspects of stromatoporoid paleontology. Current projects involve 1) the Llandovery recovery of stromatoporoids following the end-Ordovician mass extinction, and 2) the origin and Silurian diversification of the order Actinostromatida.

Sven Stridsberg (Sweden)

Continues studies of Paleozoic cephalopods, mainly Silurian. Functional morpholgy and global distribution.

Des Strusz (Australia)

Retires (somewhat earlier than expected) from the Australian Geological Survey Organisation in mid-November, but intends keeping up his palaeontological research. With no curatorial duties, even 2-3 days a week on palaeontology should reduce the considerable gestation period for papers. There is a good chance that the current E-mail address (dstrusz@agso.gov.au) will remain available, but logging on will not be a daily occurrence! Likewise he will eventually get faxes sent to the current number {616} 249 9983. Correspondence should go to: 97 Burnie Street, Lyons, Australia 2606. Home telephone (and fax/modem, when the computer's switched on) is {616} 281 4569. All Canberra numbers will be changing in the second half of 1997.

In the final stage of preparation (at last) is a joint paper with Wright, Percival, Pickett and Byrnes on a new large trimerellid from the Wenlock of New South Wales. Work should then resume on a revision of the Silurian-Devonian chonetids of southeastern Australia. Beyond that lies revision of the brachiopods of the Yass Syncline sequence.

Su Yangzheng (China)

Outline of research: Ordovician and Silurian brachiopods and Paleozoic stratigraphy of northeastern China.

Stuart Sutherland (UK)

I currently working with John Richardson at the Natural History Museum on the palynology of late Silurian - early Devonian sediments of Cantabria, northern Spain.

Alan T Thomas (UK)

Silurian research over the last year has principally involved completion of a manuscript on trace fossils from the UK and Australia - a bit of a change for me. The MSS is now off to Palaeontology.

Judi Thorogood (UK)

The working title for my thesis is: The volcanic evolution and stratigraphic significance of bentonites from the Silurian Welsh Basin: a correlative study by LA-ICP-MS and Isotope analysis.

ABSTRACT: This project will use the experience and knowledge gained in a preliminary study using the ICP-MS facility at Aberystwyth University, together with isotope analyses, in order to fingerprint heavy mineral separates and glassy melt inclusions within altered ash deposits (bentonites). These results will then be used to erect a comprehensive framework for correlation within the lower Silurian of the Welsh Basin. Principal areas of interest lie in the U. Llandovery (Telychian) / L. Wenlock (Sheinwoodian) boundary, where the stratotype occurs associated with a shelly fauna of limited extent. At this

level a much more extensive deep water, graptolitic fauna has recently been described (Loydell & Cave 1996), but this cannot be directly correlated with the stratotype.
NERC small grant GR9/1129 (Loydell & Cave 1996) began the work of establishing a detailed correlation between British graptolitic sequences and graptolitic sequences world-wide. By studying bentonites in these successions, this project will offer a geochemical means of correlation and provide a tool for use in areas devoid of graptolites. In addition, correlations between shallow and deep water sequences should be enabled.
Geochemistry of the melt inclusions in quartz xenocrysts will further provide information on the petrogenetics of the bentonites and possible source areas. It may be possible to correlate these sequences with bentonites from other countries, such as Scandinavia and North America, which are known to be of similar age.

Jacques Verniers (Belgium)

Subjects of M.Sc. theses include in 95-96 (1) a Chitinozoa biozonation of the Silurian inliers from the Midland Valley of Scotland (Pentland Hills)(S. De Smet); (2) a litho- and biostratigraphical study with Chitinozoa of the Late Ordovician and Silurian outcrop area of Nivelles (Brabant Massif)(B. Diependale); (3) a structural study of the Gorstian outcrop of Ronquieres (Brabant Massif)(T. De Backer) and in 96-97 (4) a litho- and biostratigraphical study with Chitinozoa of a Late Ordovician and Silurian outcrop area of Enghien (Brabant Massif).
J. Verniers continues the study of Chitinozoa from the Wenlock from Builth Wells, Wales, where Jan Zalasiewicz (Leicester) and Mark Williams (BGS, Nottingham) have restudied the graptolites in the type area of the Wenlock graptolite zonation (Elles, 1900). The acritarchs and spores will be studied by M. Jachowicz (Sosnowiec). First preliminary results were presented at the James Hall Meeting. He continues also the study of the Silurian outcrop areas of the Brabant Massif (the past and following year the Sennette valley). A Chitinozoa biozonation of the Silurian of the Ossa Morena area is also planned in collaboration with M. Robardet and F. Paris (Rennes, France).

Viive Viira (Estonia)

Outline of reseach: Wenlockian - Pridolian conodonts of Estonia and Latvia.

Tony Wright (Australia)

Reports the following projects: 1. Rickards & Wright. Late Wenlock graptolites and brachiopods from Cobblers Creek, NSW. (to be submitted to the Records of the Australian Museum). This is a *ludensis* Biozone fauna of some 8 graptoloids and 2 brachiopods. 2. graptolites from Iran (with Rickards & Hamedi) This includes more material from the Banestan locality but more importantly material from 2 main localities in the Zagros, and is mostly Silurian material, but includes a high Ordovician fauna. An interseting aspect of this study has been unearthing some old Anglo-Iranian Petroleum co. unpublished reports in the archives at Sunbury in London. One as yet unlocated BP report by Kheradpir and Nicol (1973) is eagerly sought, so if anyone can help with Nicol, that will be most appreciated. 3. Rickards, Wright & Gordon Packham are re-examining the ?Pragian graptolites from Limekilns, NSW. 4. Rickards, Wright, Paul Carr & Brian Jones (the Wollongong one!) are studying a well-preserved Llandovery fauna of monograptids, especially *M. exiguus*-like forms, from near Bungonia, NSW. Material like this age from Bungonia has been known for about 60 years, but never studied.

Evgeny A. Yolkin (Russia).

Projects include: 1. Continued study of the Silurian and Devonian event-stratigraphy of the Altai-Sayan Folded Area [with some support from the Russian Foundation for the Basic Researches - RFBR, for the team: E.A.Yolkin (leader), N.V.Sennikov, N.K.Bakharev, N.G.Izokh, A.G.Kletz, A.Yu.Yazikov]; 2. Continued study of the subsurface Paleozoic of the Western Siberian Plain; 3. Started study on the project Information-research complex "BIOCHRON" [with support from the RFBR for the team: N.V.Sennikov, (leader, graptolites), E.A.Yolkin (curator on paleontology, conodonts), O.A.Betekhtina (non-marine bivalves), R.T.Gratsianova, A.G.Kletz and A.Yu.Yazikov (brachiopods), N.G.Izokh and T.A.Moskalenko (conodonts), V.N.Yolkina (curator on computer programming), T.P.Kipriyanova, N.V.Semyonova and E.N.Shemyakina (programming)]; 4. Collaborative project is being discussed on Silurian stratigraphy, paleontology, sedimentology and paleogeography of the Altai-Tuva territory (with M.Basset, Derek Siveter, David Siveter, F.Ettenson and J.Barrik).

Zhang Yuan-dong (China)

Is currently working in Canada with A.C. Lenz on the Homerian, Ludlow and early Devonian graptolites from Southwest Yunnan, China. He will return to Nanjing in January, 1997.

SILURIAN PUBLICATIONS FOR 1995-1996:

Aldridge, R.J. and Jeppsson, L. in press. The Wenlock-Pridoli recurrent condont associations. In Boucot, A.J. and Lawson, J.D. (eds.). Paleocommunities: a case study from the Silurian and Lower Devonian.

Al-Hajri, S. & Paris, F (in press). Age and paleoenvironment of the Sharawra Member (Silurian of north-western Saudi Arabia). Geobios

Antoshkina, A.I. (in press). Genesis of the Upper Carboniferous-Lower Permian carbonate massif in the Subpolar Urals. Proceedings Volume XIII IGC. Krakov.

Antoshkina, A.I. (in press). Organic buildups and reefs on the Paleozoic carbonate platform margin, Pechora Urals. Sedimentary Geology.

Antoshkina, A.I. (in press). Aphrosalpingid-Fistulella biota in Middle Paleozoic reefs. Reports of Russian Academy of Sciences (in Russian).

Antoshkina, A.I. 1996. Ordovician reefs of the Urals. Facies, 35: 1-8.

Antoshkina,A.I. 1996. About boundaries of the Silurian in the Timan-Urals region. Silurian Times, 4:13-14.

Armstrong, H. A. & Dean, M. T. 1996. Conodonts from Ruddenleys, Lamancha and Crawford, Southern Uplands, Scotland. B.G.S. Technical Report WH/96/192R.

Armstrong, H. A. 1996. Biotic recovery after mass extinction-the role of climate and ocean-state in the post-glacial (Upper Ordovician-Lower Silurian) recovery of the conodonts. In, Hart M. B. (ed.) Biotic Recovery from Mass Extinction Events. Geological Society London Special Publication 102, 105-117.

Armstrong, H. A., Johnson, E. W. & Scott, R. 1996. Conodont biostratigraphy of the attenuated Dent Group (Upper Ordovician) at Hartley Ground, Broughton in Furness. Proceedings of the Yorkshire Geological Society, 51, 9-23.

Armstrong, H. A., Owen, A. W., Scrutton, C. T., Clarkson, E. N. K. & Taylor, C. 1996. Evolution of the Northern Belt, Southern Uplands-implications for the Southern Uplands controversy. Journal of the Geological Society, London, 153, 197-205.

Barrick, J.E. 1996. The Silurian stratigraphic succession in the southern Midcontinent region of North America. The James Hall Symposium: Second International Symposium on the Silurian System. Program and Abstracts, p. 27.

Bergstrom, S. M. and Bergstrom, J. 1996. The Ordovician-Silurian boundary successions in Ostergotland and Vastergotland, S. Sweden. GFF, 118:25-42.

Bergstrom, S. M., Huff, W. D.,, Ortega, D. and Kolata, D. R. 1996. Early Silurian (Llandoverian) K-bentonites in the Southern and Central Appalachians: New discoveries and their significance. Geological Society of America Abstracts with Programs, 28:A-504.

Birkmann, H. and Lundin, R. F., 1996, Confocal microscopy: potential applications in micropaleontology. J. Paleontol. 70(6): 1084-1087.

Bogolepova, O.K. 1996. The basal Silurian of Eastern Siberia. Newsletters in Stratigraphy. 33(2): 63-75.

Bogolepova, O.K. 1996. The cephalopod limestone biofacies: Tajmyr - the Carnic Alps. Stratigraphy. Geological Correlation. 4(3): 105-109 (in Russian)

Bogolepova, O.K. and Holland, C.H. 1995. Concentrations of Silurian cephalopods from Russia and Kazakhstan. Acta Palaeontologica Polonica, 40 : 429-436.

Bogolepova, O.K. & Kriz, J. 1955. Ancestral forms of Bohemian type Bivalvia from the lower Silurian of Siberia (Tungusskaja Syneclise, Russia). Geobios, 28, 6: 691 - 699.

Boucot, A.J. & Kriz, J. in press. Definition of the terms "homologous" and "analogous" community. Cambridge University Press,.

Bounendjel, K & Paris, F. (in press) Chitinozoaires du Dévonien d'Ougarta (Sahara occidental, Algérie). Annales de la Société Géologique du nord.

Bradshaw, M. A. 1995. Stratigraphy and structure of the Lower Devonian rocks of the Waitahu and Orlando Outliers, near Reefton, New Zealand, and their relationship to the Inangahua Outlier. New Zealand Journal of Geology and Geophysics 38: 81-92.

Briggs, D. E. G., Siveter, David J. and Siveter, Derek J. 1996. Soft-bodied fossils from a Silurian volcaniclastic deposit. Nature, 382: 248-250.

Bull, E. E., and Loydell, D.K. 1995. Uppermost Telychian graptolites from the North Esk Inlier, Pentland Hills, near Edinburgh. Scottish Journal of Geology 31: 163-170.

Bull, E., Armstrong, H. A. & Scrutton, C. 1995. Biostratigraphic correlation of graptolites, conodonts and corals in the Upper Telychian of Scotland. Palaeontological Association, Annual Meeting, December, University College Galway.

Burgess, N and Richardson, J.B. 1995. Late Wenlock to early Pridoli cryptospores and miospores from south and southwest Wales. Palaeontographica B, 236:1-44.

Burrow, C.J. & Simpson, A.J. 1995. A new ischnacanthid acanthodian from the Late Silurian (Ludlow, ploeckensis Zone) Jack Formation, north Queensland. Memoirs of the Queensland Museum, 38(2): 383-395.

Cave, R., and Loydell, D.K. in press. The eastern margin of the Aberystwyth Grits Formation Geological Journal.

Chen Xu, and Loydell, D.K. in press. Restudy of the type species of *Sinodiversograptus* Mu and Chen, 1962. Palaeoworld.

Chi Yongyi, Su Yangzheng and Nan Runshan. 1996. Age, division and correlation of "Hulan Group" , Liaoyuan District, Jilin. Acta Geoscientia Sinica, 17 (42): 140-147.

Clarkson, E. N. K, D. A. T. Harper, and J. S. Peel. Taxonomy and palaeoecology of the mollusc Pterotheca in Scotland. Lethaia 28, 101-114.

Clarkson, E. N. K., D. A. T. Harper, and N. Hoey. (in review) Basal Wenlock biofacies from the Girvan district, SW Scotland. Scottish Journal of Geology. early Devonian in south-western Sardinia. Rendiconti del Seminario della

Cocks L.R.M. & Modzalevskaya, T.L. (in press). Late Ordovician brachiopods from Taimyr, Arctic Russia, and their paleogeographical significance. Palaeontology.

Corradini, C. & Olivieri, R. (in press). Conodont biostratigraphy of some supplementary sections in the Sardinian "Ockerkalk" (Upper Silurian)". Bollettino del Museo Regionale di Scienze Naturali di Torino.

Cullum, A.A., and Loydell, D.K. in press. A new species of *Neodiplograptus* from the Middle Llandovery of the Rheidol Gorge, Wales. Journal of the Czech Geological Society.

Cullum, A.A., and Loydell, D.K. in press. A new species of *Neodiplograptus* from the Middle Llandovery of the Rheidol Gorge, Wales. Journal of the Czech Geological Society.

Dalingwater, J.E., Hutchinson, S.J., Mutvei, H. & Siveter, D.J. (in press). Mineralization of some Silurian homalonotid trilobite cuticle. Bulletin de l'Institut Oceanographique de Monaco, 6pp., 3 pls.

de Freitas, T and Mayr, U. (in press). Upper Ordovician to Lower Devonian carbonate platforms (Richmondian to Emsian) and Boothia Uplift synorogenic succession. in U. Mayr, T. de Freitas, B. Beauchamp, G. Eisbacher. The Geology of Devon Island north of 76, Canadian Arctic Archipelago. Geological Survey of Canada, Bulletin.

de Freitas, T. and Dixon, O.A. 1996. Lower Paleozoic stratigraphy and tectonics, Canadian Arctic Islands. James Hall Meeting on the Silurian System, Rochester New York, Program with Abstracts, p. 44.

de Freitas, T., Dixon, O.A., and Trettin, H.P. 1996. Silurian System of the Canadian Arctic Islands. James Hall Symposium (Silurian Symposium), Rochester, New York, Program with Abstracts, p. 45

de Freitas, T., Harrison, J.C., and Mayr, U. 1997. Sequence stratigraphic correlation charts of the Canadian Arctic Islands and parts of North Greenland. Geological Survey of Canada Open File Report.

Donovan, S.K. 1995 No evidence for an echinoderm equivalent of the Hirnantia fauna. Modern Geology, 20:11-19.

Donovan, S.K. and Pickerill, R.K. 1995. A camerate crinoid from the Upper Silurian (Ludlow) Moydart Formation of Nova Scotia, Canada. Atlantic Geology, 31:81-86.

Donovan, S.K. and Pickerill, R.K. 1995. Crinoid columnals preserved in life position in the Silurian Arisaig Group of Nova Scotia, Canada. Palaios, 10:362-370.

Donovan, S.K. and Wright, A.D. 1995. Pelmatozoan (crinoid?) columnals from the Hirnantian (Ordovician, Ashgill) of Keisley, Cumbria, UK. Proceedings of the Yorkshire Geological Society, 50:229-238.

Donovan, S.K., R.K. Pickerill, D.G. Mikulic, and J. Kluessendorf. in press. Upright crinoids of the Thornton Reef, Wenlock (Silurian) of Illinois, U.S.A. Geological Journal 32.

Dufka, P. & Gnoli, M. 1996. A report on Silurian and lowermost Devonian chitinozoans from South-western Sardinia. Bollettino della Società Paleontologica Italiana, 34(3): 263-269.

Dufka, P., Kriz., J, & Storch, P. 1995. Silurian graptolites and chitinozoans from the Uranium industry boreholes drilled in 1968-1971. (Prague Basin, Bohemia). Vestnik CGU, 70: 5-11.

Edwards, D., Davies, JK.L., Richardson, J.B. and Axe, L. 1995. The ultrastructure of spores of *Cooksonia pertoni* Lang. Palaeontology, 38:153-168.

Edwards, D., and Richardson, J.B. 1996. Chapter 14A Integrated palynologial and palaeobotanical approaches to phyto-terrestrialization in the Silurian and the early Devonian. *In* Jansonius, J. and McGregor, D.C. (eds.), Palynology: principles and applications, AASP Volume 1.

Edwards, D., Davies, K.L., Richardson, J.B., Wellman, C.H. and Axe, L. 1996. Ultrastructure of *Synorisporites downtonensis* and *Retusotriletes* cf. *coronadus* in spore masses from the Pridoli of the Welsh Borderland. Palaeontology, 39:783-800.

Edwards, D., Duckett, J.G. and Richardson, J.B. 1995. The earliest land plants: a hepatic connection? Nature, 374:635-636.

Edwards, D., Fanning, U., Davies, K.L., Axe, L and Richardson, J.B. 1995. Exceptional preservation in coalified fossils from the Welsh Borderland: reniform sporangia lacking thickened borders. Bot. J. Linn. Soc. 117:233-254.

Edwards, D., Selden, P.A., Richardson, J.B. and Axe. L. 1995. Coprolites as evidence for plant-animal interaction in Siluro-Devonian terrestrial ecosystems. Nature, 377:329-331.

Eriksson. M., 1996. Taxonomy and palaeoecology of some labidognathid polychaetes from the Lower Silurian of Gotland. (extended abstract), Geologiska Föreningens i Stockholm Förhandlingar 118, Jubilee Issue. p. A59.

Evans, D.E. and Holland, C.H.1995. The nautiloid cephalopod Order Endocerida in the Silurian. Palaeontologische Zeitschrift , 69:343-352

Ferretti, A. & Serpagli, E. (in press). Geological outline, community sequence and palaeoecology of the Silurian of Sardinia. Rivista Italiana di Paleontologia e Stratigrafia, 102(3).

Ferretti, A., Gnoli, M., Kriz, J. & Serpagli, E. 1955. The Silurian and early Devonian in south-western Sardinia. Rendiconti del Seminario della Facolta di Scienze dell'Universita di Cagliari, suppl. vol. LXV: 106 -117.

Fu Lipu. 1996. Arenigian graptolites in Qinling mountain, Ziyang. Acta Palaeontographica Sinica, 35 (5).

Fu Lipu. 1996. Biogeographic structure on bipolarity in the Ordovician Period. 30th International Geological Congress, 2: 104.

Gentzis. T, de Freitas, T.A., Goodarzi, F., Lenz, A.C., and Melchin, M.J. 1996. Graptolite reflectance as an indicator of thermal history in Arctic Canada. AAPG Bulletin, 80, p.1065-1084.

Gnoli, M. (in press). A further contribution towards the taxonomic revision of Silurian Nautiloid cephalopods erected and/or reported by J. Barrande in the last century in the Barrandian (Central Bohemia). Acta Universitatis Carolinae

Gnoli, M. 1996. Occurrence of Bohemian-type Phragmoceratid (Nautiloidea) from the Silurian of South-western Sardinia. Accademia Nazionale di Scienze, Lettere ed Arti di Modena, Collana di Studi, 15:355-360.

Gutiérrez-Marco, J.C., Lenz, A.C., Robardet, M. and Piçarra, J.M. 1996. Wenlock-Ludlow graptolite biostratigaphy and extinction: a reassessment from the southwestern Iberian Peninsula (Spain and Portugal). Canadian Journal of Earth Sciences, 33:656-663.

Harris, M. T., and Sheehan, P. M., 1996, Upper Ordovician - Lower Silurian Sequences determined from inner shelf sections, Barn Hills and Lakeside Mountains, Eastern Great Basin: in Witzke, B. J., Ludvigson, G. A., and Day, J. E., eds., Paleozoic Sequence Stratigraphy: North American Perspectives - Views from the North American Craton, GSA Special Publication 306, p 161-176.

Harris, M. T., and Waldhuetter, K. R., 1996, Silurian of the Great Lakes Region III: Llandovery Strata of the Door Peninsula, Wisconsin: Contributions to Biology and Geology, Milwaukee Public Museum, n. 90, 162 p.

Harris, M. T., Muldoon, M. A., and Stieglitz, R. D., eds., 1996, The Silurian Dolomite Aquifer of the Door Peninsula: Facies, Sequence Stratigraphy, Porosity and Hydrogeology, Guidebook for Great Lakes Section of SEPM Fall 1996 Field Conference, 121 p.

Harrison, J.C. and de Freitas, T. 1996. New mineral occurrence and geological setting for mineral exploration in the Canadian Arctic Islands. Geological Survey of Canada, Current Research, Paper 96B, p. 81-90.

Harrison, J.C., de Freitas, T., and Brent, T. 1996. Nature and timing of recurrent faulting in the Innuitian Orogen, Arctic Canada. Geological Society of America, Abstracts with Programs, p.447-448.

Holland, C.H. (in press). The nautiloid cephalopod Order Actinocerida in the British Silurian. Palaeontology.

Hou Xianguang, Siveter, David. J., Williams M., Walossek, D. & J. Bergstrom, J. 1996. Appendages of the arthropod Kunmingella from the early Cambrian of China: its bearing on the systematic position of the Bradoriida and the fossil record of the Ostracoda Philosophical Transactions of the Royal Society London B, 351, 1131-145.

Jacobsson, C. M. 1996. Storm deposition on a Silurian prograding carbonate ramp, Gotland, Sweden. GFF, In press.

Jeppsson, L. 1996. Silurian events- a review of the knowledge in 1996. James Hall Symposium Program and Abstracts. University of Rochester August 4-9, 1996, p. 59.

Jeppsson, L. in press. The anatomy of the mid-Early Silurian Ireviken Event. In Brett, C.C. (ed.). Paleontological Event Horizons, Ecological and Evolutionary Implications. Columbia Press.

Johnson, M.E. 1996. Silurian event horizons related to the evolution and ecology of pentamerid brachiopods. in Brett, C.E. and Baird, G.C. (eds), Paleontological Event Horizons, Their Ecological and Evolutionary Implications. Columbia University Press, p. 162-180.

Johnson, M.E. 1996. Stable cratonic sequences and a standard for Silurian eustasy. in Witzke, B.J., Ludvigson, G.A., and Day, J.E. (eds.), Paleozoic sequence stratigraphy: Views from the North American craton. Geological Society of America Special Paper 306:203-211.

Kaljo, D., Boucot, A.J., Corfield, R.M., Le Herisse, A., Koren, T.N., Kriz, J., Mannik, P., Marss, T., Nestor, V., Shaver R.H., Siveter, D.J. & Viira, V. 1996. Silurian Bio-Events. In: Walliser, O. (ed.). Global Events and Event Stratigraphy in the Phanerozoic. Springer-Verlag, 173-224.

Kiselev G.N.,Modzalevskaya, T.L., Savitsky, Yu.V. (in press). Atlas nonammonoid cephalopods and brachiopods of Silurian and Lower Devonian deposits of Turkestanian Ridge. S.Petersburg University Publ.House.

Kleffner, M.A. and Barrick, J.E. 1996. Development of a North American Southern Midcontinent Silurian (Upper Llandovery-Wenlock) composite, correlation with a global Silurian composite, and implications for Wenlock conodont zones and conodont phylogeny. In Repetski, J.E.,(ed), Sixth North American Paleontological Convention Abstracts of Papers, The Paleontological Society Special Publication 8:211.

Kleffner, M.A., and Barrick, J.E. 1996., A revised conodont- and graptolite-based Silurian chronostratigraphy developed by graphic correlation. The James Hall Symposium: Second International Symposium on the Silurian System. Program and Abstracts, p. 64.

Kluessendorf, J., and Mikulic, D. G. 1996. An early Silurian sequence boundary in from the North American craton. In: B.J. Witzke, et al. (eds.) Paleozoic sequence stratigraphy: Views from the North American craton. Geological Society of America Special Paper 306 : 177-186.

Kluessendorf, J., and Mikulic, D.G. in press. Sequence stratigraphy and depositional environments of Silurian strata in southeastern Wisconsin. Wisconsin Geological & Natural History Survey, Field guide for the Geological Society of America -North Central Section.

Koren T.N, Lenz, A.C., Loydell, D.K., Melchin, M.J., Storch, P. & Teller, L. 1996. Generalized graptolite zonal sequence defining Silurian time intervals for global paleogeographic studies. Lethaia, Vol. 29, pp. 59-60.

Koren T.N. & Rickards, R.B. In press. An unusually diverse Llandovery (Silurian) diplograptid fauna from southern Urals of russia and its evolutionary significance. Special Papers in Palaeontology. The Palaeontological Association.

Koren, T.N. & Bjerreskov, M. 1996. The generative phase and the first radiation in the early Llandovery monograptids. 6th NAPC Convention Abstracts of papers. Smithsonian Institution, washington, D.C., June 9-12, 1996. Paleontolgical Society Special Publication, No. 8: 217.

Koren, T.N. & Bjerreskov, M., In press. Early Llandovery monograptids from Bornholm and South urals: taxonomy and evolution. Bulletin of Geological Society of Denmark.

Koren, T.N. & Rickards, R.B., 1996. Taxonomy and evolution of Llandovery biserial graptoloids from the Southern Urals, western Kazakhstan. Special Papers in Palaeontology. 54. The Palaeontological Association. p. 103.

Koren, T.N., Degtjarev, K.E., Kovalevsky, O.P., Modzalevskaya, T.L. & Popov, L.E. 1996. Kazakhstan in the Silurian. The James Hall Symposium: Second International Symposium on the Silurian System. Program and Abstracts.University of Rochester, August 4-9, 1996, p. 66.

Kozlowska-Dawidziuk, A. in press. Some phylogenetical observations on the retiolitid graptolites from the East European Platform. Acta Palaeontologica Polonica.

Kriz, J. & Bogolepova, O.K. 1995. Cardiola signata Community (Bivalvia) in cephalopod limestones from Tajmyr (Gorstian, Silurian, Russia). Geobios, 28, 5: 573 - 583.

Kriz, J. 1996. Silurian Bivalvia of Bohemian type from the Montagne Noire and Mouthoumet Massif, France. Palaeontographica, (A)., Bd. 240: 29 - 63.

Kriz, J. in press. Bivalvia dominated communities of Bohemian type from the Silurian and Lower Devonian carbonate facies. Cambridge University Press.

Kriz, J. in press. *Majda* nov. gen. the oldest known nektoplanktic bivalve from the Pridoli (Siluirian) of Europe. Geobios.

Legrand, P. 1994. Sea-level and fauna change during the late Wenlock and earliest Ludlow (Silurian): a point of view from the Algerian Sahara. Historical Biology, 7:271-290.

Legrand, P. 1995. Apropos d'un niveau à *Neodiplograptus* dans le Silurien inférieur à l'est de Oualléne, Aserjad (Sahara algérien). Implications stratigraphiques et paléogéographiques. *In* 118° congr. nat. soc. et scient., Pau 1993, Actes IV° coll. Géologie africaine, 409-424.

Legrand, P. 1996. Etages et zones de graptolites: définition et validité, l'exemple du Silurian inférieur. Bull. Soc. géol. France, 167:29-38.

Lenz, A.C and Melchin, M.J. (in press). Phylogenetic analysis of the Silurian Retiolitidae. Lethaia.

Lenz, A.C. 1995. Upper Homerian (Wenlock, Silurian) graptolites and graptolite biostratigraphy, Arctic Archipelago, Canada. Canadian Journal of Earth Sciences, 32:1378-1392.

Lenz, A.C. and Melchin, M.J. In press. Phylogenetic analysis of the Silurian Retiolitidae (graptolites). Lethaia.

Lenz, A.C. and Thorsteinsson, R. In press. Fusellar banding in Silurian retiolitid graptolites. Journal of Paleontology.

Lenz, A.C., Chen, X and Ni, Y-n. 1996. Wenlock, Ludlow and Pridoli? graptolites from Yulin, Guangxi, China. Canadian Journal of Earth Sciences, 33:1390-1401.

Lenz, A.C., Robardet, M., Gutiérrez-Marco, J.C. and Piçarra, J.M. In press. Devonian graptolites from southwestern Europe - a review with new data. Geological Journal.

LoDuca, S.T. and Brett, C.E. 1996, The Medusaegraptus epibole and lower Ludlovian Konservat-Lagerstätten of eastern North

LoDuca, S.T. and Pratt, L.M. 1996. Stable carbon isotopic compositions of Paleozoic thallophytic algae and dendroid graptolites: Results and implications. Palaios, in review.

LoDuca, S.T. In press. The green alga *Chaetocladus* (Dasycladales). Journal of Paleontology.

Loydell, D.K. 1995. *Monograptus riccartonensis* Lapworth, 1876 (Graptolithina): proposed designation of a neotype. Bulletin of Zoological Nomenclature 52: 319-320.

Loydell, D.K. 1996. *Globosograptus* Boucek and Pribyl in Pribyl, 1948 (Silurian: Graptoloidea) is a synonym of *Streptograptus* Yin, 1937. Journal of Paleontology 70: 891-892.

Loydell, D.K. in press. Comment on a global Chitinozoa biozonation for the Silurian. Newsletters on Stratigraphy.

Loydell, D.K., Storch, P., and Bates, D.E.B. in press. Revision of the Silurian graptolite genus *Retiolites*. Palaeontology.

Loydell, D.K., and Cave, R. 1996. The Llandovery-Wenlock boundary and related stratigraphy in eastern mid-Wales with special reference to the Banwy section. Newsletters on Stratigraphy 34: 39-64.

Loydell, D.K., and Storch, P. in press. *Gladiolites geinitzianus* Barrande, 1850 (currently *Retiolites geinitzianus*; Graptolithina): proposed designation of a neotype. Bulletin of Zoological Nomenclature 53.

Lukasik, J.J. and Melchin, M.J. (in press). Morphology and classification of some Early Silurian monograptids (Graptoloidea) from the Cape Phillips Formation, Canadian Arctic Islands. Canadian Journal of Earth Sciences.

Maletz, J. (submitted to Geschiebekunde aktuell). *Saetograptus* cf. *leintwardinensis* in einem Geschiebe von Nienhagen.

Maletz, J. (submitted to Zeitschrift für Geologische Wissenschaften) Ordovician and Silurian strata of the G-14 well (Baltic sea): graptolite faunas and biostratigraphy.

Märss, T., Fredholm, D., Talimaa, V., Turner, S., Jeppsson, L. and Nowlan, G. 1996. Towards the Silurian vertebrate biozonal standard. James Hall Symposium Program and Abstracts. University of Rochester August 4-9, 1996, p. 73.

Masiak. M. 1996. Some Silurian acritarch from the Holly Cross Mountains (Central Poland). The Third Baltic Stratigraphical Conference, Tallin, 42.

Mayr, U., and de Freitas, T. (in press) Regional geology. in U. Mayr, T. de Freitas, B. Beauchamp, G. Eisbacher. The Geology of Devon Island north of 76, Canadian Arctic Archipelago. Geological Survey of Canada, Bulletin.

Mayr, U., de Freitas, T., and Beauchamp, B. (in press). Economic geology. in U. Mayr, T. de Freitas, B. Beauchamp, G. Eisbacher. The Geology of Devon Island north of 76, Canadian Arctic Archipelago. Geological Survey of Canada, Bulletin.

Mayr, U., de Freitas, T., Eisbacher, J., and Kerr, J. Wm. (in press). Geology, Prince Alfred Bay-Cardigan Strait and parts of adjacent sheets, Northwest Territories; Geological Survey of Canada, Map 0000A, scale 1:250,000.

Melchin, M.J. and Doucet, K.M. 1996. Modelling flow patterns in conical dendroid graptolites. Lethaia 29: 39-46.

Melnikova, L., Siveter, D. J. & Williams, M. In press. Cambrian bradoriids and phosphatocopids of the former Soviet Union. Journal of Micropalaeontology.

Miller, C. G. & Aldridge, R. J. (in press) Remscheidensis plexus conodonts from the late Silurian of the Welsh Borderland. Journal of Micropaleontology.

Miller, C. G. & Austin, R. L. 1996. Conodont collections formerly housed at the University of Southampton. Journal of Paleontology, 70: 535.

Miller, C. G. 1995. Ostracode and conodont distribution across the Ludlow/Pridoli boundary of Wales and the Welsh Borderland. Palaeontology, 38, 341-384.

Miller, C.G., Sutherland, S.J.E. & Dorning, K.J. In press. Late Silurian (Ludlow-Pridoli) microfossils and sedimentation in the Welsh Basin near Clun, Shropshire. Geological Journal.

Modzalevskaya T.L.(in press). Brachiopods of Upper Silurian key sections of Pechora and Middle Urals. In: Atlas etalonnyh kompleksov paleozoiskoi bentosnoi fauny severo-vostoka Evropejskoi Rossii. VSEGEI Publ.House.

Modzalevskaya T.L.(in press). Byelorussian brachiopods on the Wenlock-Ludlow boundary. Voprosy paleontologii.

Modzalevskaya T.L.(in press). *Homeathyris*, a new genus of Ludfordian athyrisinid brachiopods. Palaeontologische Zeitschrift.

Modzalevskaya T.L.(in press). Middle Ludfordian event in brachiopod evolution in the European Province. Stratigraphy.Geological correlation. Moscow.

Modzalevskaya, T.L..Biozonal method and its use in geological survey (-50 and -200).T.N.Koren (ed.).1995. St.Petersburg, VSEGEI:1-75.

Modzalevskaya,T.L., Popov L.E. 1995. Earlist Silurian articulate brachiopods from Central Kazakhstan. Acta Paleontologica Polonica, 40,4:399-426

Modzalevskaya,T.L.1996. Principal trends in early athyrid evolution. Proceedings of the Third Int.Brach.Congress Sudbury/Ontario/Canada/2-5 Sept.1995.

Mora, C.I., Driese, S.G., and Colarusso, L.A. 1996. Middle to Late Paleozoic atmospheric CO2 levels from soil carbonate and organic matter. Science 271: 1105-1107.

Musteikis, P., and Kaminskas, D. 1996. Geochemical parameters of sedimentation and the distribution of Silurian brachiopod communities in Lithuania. Historical Biology 11:229-246.

Musteikis, P., and Kaminskas, D. 1996. Geochemical parameters of sedimentation and the distribution of Silurian brachiopod communities in Lithuania. Historical Biology 11:229-246.

Musteikis, P., and Kaminskas, D. In press. Relationships between siliclastics/carbonates and Silurian brachiopod community distribution in Lithuania: 191-196. - In Copper, P. and Jin, J. (eds.). Brachiopods, Sudbury/Ontario/Canada/2-5 September 1995. A.A. Balkema/Rotterdam/Brookfield.

Musteikis, P., and Paskevicius, J. In press. Brachiopod communities of the Lithuanian Silurian. - In Boucot, A.J. and Lawson, J.D. (eds.). Final Report Project Ecostratigraphy Cambridge. Cambridge Univ. Press.

Nestor, H. 1995. Ordovician and Silurian reefs in the Baltic area. In B. Lathuiliere & J. Geister (eds). Coral reefs in the past, present and future. Publications du Service geologique du Luxembourg, 29: 35-47.

Nowlan, G.S., Fowler, M.G., Meijer Drees, N.C., Palmer, B.R. and Stasiuk, L.D. 1995. The Lower Paleozoic: A new frontier in the Western Canada Basin. Geological Survey of Canada Open File 3058, p. 107-111.

Paris, F. & Lécuyer, Ch. 1996. Stable carbon isotope ratios of sorted organic walled microfossils of early Paleozoic age. 9 th International Palynologic Gongress, Houston, Texas, June 23-28, 1996 (Abstract)

Paris, F. Grahn, Y. 1996. Chitinozoa of the Silurian-Devonian boundary sections in Podolia (Ukraine).Palaeontology, 39

Paris, F., Verniers, J., Al-Hajri, S., Al-Tayyar, H., 1995. Biostratigraphy and palaeogeographic affinities of early Silurian chitinozoans from Saudi Arabia. Review of Palaeobotany and Palynology, 89: 75-90

Petersen, L. E. and Lundin, R. F., 1996, On *Cytherellina jonesi* sp. nov. Stereo-Atlas of Ostracod Shells, 23 (X).

Petersen, L. E. and Lundin, R. F., 1996, On *Wenlockiella phaseola* (Jones). Stereo-Atlas of Ostracod Shells, 23(X).

Piçarra, J.M. and Oliveira, J.T. 1996. The Silurian sequence in the Portuguese part of the Ossa Morena Zone, Iberian Peninsula. In Baldis, B. and Aceñolaza, F.G. (Eds.), Early Paleozoic evolution in NW Gondwana, Serie Correlacion Geologica, Univ. Tucumán, 12: 151-153.

Piçarra, J.M., Gutiérrez-Marco, J.C., Lenz, A.C. and Robardet, M., in press, Pridoli graptolites from the Iberian Peninsula: a review of previous data and new records. Canadian Journal of Earth Sciences.

Piçarra, J.M., Oliveira, J.T., Robardet, M. and Gutiérrez-Marco, in press, The Ordovician-Silurian transition in southwestern Iberian Peninsula (Ossa Morena Zone). Proceedings of the 3rd Conference IGCP Project 351, Bulletin of Turkish Association Petroleum Geologists, Ankara.

Pratt, B. R., 1995, The origin, biota and evolution of deep-water mud-mounds, in Monty, C., Bosence, Bridges, P., and Pratt, B. R., eds., Carbonate mud-mounds, their origin and evolution: International Association of Sedimentologists, Special Publication 23, p. 49-123.

Radcliffe, G. & Armstrong, H. A. 1996. Crisis progenitor taxa initiate biotic recovery- Evidence from the Upper Ordovician conodont and sedimentary record of Anticosti Island, Quebec. International Meeting of the Silurian Subcommission, Rochester, New York.

Richardson, J.B. 1996. Chapter 18A. Early and Middle Palaeozoic records of terrestrial palynomorphs. *In* Jansonius, J. and McGregor, D.C. (eds.), Palynology: principles and applications, AASP Volume 2:555-574.

Richardson, J.B. and Burgess, N. In press. Mid-Palaeozoic sporomorph evolution in the Anglo-Welsh Basin: tempo and parallelism. Proceedings of the Conference on the Evolution of Plant Archtecture, 1994. The Linnean Society of London and Royal Botanic Gardens Kew.

Richardson, J.B. In press. Abnormal spores and possible hybridization as a factor in the evolution of early land plants. Review of Paleobotany and Palynology.

Richardson, J.B. In press. Taxonomy and classification of some new Early Devonian cryptospores from England. Special Papers in Palaeontology, 55.

Richardson, J.B., Rodriguez, R.M. and Sutherland, S.J.E. In press. Paynology and recognition of Silurian/Devonian boundary in some British terrestrial sediments by correlation with Cantabrian and other European sequences- a progress report. Courier Forshungsinstitut Senckenberg.

Rickards, R.B. and Wright, A.J. in press. Graptolites from the Barny Hills Shale, New South Wales. Proceedings of the Yorkshire Geological Society.

Rickards, R.B., Holland, C.H., and Serpagli, E. 1995. Aspects of Silurian and Lower Devonian graptolite faunas and stratigraphy in southern Sardinia. Bollettino della Societa Palaeontologica Italiana, 34 :67-80.

Rigby, J.K., Gutiérrez-Marco, J.C., Robardet, M. and Piçarra, J.M. in press. First articulated Silurian sponges from the Iberian Peninsula (Spain and Portugal). Journal of Paleontology.

Rong, J-y. and Johnson, M.E. 1996. A stepped karst unconformity as an Early Silurian rocky shoreline in Guizhou Province (South China). Palaeogeography, Palaeoclimatology, Palaeoecology 121:115-129.

Rubinstein, C. V., (in press). Primer registro de palinomorfos siluricos en el Formacion La Horqueta, Bloque de San Rafael, Provincia de Mendoza, Argentina. Ameghiniana.

Rubinstein, C. V., (in press). Silurian acritarchs from South America: a review. Commission International de Microflore du Palezoque (C.I.M.P).International Meeting and Workshop. Acritarch Subcommission. Prague, April 1996. Acta Universitatis Carolinae. Geologica. Special Volume

Ruppel, S.C., James, E.W., Barrick, J.E., Nowlan, G., and Uyeno, T.T. 1996. High-resolution 87SR/86Sr chemostratigraphy of the Silurian: Implications for event correlation and strontium flux. Geology, 24: 831-834.

Sheehan, P.M., Soja, C.M., Norford, B.S., and Harris, M.T. 1996. Silurian of western North America. Second International Symposium on the Silurian System, Program and Abstracts:85.

Siveter, D. J. & Lane, P.D. In press. The myodocope ostracode Entomozoe from an early Silurian (Telychian, Llandovery) carbonate mound of the Samuelson Hoj Formation of North Greenland. Bulletin Gronlands Geologiske Undersolgelse.

Siveter, D. J. & Williams, M. In Press. Cambrian bradoriid and phosphatocopid arthropods of North America. Special Papers in Palaeontology.

Siveter, David J. & Williams, M., Peel, J. & Siveter, Derek J. 1996. Bradoriids (Arthropoda) from the early Cambrian of North Greenland. Transactions of the Royal Society of Edinburgh, Earth Sciences, 86 (for 1995), 113-121.

Siveter, David J. Williams, M. Peel, J. & Siveter, Derek J. 1996. Bradoriids (Arthropoda) from the early Cambrian of North Greenland. Transactions of the Royal Society of Edinburgh; Earth Sciences, 86 (for 1995): 113-121, 6 figs.

Siveter, David, J., Rushton, A.W.A. & Siveter, Derek, J. 1995. A Tremadoc arthropod with appendages from Central England. Lethaia, 28 (4): 299-307.

Siveter, Derek J. & Chatterton, B.D.E. 1996. Silicified calymenid trilobites from the Silurian of the Mackenzie Mountains, northwest Canada. Palaeontographica, A 239: 43-60.

Siveter, Derek J. 1996 Calymenid trilobites from the Wenlock Series (Silurian) of Britain. Transactions of the Royal Society of Edinburgh; Earth Sciences, 86: 257-285.

Sobolevskaya, R.F. & Koren, T.N. In press. The Ordovician and Silurian graptolites in Novaya Zemlja. VSEGEI, Committee of Geology. (In Russian).

Sobolevskaya, R.F., Kabanikov, V.Ya, and Bondarev, V.I. 1995. O granizh ordovikskoi sistemy na Taimyre (Boundaries of the Ordovician System in Taimyr). "Nedra Taimyra", Norlisk, p. 113-123.

Soja, C.M. 1996. Island-arc carbonates: characterization and recognition in the ancient geologic record. Earth-Science Reviews, 41:31-65.

Soja, C.M. In review. Silurian of Alaska.. Proceedings of the 1996 Murchison International Meeting on the Silurian System, University of Rochester, Rochester, NY.

Soja, C.M., and Antoshkina, A.I. 1996. Comparative study of Silurian subtidal stromatolites in southeastern Alaska and the northern Urals:paleobiogeograhic implications. Second International Symposium on the Silurian System, Program and Abstracts:86.

Soja, C.M., and Antoshkina, A.I. 1996. Paleobiogeographic implications of Silurian subtidal stromatolites in southeastern Alaska (Alexander terrane) and the Urals. G.S.A. Abstracts with Programs, 28:113.

Soja, C.M., and Antoshkina, A.I. In review. Coeval development of Silurian stromatolite reefs in Alaska and the Ural Mountains: implications for paleogeography of the Alexander terrane. Geology.

Steemans, P., Rubinstein, C. and Le Hérissé, A. 1996. Precisions on the palynostratigraphy of the Siluro-Devonian boundary in Libya. Ninth International Palynological Congress. CIMP Symposium on Paleozoic Palynology. Houston, June 1996. Abstract.

Stern, B., Abbott, G. D., Collins, M. J. & Armstrong, H. A. 1995. Extraction and analysis of intercrystalline lipids from a variety of Recenet and fossil mollusc shells. British Organic Geochemistry, Bristol.

Stock, C.W. 1996. Lower Silurian (Llandovery) stromatoporoids from the Blackgum Formation of eastern Oklahoma. Geological Society of America, Abstracts with Programs, 28(1):65.

Stock, C.W. 1996. Lower Silurian (Llandovery) stromatoporoids from the Red Mountain Formation of northeastern Alabama. Geological Society of America, Abstracts with Programs, 28(2):45.

Stock, C.W. 1996. Mustoe, p. 119-121. In T.W. Broadhead (ed.), Sedimentary environments of Silurian Taconia: fieldtrips to the Appalachians and southern craton of eastern North America. University of Tennessee, Department of Geological Sciences, Studies in Geology 26.

Stock, C.W. 1996. Sparks Gap chert pit, p. 42-43. In T.W. Broadhead (ed.), Sedimentary environments of Silurian Taconia: fieldtrips to the Appalachians and southern craton of eastern North America. University of Tennessee, Department of Geological Sciences, Studies in Geology 26.

Stock, C.W. 1996. Upper Silurian strata from Dugway Gorge, Salt Springville, New York, p. 168-169. In T.W. Broadhead (ed.), Sedimentary environments of Silurian Taconia: fieldtrips to the Appalachians and southern craton of eastern North America. University of Tennessee, Department of Geological Sciences, Studies in Geology 26.

Stock, C.W. In press. Lower Silurian (Llandovery) stromatoporoids from the Blackgum Formation of eastern Oklahoma. Geological Society of America.

Stock, C.W., B.H. Tompkins, and A.F. Budd. 1996. Paleobiogeographic significance and evolutionary implications of Lower Silurian (Llandovery) stromatoporoids from the La Porte City Formation of Iowa. Geological Society of America, Abstracts with Programs, 28(7).

Stock, C.W., B.H. Tompkins, and A.F. Budd. 1996. Llandovery (Telychian) stromatoporoids from a quarry in the La Porte City Formation of eastern Iowa. The James Hall Symposium: Second International Symposium on the Silurian System, Programs with Abstracts, p. 87.

Stock, C.W., C.J. Crow, and M.R. Anderson. 1996. Wenlock (Homerian) stromatoporoids from the Louisville Limestone of the Louisville, Kentucky vicinity. The James Hall Symposium: Second International Symposium on the Silurian System, Programs with Abstracts, p. 88.

Storch, P., and Loydell, D.K. in press. The Hirnantian graptolites *Normalograptus persculptus* and *'Glyptograptus' bohemicus*: stratigraphical consequences of their synonymy. Palaeontology: 39.

Stridsberg, S., and Turek, V. 1997: A revision of the Silurian nautiloid genus Ophioceras Barrande. GFF 119 Vol 1

Strusz, D.L. 1996a. Silurian (Chart 3). 88-95, chart 3 In Young, G.C. & Laurie, J.R. (eds), An Australian Phanerozoic Timescale. Oxford University Press, Melbourne. 279pp.

Strusz, D.L. 1996b. Timescales 3. Silurian. Australian Phanerozoic Timescales, biostratigraphic charts and explanatory notes, second series. Australian Geological Survey Organisation Record 1995/32; 30pp.

Strusz, D.L. & Munson, T. In press. Coral assemblages in the Silurian of eastern Australia: a rugosan perspective. Boletin de la Real Sociedad Española de Historia Natural.

Tsegelnyuk P.D. Disposition bio - and lithostratigraphical of the boundaries in adjacent Silurian-Devo nian deposits of the Podolia and Volyn'. In: Biostratigraphical research during search for mineral of the resource of Ukraine. - Kiev: Geoprognoz, 1996.- P.10. [In Ukrainian]. University of Southampton. Journal of Paleontology, 70(3), 535.

Tsegelnyuk P.D. In press. Morphological evolution of the graptolites and zonal stratigraphy of the Silurian of Ukraine.-Kiev: Naukova dumka, 1992. - 352 p. 117.

Vannier, J. M. C. & Siveter, D. J. 1996. On *Juraleberis jubata* gen. et sp. nov. Stereo-Atlas of Ostracod Shells 22 (21) [for 1995], 86-95.

Verniers, J. 1996. Chitinozoa biozonation of the Wenlock of the Built area, Wales, U.K., preliminary results. Program and abstracts, The James Hall Symposium, Second International Symposium on the Silurian System, University of Rochester, USA, August 4-9 1996. p. 101.

Verrecchia, E., van Grootel, G., Guillemet, G. submitted: Classification of Chitinozoa (Llandoverian, Canada) using Image Analysis. Micro 3, Numero special: Analyse d'images, XX ieme anniversaire de l'Association Française de Stereologie

Viira, V. 1996. Ludlow and Pridoli conodont zones in the northern East Baltic. - In: Meidla, T., Puura, I., Nemliher, J., Raukas, A., Saarse, L. (eds.). The Third Baltic Stratigraphical Conference. Abstracts. Field Guide. Tartu, 72-73.

Waldron, J.W.F, Murphy, J.B., Melchin, M.J. and Davis, G. (in press). Silurian tectonics of western Avalonia: strain-corrected subsidence history of the Arisaig Group, Nova Scotia. Journal of Geology.

Wellman, C. and Richardson, J.B. In press. Sporomorph assemblages from the Lower Old Red Sandstone of Lorne, Scotland. Special Papers in Palaeontology, 55.

White, B., and Soja, C.M. 1996. Dolomite diagenesis in the Silurian Heceta Formation, Alexander terrane, southeastern Alaska. Second International Symposium on the Silurian System, Program and Abstracts:104.

Williams, M. & Siveter, David J. 1996. Lithofacies-influenced ostracod associations in the middle Ordovician Bromide Formation, Oklahoma, USA. Journal of Micropalaeontology 15, 69-81.

Williams, M., Siveter, D. J. & Peel, J. 1996. *Isoxys* (Arthropoda) from the early Cambrian Sirius Passet Lagersatte, North Greenland. Journal of Paleontology, 70: 947-954..

Wright, A.J. in press. A global perspective of the Silurian tetracoral *Goniophyllum*. Jess Johnson Memorial Volume (hopefully a GSA Memoir)

Wright, V.P., Marriott, S.B., Barclay, W.J. and Richardson, J.B. 1996. Discussion and reply. Brackish water faunas from the St. Maughans Formation: the Old Red Sandstone section at Ammons Hill, Hereford and Worcester, UK by W.J. Barclay, P.A. Rathbone, D.E. White and J.B. Richardson. Geologial Journal, 31:89-94.

Zalasiewicz, J., Loydell, D.K., and Storch, P. 1995. A taxonomic revision of three mid-Telychian monoclimacids. Journal of Paleontology 69: 961-967.

Zhao Chunjin, Peng Yujing, Dang Zengxin, Zhang Yunping, Zhu Qun, Su Yangzheng, et al., in press. Tectonic framework and crustal evolution of eastern Jilin and Heiongjiang provinces. Liaoning University Press.

New Names and changes of Address (for others on the mailing list, see Silurian Times 3 and 4)

Dr. Carol Burrow
Vertebrate Paleontology Laboratory
Department of Zoology
University of Queensland
St. Lucia, Queensland
Australia 4072
Fax: 61 7 3365 1655

Dr. Mikael Calner
Department of Geology
University of Lund
Sölvegatan 13
S-223 62 Lund
Sweden
Fax: 46 46 12 1477

Dr. Lesley Cherns
Department of Earth Sciences
University of Wales
P.O. Box 914
Cardiff CF1 3YE
UK

Dr. Carlo Corradini
Departimento di Scienze della
Terra-Paleontologia
Via Universitaria 4
41100 Modena
Italy
Fax: 059 218212

Dr. Alfredo Cuerda
Facultad de Ciencias Naturales
y Museo de la Plata
Centro de Investigaciones Geologicas
Calle 1, No. 644
La Plata
Argentina

Dr. Mats Eriksson
Department of Geology
Lund University
Solvegatan 13
S-223 62 Lund
Sweden

Mr Todd Hendricks
P.O. Box 191
Bardstown
KY 40004
USA

Dr. Philippe Legrand
(address unchanged)
Fax and phone: 33 2 56893324

Dr. S.V. Melnikov
Timan-Pechora Scientific Research Centre
2, Pushkin Street
Ukta 169400
Komi, Russia
Fax.: 821 47 61304

Dr. Charles E. Mitchell
Department of Geology
State University of New York at Buffalo

Buffalo, NY 14260-3050
Office:(716)645-680 ex. 3991 FAX (716)645-3999
e-mail: cem@acsu.buffalo.edu

Dr. Renata Olivieri
Departimento di Scienze della
Terre-Paleontologia
Via Universitaria 4
4100 Modena
Italy
Fax: 059 218 212

Dr. Susan Rigby
Department of Geology & Geophysics
University of Edinburgh
West Mains Road
Edinburgh EH9 3JW
UK

Dr. Judi Thorogood
Insitute of Earth Sciences
Llandinam Building
University of Wales
Aberystwyth SY23 3DB
UK

Dr. J.M.J. Vergoossen
Biologisch Centrum RUG
Paleontologische Werkkamen
Postbus 14
NL 9750 AA Haren
Netherlands

Dr. Wang Nian-zhong
P.O. Box 643
Beijing 100044
China
Fax: 008610 6833 7001

Dr. O. Walliser
Geologische-Paläontologische Museum der
Univsersität Göttingen
Goldschmidtstrasse
D3400 Göttingen
Germany

Dr. Brian White
Department of Geology
Smith College
Northampton
MA 01063
USA

E-MAIL ADDRESSES

Jonathan Adrain	jma@nhm.ac.uk,
Aicha Achab	achab@gsc.NRCan.gc.ca,
Dick Aldridge	ra12@leicester.ac.uk,
Anna Antoshkina	litgeo@geo.dereza.komi.su,
D.K. Armstrong	armstrd@nmd.gov.on. ca,
H.A. Armstrong	h.a.armstrong@durham.ac.uk,
Esther Asselin	asselin@gsc.NRCan.gc.ca,
William Ausich	Ausich.1@osu.edu,
C.R. Barnes	crbarnes@UVic.ca,
J.E. Barrick	ghjeb@ttacs.ttu.edu,
Michael Bassett	BASSETT@cardiff.ac.uk,
Richard Batchelor	rab@st-andrews.ac.uk,
Denis Bates	deb@aber.ac.uk,
J.H. Beck	beckj@wesds1.bc.edu,
Michael Benton	mike.benton@bristol.ac.uk,
Claes Berman	claes.bergman@geol.lu.se,
Stig Bergström	stig@orton.mps.ohio-state.edu,
Bill Berry	bberry@uclink4.berkeley.edu,
Merete Bjerreskov	MERETEB@savik.geomus.ku.dk,
Alain Blieck	Alain.Blieck@univ-lille1.fr,
Henning Blom	Henning.Blom@pal.uu.se,
Olga Bogolepova	Olga.Bogolepova@pal.uu.se,
Art Boucot	boucota@bcc.orst.edu,
Pierre-André Bourque	bourque@ggl.ulaval.ca,
Margaret Bradshaw	marga@Chch.plaNet.org.NZ,
P.J. Brenchley	july08@liverpool.ac.uk,
Carlton Brett	cebh@db1.cc.rochester.edu,
Thomas Broadhead	broadhea@utkvx.utk.edu,
Frank Brunton	brunton@geol.queensu.ca,
Carole Burrow	CBurrow@zoology.uq.edu.au,
Andy Butler	ajb1020@esc.cam.ac.uk,
Mikael Calner	Mikael.calner@geol.lu.se
Brian Chatterton	chatterton@UAlberta.CA,
Chen Xu	LPSNIGP@NANJING.JSPTA.chinamail.sprint.com,
Gina Christodoulu	Gina.Christodoulou@Geol.lu.se,
Euan Clarkson	Euan.Clarkson@ed.ac.uk,
Robin Cocks	lrmc@nhm.ac.uk,
Paul Copper	pcopper@nickel.laurentian.ca,
Peter Crowther	peter.crowther.um@nics.gov.uk,
Tim de Freitas	tfreitas@gsc.emr.ca,
Keith Dewing	kdewing@ gsc.NRCan.gc.ca,
Richard Diecchio	rdiecchi@osfl.gmu.edu,
Steven Driese	sdriese@utk.edu,
Pavel Dufka	dufka@cgu.cz, einasto@gi.ee,
Rein Einasto	einasto@gi.ee,
Mats Erikssson	Mats.Eriksson@geol.lu.se,
Richard Fluegeman	rhfluegema@bsuvc.bsu.edu,
Yngve Grahn	Stefan.Bengtson@nrm.se,
Alexander Gubanov	Alexander.Gubanov@pal.uu.se,
Juan Carlos Gutiérrez Marco	jcgrapto@eucmax.sim.ucm.es,
Mark Harris	mtharris@csd.uwm.edu,
William Harrison	william.harrison_iii@wmich.edu,
Rachel Heath	R.J.Heath@liverpool.ac.uk,
Charles Holland	hepwholl@tcd.ie,
Alan Horowitz	horowitz@ucs.indiana.edu,
Mikael Jacobsson	Mikael.Jacobsson@Geol.lu.se,
A.J. Jeram	ajj@belumreg.demon.co.uk,
Fredrik Jerre	fredrik.jerre@draco.se.astra.com,
Markes Johnson	Markes.E.Johnson@williams.edu,
Dimitri Kaljo	kaljo@pzgeol.gi.ee,
Stephen Kershaw	KERSHAW_SJ@WLIHE.AC.UK,
Guennadji Kisselev	anna@dean.geol.lgu.spb.su,
Mark Kleffner	Kleffner.1@osu.edu,
Joanne Kluessendorf	jkluesse@uiuc.edu,
Tania Koren	tkoren@dronov.usr.pu.ru,
A. Kozlowska-Dawdziuk	paleo@asp.biogeo.uw.edu.pl
Jiri Kriz	kriz@cgu.cz,
Kent Larsson	kent.larsson@geol.lu.se,
A. LeHérissé	herisse@univ-brest.fr,
Pierre Lespérance	lesperap@ERE.UMontreal.CA,
Steven LoDuca	GEO_LODUCA@ONLINE.EMICH.EDU,
Darrel Long	dlong@nickel.laurentian.ca,
David Loydell	David.Loydell@port.ac.uk,
Robert Lundin	robert.lundin@asu.edu,
Georg Maletz	OBST@RZ.UNI-GREIFSWALD. DE,
Petras Musteikis	Donatas.Kaminskas@GF.VU.lt,
Peep Männik	mannik@ gi.ee,
Tiiu Märss	marss@gaia.gi.ee,
Monica Masiak	monika@aw.geo.uw.edu.pl,
Sandy McCracken	mccracken@gsc.NRCan.gc.ca,
Jörg Maletz	OBST@RZ.UNI-GREIFSWALD.DE,
Donald Mikulic	mikulic@geoserv.isgs.uiuc.edu,
Mike Melchin	mmelchin@juliet.stfx.ca,
Carl Mendelsohn	mendelsn@beloit.edu,
Giles Miller	cgm@nhm.ac.uk,
Charles Mitchell	cem@acsu.buffalo.edu,

Tania Modzalevskaya vsg@sovam.com,
Mike Murphy mamurphy@geology.ucdavis.edu,
Ludmilla Nekhorosheva vniio@g-ocean.spb.su,
Heldur Nestor hnestor@pzgeol.gi.ee,
Viiu Nestor vnestor@gi.ee,
Paula Noble noblepj@CCVAX.CCS.CSUS.EDU,
Brian Norford norford@gsc.NRCan.gc.ca,
Godfrey Nowlan nowlan@gsc.NRCan.gc.ca,
Jeffrey Over over@uno.cc.geneseo.edu,
Florentin Paris Florentin.Paris@univ_rennes1.fr,
John Peel John.Peel@pal.uu.se,
Daniel Phelps phelps_d@nosgis.nr.state.ky.us,
John Richardson J.Richardson@nhm.ac.uk,
Barrie Rickards sjl11@esc.cam.ac.uk,
Susan Rigby SUERIGBY@glg.ed.ac.uk,
Rong Jia-yu
LPSNIGP@NANJING.JSPTA.chinamail.sprint.com,
June Ross rossjrp@henson.cc.wwu.edu,
Madis Rubel RUBEL@GI.EE,
Claudia Rubenstein rubicaro@planet.losandes.com.ar,
Olof Sandström Olof.Sandstrom@geol.lu.se,
Hans Peter Schönlaub schhp@cc.geolba.ac.at,
C.T. Scrutton C.T.Scrutton@durham.ac.uk,
N.V. Sennikov sennikov@geology.uiggm.nsc.ru,
Enrico Serpagli serpagli@unimo.it,
Peter Sheehan Sheehan@CSD4.CSD.UWM.edu,
Andrew Simpson simpson@earthsciences.uq.edu.au,
David Siveter djs@le.ac.uk,
Derek Siveter derek.siveter@earth.ox.ac.uk,
Rimma Sobolevskaya vniio@g-ocean.spb.su,
Ken Soehn markwilson@ualberta.ca,
Constance Soja CSOJA@CENTER.COLGATE.EDU,
Asseddine Soufiane asoufiane@gsc.NRCan.gc.ca,
Colin Stearn colins@geosci.lan.mcgill.ca,
Ronald Stieglitz stieglir@uwgb.edu,
Carl Stock cstock@wgs.geo.ua.edu,
Petr Storch storch@gli.cas.cz,
Sven Stridsberg Sven.Stridsberg@Geol.lu.se,
Paul Strother StratheP@wesds1.bc.edu,
Des Strusz dstrusz@bmr.gov.au,
Stuart Sutherland ses@nhm.ac.uk,
Lech Teller paleo@asp.biogeo.uw.edu.pl,
Y.I. Tesakov lab17@uiggm.nsk.su,
A.T. Thomas A.T.Thomas@bham.ac.uk,
Judi Thorogood jjt91@aber.ac.uk,
P.D. Tsegelnyuk ignnanu@geolog.kiev.ua,
Simon Tull SJT1008@hermes.cam.ac.uk,
Susan Turner S.Turner@mailbox.uq.oz.au,
Charles Underwood cju@liv.ac.uk,
Adam Urbanek paleo@asp.biogeo.uw.edu.pl,
J.M.J. Vergoossen J.M.J. Vergoossen@biol.RUG.NL,
Jacques Verniers Jacques.Verniers@rug.ac.be,
Viive Viira viira@gi.ee,
Brian White bwhite@science.smith.edu,
Brian Witzke bwitzke@gsbth-po.igsb.uiowa.edu,
Mark Williams MWILLI@wpo.nerc.ac.uk,
Mark Wilson mark.wilson@ualberta.ca,
Tony Wright Tony_Wright@uow.edu.au,
Ryszard Wrona pale@asp.biogeo.uw.edu.pl,
Evgeny Yolkin yolkin@geology.uiggm.nsc.ru,
Jan Zalasiewicz MWILLI@wpo.nerc.ac.uk