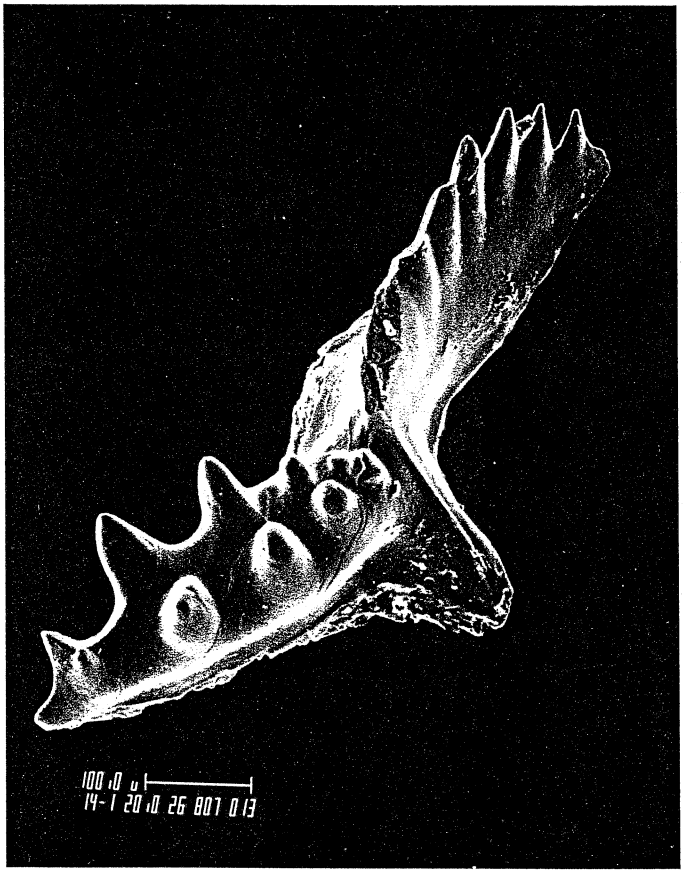
SILURIAN TIMES

No. 2 March 1994

A NEWSLETTER OF THE SILURIAN SUBCOMMISSION



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COVER PICTURE: A specimen of *Icriodella deflecta* Aldrige from the Clemville Formation of Llandovery age in the Port-Daniel area of the Gaspé Peninsula, Quebec, Canada.

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EDITORIAL

Welcome to the second issue of Silurian Times. This is the newsletter of the Subcommission on Silurian Stratigraphy of the International Commission on Stratigraphy. It is intended to be available to all those interested in Silurian rocks worldwide. This edition marks the first for which news items were solicited from all on the mailing list. Over 70 responses have been received from the 258 people on our mailing list. The mailing list was constructed from three sources: the existing list of voting and corresponding members, a list of North American workers interested in the Silurian and the Ludlow Research Group address list. The responses have been distilled into three separate sections: 1. News and Current Research of Silurian Workers; 2, Silurian Publications 1992-93; and 3, The Mailing List. For those who replied to the request for information in the first issue, these addresses have been revised according to what was sent and phone, fax and e-mail details have been added.

The cost of producing a newsletter such as this is well beyond the means of the Subcommission and so we are looking to trim the mailing list to include only those who are genuinely interested in receiving it. Therefore, *we will be ruthless about sending the third issue of Silurian Times only to those who respond to the Request for Information that will be issued later in 1994.*

This issue is more substantial than the first and contains a number of responses to the proposed left hand column for correlation charts. This proposal has aroused considerable interest. We believe that for future international projects it would be desirable to have a simple and a generally acceptable compromise for the left hand column, so that time slices for paleogeographic study could be internationally agreed. We would like to emphasize that this is not an attempt to define a standard left-hand column for all time. Obviously, the left-hand column will continue to develop as new discoveries are made, but we do need some stability in order to develop international projects.

NOTES FOR CONTRIBUTORS

Contributions should be in English, typed double spaced and sent by mail, fax or E-Mail to:

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For longer contributions, it would help if a copy was sent on 3.5" or 5.25" diskette. Please indicate on the diskette the operating system used and, if possible, provide one version in ASCII. If you are unable to provide a disk, please submit as clean a paper copy as possible so that the text can be scanned into a disk file.

INTERNATIONAL UNION OF GEOLOGICAL SCIENCES (IUGS)

Report of the Subcommission on Silurian Stratigraphy (SSS) of the International Commission on Stratigraphy, IUGS for 1993

1. **Title of constituent body**
   Subcommission on Silurian Stratigraphy (SSS) of the International Commission on Stratigraphy, IUGS.

2. **Overall objectives**
   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 IGS guidelines; refinement of international correlation; stimulation of research and international cooperation; evaluation and integration of new approaches to the correlation of Silurian strata on a global scale.

3. **Organization**
   The SSS consists of 16 Voting and 57 Corresponding members. Several temporary working groups have been established.

   Officers
   - Chairman: M.E. Johnson (Dept. of Geology, Williams College, Williamstown, Massachusetts, 01267 USA)
   - Secretary: G.S. Nowlan (Geological Survey of Canada, Calgary, Alberta, T2L 2A7, Canada)
   - Contact with Subcommission on Geochronology: L.R.M. Cocks, British Museum of Natural History, London, United Kingdom

   Treasury
   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 27 countries from all continents. Most of the major regions of the world with extensive exposures of Silurian strata are covered, especially North America, Europe, Russia, China, and Australia. We have enjoyed significant national-based support for the organization of symposia and field meetings: 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**
   The SSS participated in IGCP Project No. 216 (Global Biological Events in Earth History) through a sub-project entitled: "The Wenlock-Ludlow Boundary Event." This project reached a conclusion in 1992 and a publication will be forthcoming. Cooperation continues with a succeeding IGCP project on biotic recoveries from mass extinctions. Due to the significant occurrence of thelodonts in

Silurian strata, members of the SSS also participate in IGCP Project No. 328 (Paleozoic Microvertebrate Fossils). Other members are very active in the IPA international research groups on graptolites and conodonts.

6. **Accomplishments and products generated in 1993**
With a press run of 274 mailings, the first issue of "Silurian Times" -the official newsletter of the Silurian Subcommission (edited by Secretary Nowlan) -was circulated to all subcommission members as well as a broad constituency of Silurian researchers around the world during the Spring of 1993. Future issues will be mailed out on an annual basis near the beginning of each calendar year.

Planning and the organization of task forces for the 1996 International Symposium on the Silurian System (the James Hall Symposium) were the other primary activities during the past year. With the conference's main theme on paleogeography, task forces have been recruited for Laurentia (North America), Avalonia (Canadian Maritimes U British Isles), Baltica, central and southern Europe, the Middle East, Siberia, and China. Task forces remain to be formed for Australia, Africa, and South America.

The task force for the paleogeography of Silurian Taconica (east coasts of Canada and the U.S.) organized a half-day symposium at the Annual Meeting of the Geological Society of America, held in Boston Oct. 27, 1993. Thirteen presentations divided into tow focus areas covering New England and the Canadian Maritimes on the tectonically active margin of Taconica, as opposed to the in-board, passive flank of the Appalachian Basin. The meeting, which emphasized patterns of correlation instrumental in the recreation of a holistic geography for a large segment of the Silurian world, served as a very useful training exercise for the 1996 International Symposium.

Also in December, Hans Schönlaub (Geological Survey of Austria) issue the first circular for the Subcommission's 1994 field meeting in the Carnic Alps.

7. **Chief problems encountered in 1993**
Agreement was attempted on the configuration of a standard left-hand column for Silurian correlation charts, embracing graptolites, conodonts, chitinozoa, spores, and vertebrates. This step is a necessary antecedent to our goal of producing a series of correlation charts in coordination with our Silurian paleogeography project. Committee action led to a model which was offered to the membership with the first issue of "Silurian Times." No configuration is likely to win universal approval and no particular model may every be considered to be final, in the sense that our knowledge of key index fossils continues to expand. The short-term goal, however, is to reach a consensus on a model serviceable for the numerous paleogeography projects in preparation for the 1996 international symposium on the Silurian System. Some minor tinkering, particularly with reference to the graptolites and conodonts, may be desirable.

8. **Work plan for 1994**
   a) Final preparation for the 1994 field meeting in the Carnic Alps (Geological Survey of Austria)
   b) Continued planning for the 2nd International Symposium on the Silurian System, scheduled for 1996 in Rochester, NY., U.S.A. (conveners: M.E. Johnson and C.E. Brett)
      1. Reach consensus on workable model for left-hand column of correlation tables
      2. Form remaining regional task forces for paleogeographic study of the Gondwana Supercontinent.
      3. Distribute standardized forms and maps for collection of paleogeographic data
   c) Production of the second issue of "Silurian Times"

9. **Potential funding sources outside IUGS**
Some oil companies are being approached for funding in support of the 2nd International Symposium on the Silurian System, for which the SSS serves as the primary organizational sponsor.

10. **Anticipated work plan for 1995-1998**
Except for possible subdivision of the Pridoli Series into stages, the critical work of the SSS has been accomplished in terms of agreements on global stratotype sections and points. Future work will focus on the resolution of detailed zonal correlation and the development of correlation charts which take into account alternative or supplementary means of correlation. Emphasis will be on the practical results of enhanced correlation, especially with regard to paleogeographic mapping. General plans for the next several years include:

1995: Development and testing of field guides to the Appalachian Basin (US) and Michigan Basin (Canada) in conjunction with the 2nd International Symposium on the Silurian System.

1996: Final preparations for the 2nd International Symposium on the Silurian System (Rochester, N.Y.)

1997: Editing of volume "Silurian Lands and Shelf Margins" with extensive correlation charts supplemented by paleogeographic maps on various regional, continental, and global scales; Advanced planning for possible field conferences in regions reflecting special issues of correlation or paleogeography, such as the Silurian cephalopod beds of the Mediterranean or tillites and paraglacial deposits of South America

1998: Final preparations for selected field conference (not determined).

11. **Financial statement for 1993**

a) Income:

1. Carryover from 1992	$101.38
2. Received via IUGS Treasurer	450.00
Total operating funds	551.38

b) Expenditures

1. Secretarial help	$125.00
2. Duplication of newsletter	175.00
3. Postage	165.80
4. Stationary	50.00
Total expenditures	515.80
Net balance at the end of 1993	$ 35.58

12. **Summary budget for next year**

SSS budget application for support from IUGS in 1994

a) General Subcommission administration	$175.00
b) Contribution toward production and mailing of newsletter	300.00
c) Subvention to 3 members for attendance at Subcommission conference and field meeting, Austria, August 1994	2,100.00

The Silurian Subcommission here seeks a total of US$2,575.00 for its operating expenses during the calendar year 1994.

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Signature of Chairperson:
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CHAIRMAN'S CORNER

It has been a year and a half since the Subcommission on Silurian Stratigraphy last met in Prague for a superb field conference. Time seems to have rushed on, but many people have been working hard behind the scenes to arrange two events of much interest to the Silurian research community at large. Focus now is on the next field conference scheduled for the Carnic Alps in August 1994, which will be followed in August 1996 by the 2nd International Symposium on the Silurian System to be convened in Rochester, N.Y.

The new director of the Austrian Geologische Bundesanstalt, Hans P. Schönlaub, issued the first circular for the Carnic Alps field conference set for August 21-28, 1994. The mailing has gone out to all members of the Subcommission, with a request for show of interest no later than the end of March 1994. Cost of the meeting is approximately US $600, covering all accommodations, meals, and travel expenses within Austria. First priority for limited space goes to titular members of the Subcommission, next corresponding members, and finally interested nonmembers. A second and final circular will be mailed only to those who respond to the first circular. Those who have not received the first circular should write to the Survey Director at P.O. Box 127, A-1031 Wien. Those of us who attended the Prague meeting look forward, I am certain, to a fine exposition of the possible correlations between the two key regions.

On October 27, 1993 a conference with 13 presentations on the "Paleogeography of Silurian Taconia" was held in conjunction with the Annual Meeting of the Geological Society of America in Boston, Massachusetts. This long, narrow land mass on the margin of the Laurentian paleocontinent once extended from present-day Quebec to Alabama. The symposium was designed to bring together a diverse group of stratigraphers, sedimentologists, petrologists, paleoecologists, and geochronologists who have studied various segments of this feature, readily divided into a more passive flank facing the cratonic interior and an active flank on the Iapetus Ocean. The goal was to reconfigure a holistic picture of changing coastal geography, -both spatial and temporal, along a significant Silurian land area.

As the conference unfolded from one presentation to the next covering adjacent but very distinctive geographic regions, I experienced the intellectual equivalent of coasting down a shoreline in something like the historic research vessel operated by C.G.J. Peterson during the decade prior to 1920. Peterson's pioneering dredge work in Danish waters established important concepts of sedimentology and marine-community analysis which were usefully adopted by paleogeographers a half a century later. The Taconia exercise was planned and executed as a test model for the paleogeography center-piece of the upcoming 2nd International Symposium on the Silurian System. Several participants belong to the organizing committee for that symposium.

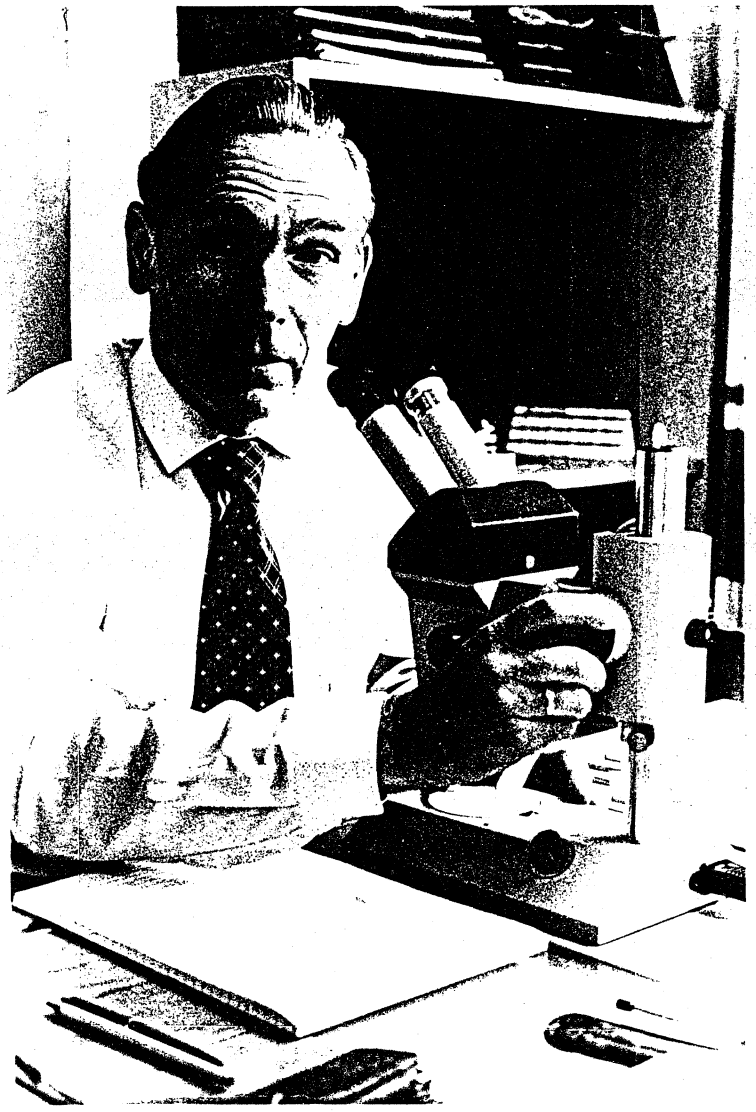
Meeting immediately after the Boston session as "Friends of the Silurian", the participants discussed the convening of the 2nd International Symposium and urged that a firm date be set as soon as possible. The first formal announcement for the symposium, named in honor of New York's famed James Hall, was submitted to the editors of Lethaia, and subsequently accepted for publication in the first available number of that journal. A copy of the text is reproduced in this newsletter.

Paleogeographic maps are only as good as the stratigraphic correlations which go into them. The challenge to assemble Silurian data of this kind on a global scale is ambitious, but most worthy of the Silurian Subcommission's goal to develop correlation charts with broad coverage illustrating a diversity of correlation methods. The basic plan leading up to the James Hall Meeting is to parcel out the necessary research to "continent masters" responsible for the organization of data from different paleocontinents. These individuals will act as central accumulators and assemblers of paleogeographic data requiring careful stratigraphic correlation. The larger paleocontinents may require several teams to assemble data around distinct land areas and different segments of shelf margin. There is enough work for everyone with an interest in this process to join in on one level or another as team leader or team member. Large territories including the component parts of Silurian Gondwana are still up for grabs. Anyone interested in this project whom I've not already contacted is urged to write me.

Participation in the Carnic Alps field conference next August offers a critical opportunity to meet together and clear up questions regarding the elusive "left-hand column" for the correlation charts so necessary to the paleogeography project. The day set aside for meetings may also be instrumental in establishing other guidelines for the paleogeography project.

Paleogeography will not be the sole focus of the 1996 James Hall Meeting. Other important topics attracting volunteered papers will be covered, as well. The opportunity will be available to visit some classic North American Silurian sections before, during, and after the symposium.

M.E. Johnson



HERMANN JAEGER (22 February 1929 - 22 September 1992)
As most of you will know, Hermann Jaeger died last year. We have received an obituary from Bernd-Dietrich Erdtmann and a history of his accomplishments from Wolfgang Hansch. We have combined these two submissions to produce this tribute to our esteemed colleague, the late Hermann Jaeger.

Obituary (submitted by B.D. Erdtmann)
Dr. sc. nat. Hermann Jaeger expired suddenly after a short illness on September 22, 1992 in Berlin, only hours before he was to chair the annual conference of the "Paläontologische Gesellschaft" at the Naturkundemuseum in Berlin, his scientific domicile for more than 40 years. Hermann Jaeger was born at Freienthal, Mark Brandengurg, SW of Berlin on February 22, 1929. He began his studies of geology and paleontology at the then famous (and now extinct) Geological Institute of the Humboldt University in Berlin a few years after the end of the 2nd World War with Hans Stille, Serge von Bubnoff and Walter Gross as personal mentors.

Long before assuming his Ph.D. studies on Siluro-Devonian graptolites upon the suggestion of his mentors and F. Deubel (Jena), Hermann Jaeger had collected graptolites from the classical Silurian to Emsian "Graptolithenschiefer" in the vicinity of Ronneburg and Gera in eastern Thuringia, meticulously assembling all stratigraphic data and other pertinent geological observations. His field investigations were then ironically aided by the recently so much incriminated uranium exploration and strip mining activities of the "Soviet-East German" mining cooperative, the "SDAG Wismut", providing excellent outcrops and fresh sections in the Ronneburg area. Starting with the "Diplom thesis" (M.Sc. equivalent) and culminating in his frequently quoted Ph.D. dissertation on "Graptolites and Stratigraphy of the Late Silurian of Thuringia" (Abh. d. fodt. Akad d. Wiss., Akademie-Verlag, Berlin, 1959) Hermann Jaeger became a "synonym" for the gradual deciphering of the evolutionary history of the latest monograptids around the world. It was unquestionably his greatest achievement in the late fifties to early sixties, when he so convincingly demonstrated that monograptids did not expire at the top Ludlow but ranged far into the Rhenish-Thuringian facies of the early Devonian, not only near Ronneburg but around the world. This fundamental contribution set off a universal discussion on the Silurian/Devonian boundary and related problems of contemporary litho- and biofacies developments on a global scale, which culminated in the constitution of the first IUGS stratigraphic boundary working group in 1960.

His involvement in this cosmopolitan team of Siluro-Devonian experts not only assisted in solving many facies-stratigraphic riddles, but also greatly helped Hermann to receive the infrequently "privileged" status for essential exit permits from the GDR bureaucracy to vist many places abroad. On several occasions, this author played "Mercurius" to hand-deliver airplane tickets and other minor "secrecies" to the beleaguered scientist in his time-venerated abode of the "Naturkundemuseum" less than two hundred meters away from "the Wall."

Hermann Jaeger's relentless workaholic ethics eventually became well documented by ca. 100 scientific publications, may of them co-authored together with colleagues from around the globe. No doubt, graptolites were his prime objects, but there was also the *Xenusion auerswaldae* which was found in the erratics of his native district. He wrote not only excellent bio- but also tectono-stratigraphic essays on geological problems concerning the Variscan thrust systems of SE Germany and critical evaluations concerning the "impactology" of the K/T boundary. His facies analyses of peri-Gondowanan developments touched on regional fine-stratigraphic problems from the Rhadames Basin of Libya, across the "Mediterranean" realm of Sardinia, the Carnic Alps to the distant "proto-Tethys" of Burma and Thailand and as far as

Australia. Hermann Jaeger certainly mastered and rivalled the pandemism which is usually ascribed to his specialty. His somber Brandenburg-accented English speech was certainly heard at many international meetings and in the field as well, where his critical comments were of his characteristic pungency, but always concise, straight-forward and profoundly substantial. His voice will now forever be missed.

History of Accomplishments (submitted by Wolfgang Hansch)

- born in Freienthal near Potsdam
- 1949-1955: study of Geology and Palaeontology at the Humboldt-University in Berlin (student of W. GROSS and S.v. BUBNOFF)
- since 1956: Assistant at the Department of Geology and Palaeontology of the Humboldt-University
- 1958: Ph.D. on "Graptolithen und Stratigraphie des jungsten Thuringer Silur", published in 1959
- since 1959: Curator at the Palaeontological Museum of the Berlin Museum for Natural History
- 1965: qualification as a University Lecturer ("Habilitation")
- 1967: Research Fellow at the University of Canberra, Australia
- 1977/1978: longer stays at the University of Uppsala (joint projects with A. MARTINSSON)
- 1960-1972: Member of the Committee for the Silurian-Devonian Boundary
- 1974-1985: Member of the Working Group for the Ordovician-Silurian Boundary
- since 1972: Voting Member of the Subcommission of Silurian Stratigraphy
- since 1973: Member of the International Research Group on Graptolites
- 1986: Honorary Corresponding Member of the Swedish Geological Society
- 1988: Member of the Leopoldina (German Academy of Natural Scientists)

Research interests

- Taxonomy and evolution of graptolites
- Biostratigraphy of the Paleozoic, especially the Silurian
- Problems of biostratigraphic nomenclature
- Paleozoic geology and paleontology
- Extensive field work in Thuringia (SE-Germany), the Prague Basin, Carnic Alps, Sardinia

From 1955-1992 Hermann Jaeger published 109 papers including reports and popular science papers. Some of the most important, which also demonstrate his worldwide activities in geology and palaeontology in particular of the Ordovician, Silurian and Devonian, are:

- Graptolithen und Stratigraphie des jüngsten Thüringer Silurs. Abh. deutsch. Akad. Wiss. Berlin; Kl. Chem., Geol., Biol., 1959, 2, 1-197, 14 Pls., 27 Figs., Berlin 1959.
- Das Silur (Gotlandium) in Thuringen und am Ostrand des Rheinischen Schiefergebirges (Kellerwald, Marburg, Giessen). Sympiosiumsband der 2. Internat. Arbeitstagung Silur/Devon-Grenze, Bonn/Bruxelles 1960, 108-135, 3 Tabellenbeilagen, Stuttgart 1962.
- Der gegenwärtige Stand der stratigraphischen Erforschung des Thüringer Silurs. Abh. deutsch. Akad. Wiss. Berlin; Kl. Bergbau, Huttenwesen, Montangeologie, Jg. 1964, 2(DEUBEL-Festschrift), 27-51, 1 Figs., Berlin 1964.
- *Monograptus hercynicus* in den Westsudeten und das Alter der Westsudeten-Hauptfaltung (Teil I und II).
- Geologie, 13, 3, 249-277, 1 Tab., 2 Pls.-, 377-394, Berlin 1964.
- Two late *Monograptus* species from Victoria, Australia, and their significance for dating the Baragwanathia flora.
- Proc. Roy. Soc. Victoria, 79, 393-413, 1 Figs., 3 Pls., Melbourne 1966.
- BOUCOT, A.J., L.M. CUMMING & H. JAEGER: Contributions to the age of the Gaspé Sandstone and Gaspé Limestone. Geol. Surv. Canada, Paper 67-25, 1-27, 3 Pls., Ottawa 1967.
- JAEGER, H., V. STEIN & R. WOLFAHRT: Fauna (Graptolithen, Brachiopoden) der unterdevonischen Schwarzschiefer Nord-Thailands. N. Jb. Geol. Palaont., Abh., 133, 2, 171-190, 1 Figs., 4 Pls., Stuttgart 1969.
- CHURKIN, M., H. JAEGER & G.D. EBERLEIN: Lower Devonian graptolites from Southeastern Alaska. Lethaia, 3, 183-202, 9 Figs., Oslo 1970.
- MASSA, D. & H. JAEGER: Données stratigraphiques sur le Silurien de L'ouest de la Libye. Colloque Ordovicien-Silurien, Brest 1971, Mémoires du B.R.G.M., 73, 313-326, 2 Figs., Paris 1971.
- CHLUPAC, I., H. JAEGER & J. ZIKMUNDOVA: The Silurian-Devonian Boundary in the Barrandian. Bull. Canadian Soc. Petrol. Geol., 20, 1, 104-174, 33 Figs., Ottawa 1972.
- JAEGER, H. J. BONNEFOUS & D. MASSA: Le Silurien en Tunisieses relations avec le Silurien de Libye nordoccidentale. Bull. soc. géol. France, 7, 68-76, 3 Figs., Paris 1975.
- Die Graptolithenführung im Silur/Devon des Cellon-Profils (Karnische Alpen). Ein Beitrag zur Gleichsetzung der Conodonten- und Graptolithen-zonen des Silurs. Carinthia II, 165/185, 111-126, 5 Figs., 2 Pls., Klagenfurt 1975.
- JAEGER, H., V. HAVLÍČEK & H.P. SCHÖNLAUB: Biostratigraphie der Ordovizium/Silur-Grenze in den Südalpen. Ein Beitrag zur Diskussion um die *Hirnantia*-Fauna. Verb. Geol. B.-A., Jg., 1975, 271-289, 2 Pls., 2 Figs., Wien 1975.
- Das Silur und Unterdevon vom thüringischen Typ in Sardinien und seine regionalgeologische Bedeutung. Nova Acta Leopoldina, 45, 224 (KOSSMAT-Symposium) 263-299, 10 Figs., 3 Pls., Leipzig 1976.
- Graptolites. The Silurian-Devonian Boundary. IUGS Series A, No. 5, 337-345, 7 Figs., Stuttgart 1977.
- Das Silur/Lochkov-Profil im Frankenberger Zwischengebirge (Sachsen). Freib. Forsch.-H. C 326, 45-59, 3 Figs., 1 Pl., Leipzig 1977.
- Entwicklungszüge (Trends) in der Evolution der Graptolithen. Schriftenreihe geol. Wiss., 10, 5-58, 13 Figs., Berlin 1978.
- JAEGER, H. & M. ROBARDET: Le Silurien et le Devonien basal dans le Nord de la Province de Seville (Espagne). Geobios, 12; 687-714, 9 Figs., 2 Pls., Lyon 1979.
- KŘÍŽ, J., H. JAEGER, F. PARIS & H.P. SCHÖNLAUB: Pridoli- the fourth subdivision of the Silurian. Jb. Geol. B.-A., 129, 2, 291-360, 44 Figs., 6 Pls., Wien 1986.
- The Ordovician-Silurian boundary in the Saxothuringian Zone of the Variscan Orogen. Bull. Br. Mus. Hist. (Geol.) 43, 101-106, 2 Figs., London 1988.
- Neue Standard-Graptolithenzonenfolge nach der "Großen Krise" an der Wenlock/Ludlow/Grenze (Silur). N. Jb. Geol. Palaont. Abh., 182, 3, 302-354, 32 Figs., Stuttgart 1991.

Submitted by
Wolfgang Hansch and Bernd-Dietrich Erdtmann

COMMENTS TO THE STANDARD LEFT HAND SIDE FOR CORRELATION CHARTS

Four articles were received in response to the publication of the left hand side in the first issue of Silurian Times. These are presented below.

1. COMMENT BY MADIS RUBEL

The recent Silurian Standard has been constructed for unambiguous accord with and use of the Standard Global Chronostratigraphic Scale in the spirit of the International Stratigraphic Guide (the last version of which was revealed in the Circular no. 85 of ISSC of IUGS ICS, August 1992). The Silurian part of this scale is noteworthy for its accomplishments: all possible (sub)divisions (system, series, stages) have been defined by Global Stratotype Sections and Points (GSSP), which guarantee continuity (no gaps, no overlaps) of geologic time in terms of geochronologic units. The supplement, given in the form of several biozones by L.M.R. Cocks and G.S. Nowlan in the Silurian Times no. 1, May 1993 represents, as I see it, a next step towards realization of bringing the new Silurian Standard into practice. Indeed, how the standard would be brought into effect using available paleontological records is now the main task. At the same time, the attempt to evaluate the extent of the 22 Silurian graptolite biozones by 12 different vertical heights on the basis of their relative thicknesses and distribution to calibrate the standard and other biozones arouses deep interest and many questions. Tanya Koren and Robin Cocks have unified available records on graptolites into 24 biozones (=biostratigraphic units) named for some reason as international and intended to correlate sections yielding diagnostic graptolites over the world. This is welcome, the more so that all boundaries of the Silurian Standard have been fixed keeping in view some graptolite events (e.g. the first appearance of a species). One may conclude now that such events have been legitimized through proposed biozones whose beginnings are hoped to be the best approximation to these chronostratigraphic boundaries. However, it is necessary to keep in mind that application of any biozones, especially if their boundaries have been defined and characterized by a few events, depends on the consistency of paleontological records. Exactly for that reason, each chronostratigraphic boundary must be specially fixed by golden spike to be really independent of changeable paleontological markers.

In spite of its triviality I would like to point out that biozones are always based on the occurrence of some fossils. As a consequence, biozonal boundaries can be located exactly in sections according to available finds of taxa. On the other hand the chronostratigraphic boundary, fixed unambiguously in one point (at GSSP), can be traced (dated) in other sections only within limits of the resolving power of existing methods of time correlation. In principle, a chronostratigraphic boundary, being interpretative, is never a single line, it can be established and drawn in the form of an interval expressing the reliability of the dating. Consequently, biozones and stages, as units of different categories, are independent and the former cannot be subdivisions of the latter. That is also true with regard to the considered graptolitic biozones, in spite of their seeming coincidence with the Silurian stages.

Now, assuming the proposed primary and supplementary biozones to be at least good time markers, and accepting their mutual correlation as well as correspondence to the Silurian Standard in the form given in the diagram, one can use them as tools for establishing the standard boundaries outside the GPSS. Thus, the beginning of the Wenlock or Sheinwoodian can be identified by the lower boundary of the *centrifugus/murchisoni* biozone in a section without revealing its limits of reliability there. Or, lacking information on graptolites, the same boundary can be located by co-occurrence of the *P. amorphognathoides* and *M. margaritana* biozones, i.e. into the interval where such co-occurrence takes place and which then represents the actual error bar for that chronostratigraphic boundary. The just-described dating of sections is not affected by extent of the biozones, it depends only on the consistency in the order of paleontological events used in the sections studied. But, if we want to bring into operation the extent of graptolite biozones in the proposed form then the whole diagram must be built up and used as an interval scale with its enhanced requirements for dating of chronostratigraphic boundaries in sections. Thus, the lower boundary of the Wenlock or Sheinwoodian must be located now into the centre of the *P. amorphognathoides* biozone, or by 3/8 of the span of the *M. margaritana* biozone above its beginning in sections. It is obvious that a special measure (why not robins or korens?) with corresponding error bars as well as many other things are needed now. All this is possible as there indeed exist many sophisticated methods for calibration of sequences of paleontological events to transform them into interval or even ratio scales (for example, Fordham, 1992; Gradstein et al., 1985). From the above and, maybe, first of all from the attempt to calibrate the Silurian Standard by the extent of its graptolite biozones one important conclusion follows: the use of paleontological records in chronostratigraphy requires a construction of some kind of paleontological time scale. The latter may be an ordinal, interval, or even ratio scale (see Agterberg, 1990), but they must be present as a necessary prerequisite for the drawing of real chronostratigraphic boundaries, i.e. indicating the limits of reliability of its position in sections studied. The biozones, even considered as time markers, i.e. as chronozones, cannot do that. The attempts by Cooper (1992) and Johnson et al. (1991) are, perhaps, the most noteworthy examples so far to use fossils in Ordovician and Silurian chronostratigraphy in the required manner.

Agterberg, F.P., 1990, Automated Stratigraphic Correlation. Developments in Palaeontology and Stratigraphy, 13. Elsevier, Amsterdam.

Cooper, R.A., 1992, A relative timescale for the Early Ordovician derived from depositional rates of graptolite shales. In: B.D.Webby and J.R.Laurie (eds.): Global Perspectives on Ordovician Geology, p. 3-21.

Fordham, B.G., 1992, Chronometric calibration of mid-Ordovician to Tournasian conodont zones: a compilation from recent graphic correlation and isotope studies. Geological Magazine, 129, 709-721.

Gradstein, F.M. et al., 1985, Quantitative Stratigraphy. Reidel Publishing Co., Dordrecht. 1985.

Johnson, M.E. et al., 1991, Eustatic sea-level patterns from the Lower Silurian (Llandovery Series) of southern Norway and Estonia. Geological Society of America, Bulletin, 103, 315-325.

2. COMMENT BY BARRY RICKARDS: SILURIAN PRIMARY BIOZONES?

There is a difference between adopting a set of graptolite zones for use on the left-hand side of correlation diagrams (Cocks & Nowlan, Silurian Times, 1993, pp.6-8) and the principles upon which such zones and sequences of zones might be based. As I have not seen the discussion documents circulated in 1990 and the autumn of 1992 perhaps I may be permitted one or two observations on the way the scheme has turned out. I hasten to add that I am far from opposed to a set of reference zones for use in correlation diagrams, even if I am a little unsure as to what is meant by "primary biozones": what relationship do they have to the increasingly popular concept of standard reference zones, or to biozones or to assemblage zones? Do they have a chronostratigraphic implication? If they are, simply, a practical means of indicating a level at which global correlation can comfortably be achieved, whilst at the same time not seeking to deny that greater precision is possible, then I can support their use equally comfortably!

On matters of detail, it should be noted that *rigidus/ellesae* does not exactly mean "... that the two successive zones ... have been combined". In this particular case it means that an horizon which has considerable global value, the *flexilis* (or *linnarssoni*) zone, has disappeared! It would be better if that particular entry in the primary biozone column read "*rigidus* to *ellesae*": that that level has great value is agreed, as this part of the "middle" Wenlock is often readily identifiable, even in poorly graptolitic sequences. Perhaps the *lundgreni* zone might be re-labelled, with advantage, the *lundgreni-testis* Zone (*?lundgreni/testis* Zone).

More serious is the *nassa/deubeli* zone (Figure , p.7). What does this mean, exactly? The *nassa* level is widespread and often easily identified. But the placement of a *deubeli* Zone below a *ludensis* Zone, completely changes the usage of the *ludensis* Zone as it has been up to now. The occurrence of *M. deubeli* itself is part way along the range of the *ludensis* Zone fauna. This is made quite clear, for example, in the recent work (1992) of Koren', for example, where a *deubeli* Zone is recognised from one third to two thirds along the duration of the *ludensis* Zone fauna (therein subdivided into *sherrardae* (= *predeubeli* level), *deubeli*, and *ludensis*. Jaeger (1991) depicts a similar, almost identical, scenario, and the same sequence was established elsewhere long ago (e.g. Holland *et al.* 1969; Bassett *et al.* 1975).

Thus by no stretch of the imagination can a primary biozone of *nassa/deubeli* be considered useful. Does it include "suppression" of a *praedeubeli* Zone? That is, is the detailed sequence really *nassa, praedeubeli?* If so then, again, the *nassa/deubeli* notation does not indicate "... that the two successive zones ... have been combined". If the intended coverage of *nassa/deubeli* is really *nassa* to *deubeli* then it implies that *M. praedeubeli* is a recognised synonym of the **early** forms of *M. ludensis*. I would regard this as being far from certain and elsewhere I regard it **at best** as a subspecies of *M. ludensis* (Rickards *et al.* in press).

Finally, the *vesiculosus* primary biozone (Figure, p.7). How is this defined? I can see in this case it broadly equates to a combination of the *atavus* and *acinaces* zones, and is presumably following the original Lapworth definition, in which case the above question is still a valid one. Or is it following Barca & Jaeger (1990, p.572) where they write:

> "It may be stated again that the indices of the three basal Silurian Zones of *Akidogr. ascensus*, *Akidogr. acuminatus* and *Cystogr. vesiculosus* with overlapping ranges, were found in the same piece of lydite and even on the same bedding plane. As the various zones are strictly defined by the first appearance of their respective zone-fossils, this sample has to be assigned to the *vesiculosus* Zone, namely its basal portion."

This, to my mind, is a completely unacceptable, and entirely unworkable concept of biozones. The appearance of *C. vesiculosus* within the *acuminatus* Zone has been known for a long time. What do we do if it is found in the *persculptus* Zone, a perfectly reasonable possibility? Change the definition of the *vesiculosus* Zone **again**? The fact is that only a few individuals have taken the Barca and Jaeger approach to zonal definition, which depends in its entirety on the first appearance of one species: so much then depends upon the recognition and definition of that species, and *C. vesiculosus* is itself a case in point. By contrast, most workers have used a **faunal assemblage**, the base **usually**, in practice, defined by the incoming of several species close together. Moreover, the base of the zone is usually tied in to a section - into the rock, in fact (Rickards, 1976). This has implications, positive ones, for any eventual, acceptable, set of standard reference zones.

It seems to me that the time is now ripe for a thorough discussion of what we mean by (bio)zones, what we mean by standard reference zones and chronozones, and, possibly, what we mean by primary biozones: the last, at least, is a new concept, whether primarily practical/utilitarian or not.

Barca, S. & Jaeger, H. 1990. New geological and biostratigraphical data on the Silurian in SE-Sardinia. Close affinity with Thuringia. Boll. Soc. Geol. It., 108, 565-580.

Bassett, M.G., Cocks, L.R.M., Holland, C.H., Rickards, R.B. & Warren, P.T. 1975. The Type Wenlock Series. Rep. Inst. Geol. Sci., 75/13, 1-19.

Cocks, L.R.M. & Nowlan, G.S. 1993. New left hand side for correlation diagrams. Silurian Times, 1, 6-8.

Holland, C.H., Rickards, R.B., & Warren, P.T. 1969. The Wenlock graptolites of the Ludlow District, Shropshire, and their stratigraphical significance. Palaeontology, 12, 663-83.

Jaeger, H. 1991. Neue Standard-Graptolithenzonen folge nach der "Grossen Krise" an der Wenlock/Ludlow-Grenze (Silur). N. Jb. Geol. Paläont. Abh. 182, 303-354.

Koren', T.N. 1992. Noviye Poznevenlokski Monograpti Alaiskogo reta. Paleontological Journal 1992, no. 2, 21-33.

Rickards, R.B. 1976. The sequence of Silurian graptolite zones in the British Isles. Geol. J., 11, 153-188.

Rickards, R.B., Packham, G.H., Wright, A.J. & Williamson, P.L. in press. The Wenlock and Ludlow graptolite faunas and biostratigraphy of the Quarry Creek Region, New South Wales. Australasian Association of Palaeontology Bulletin.

3. COMMENT BY LENNART JEPPSSON

The requirement for the left hand column of correlation charts is to define zones that can be applied as widely as possible. A detailed zonation may not be applicable widely for two reasons. Firstly, it may include zones that are only locally developed or zones that are poorly known in many areas. In the first case, lumping of zones may be desirable to get a more widely applicable zonation. The latter case is common and reflects rates of progress in biostratigraphy. For example, it took a long time for the *G. nassa* Zone to become widely recognized. The recent redefinition of this zone by Jaeger who, for example, separated a preceding *M. d. parvus* Zone is very important because it helps in understanding the sequence of changes. The inclusion of such a change in the standard zonation may take years and should be a responsibility for graptolite specialists, but its exclusion should not cause anyone to refrain from doing their utmost to improve stratigraphic resolution. I think that some widely recognizable zones may be left out because they are new. In those case the Subcommission should include the zones and urge appropriate specialists to try to remedy the local situation. The standard zonation should adapt to the best known sequences, not the least known.

Another example is the latest Pridoli where I (1972) noted the stratigraphic importance of *Oulodus elegans detorta* and defined the *O. e. detorta* Zone in 1989. Where this interval is studied in detail, the zone is now recognized across Europe and in North America. I have seen enough published and unpublished material to confidently conclude that the lack of still wider recognition is due to its recent introduction.

I am deeply concerned that the lack of recognition of good zones in the official standard zonation may slow down scientific progress in stratigraphic resolution and that such a decision may result in a wide gap between the subcommissional vocabulary and that of those of us that strive for better stratigraphic resolution. I would ask whether the official standard zonation is seen as a temporary version or as something for the future. If the latter is true, then over time the gap will grow to a chasm and any increase in resolution will be halted by the existence of an Official Standard Zonation. For example, the average resolution in the suggested conodont column (about 3 Ma) is very far below that achieved in large parts of the post-Silurian, and far below what is possible today based on published data.

In a manuscript that I am currently writing, I have worked with the conodont zonation from the uppermost *P. amorphognathoides* Zone to the *O. s. sagitta* Zone. In my efforts to establish a better standard conodont zonation in this interval, I have reviewed all publications relevant to applying such a zonation globally and intercalibrating it with the graptolite zonation. With this work in mind I see several errors in the standard zonation as presented in the first issue of Silurian Times. The most important errors are:

1. The exclusion of a *K. ranuliformis* Zone means that the *P. amorphognathoides* Zone includes an interval lacking both this species and all other taxa characteristic for the zone. The duration of the omitted zone is between all to one one half of the *P. amorphognathoides* Zone as defined by conodont specialists.

2. The ancestry of *O. sagitta* is unknown but it probably dates back to the Llandovery. Hence, the *O. s. rhenana* Zone is defined on the *widespread* appearance of that subspecies. Where found in sequence with the graptolites, it is nowhere older than the *M. riccartonensis* Zone. Its appearance on Gotland is well above the only level with *M. riccartonensis* (Jeppsson, 1979) and in Britain *O. s. rhenana* is found just below graptolites of the *M. antennularius* Zone (probably within the *M. riccartonensis* Zone). Hence the lower boundary of the *O. s. rhenana* Zone is younger than that of the *M. riccartonensis* Zone, not half way up in the previous zone as delimited in the proposed zonation.

3. There is a very long gap in the known record of *O. sagitta.* The older segment of the range overlaps with the lowest part of the range of *Kockelella walliseri,* far below the thin *K. patula* Zone, which correlates with the *C. rigidus* Zone (Jaeger, 1975). Above a thin interval lacking *Kockelella* follows *K. absidata.* Further up, in the latest Sheinwoodian *O. sagitta* appears again. The type specimen of *O. sagitta* is from this interval and all records from this younger interval are identified as *O. s. sagitta.* The type specimen of *O. s. rhenana* is from the youngest part of the lower range. However, some specimens from this level are close to *O. s. sagitta* (see Walliser, 1964; Aldridge, 1975). Based on the average of these populations, they have been referred to *O. s. rhenana* except for those described from New York (Kleffner, 1991). This nomenclatural difference may, or may not, reflect a taxonomic difference. As yet, nobody has compared collections widely to find out. A stable zonation requires better definition of the base of the *O. s. sagitta* Zone which I see as the widespread return of *O. sagitta* far above the extinction of both *K. walliseri* and *K. patula* and also well above the appearance of *K. absidata.* This definition agrees with the base of the *O. s. sagitta* Zone as identified by most conodont specialists hitherto.

4. This *O. s. sagitta* Zone was found to be coeval with the *M. testis* Zone by Walliser (1964), that is, the upper part of the *C. lundgreni* Zone. The oldest datable record elsewhere is just below the base of the Homerian (Aldridge, 1985). On Gotland, *O. s. sagitta* also occurs within the range of *M. testis*.

5. Like *O. sagitta, O. b. bohemica* has cryptic origins and the base of the zone must be based on its widespread appearance. The oldest dated record is from the topmost part of the *C. lundgreni* Zone on Gotland. It is of the same age where dated elsewhere and so the base of this zone is in the topmost *C. lundgreni* Zone, not well below as shown on the proposed chart.

6. The type level of *O. bohemica* is in the *M. nilssoni* Zone (Walliser, 1964). This record needs to be restudied since the name is today applied to a taxon which seems to be lacking above the lower part of the graptolite zone which in the proposed chart is called the *M. ludensis* Zone.

7. The base of Walliser's (1964) *A. ploeckensis* Zone is, as far as can be judged now, within the *M. nilssoni* Zone, not at the top.

8. What is the evidence for *P. siluricus* above *M. leintwardensis*?

9. *I. woschmidti* has only been found in a few Silurian samples apart from the type locality, whereas *O. e. detorta* is widespread.

10. I assume that the "all-embracing concept" of *O eosteinhornensis* and the inclusion of this in *O. remscheidensis* has historical reasons, however, this concept prevents conodonts from playing the role they can do in the zonation of the Pridoli.

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Jaeger, H. 1975. Die graptolithenführung im Silur/Devon des Cellon-Profils (Karnische Alpen). Ein Beitrag zur Gleichsetzung der Conodonten- und Graptolithenzonen des Silurs. Carinthia II, 165/185, 111-126.

Jeppsson, L. 1972. Some Silurian conodont apparatuses and possible conodont dimorphism. Geologica et Palaeontologica 6, 51-69.

Jeppsson, L. 1989. Latest Silurian conodonts from Klonk. Geologica et Palaeontologica 23, 21-37.

Kleffner, M. 1991. Conodont biostratigraphy of the upper part of the Clinton Group and the Lockport group (Silurian) in the Niagara Gorge region, New York and Ontario. Journal of Paleontology, 65, 500-511.

Walliser, O.H. 1964. Conodonten des Silurs. Abhandlungen des Hessischen Landesamtes für Bodenforschung zu Wiesbaden 41, 1-106.

4. COMMENT BY LECH TELLER

I would like to emphasize that the zonal scheme presented (in the first issue of Silurian Times) is very controversial and does not represent the present state of knowledge on Silurian graptolite biostratigraphy in different regions of the world but only a restricted area. The version represents a subjective compilation and views of only two members of the Subcommission, only one being a specialist on graptolites. If the Subcommission wants to present a modern and objective scheme then it can only result from a discussion among the graptologists and other Silurian biostratigraphers.

There are important changes which should be made to the scheme itself. I would like to demonstrate how far-reaching these changes need to be by reference to the Wenlock, Ludlow and Pridoli Series. Only the first point concerns the Upper Telychian.

1. The Upper Telychian should end in the *spiralis* zone or even the *grandis* zone. The *crenulata* Zone should be eliminated because the *tullbergi* Zone is much more important and common. All the proposed Upper Telychian taxa are known in European and non-European sections excluding Britain.

2. The Sheinwoodian should begin with the *insectus* Zone while the *centrifugus* and *murchisoni* zones should be independent. Between the *riccartonensis* and *rigidus* zones, the *belophorus* Zone (synonym of *flemilis)* should be introduced as it is well known in many sections.

   The *rigidus* Zone should be separated from the higher *ellesae*, the latter being, in my opinion, a synonym of *perneri*, which occurs together with *ramosus*. It is a matter of discussion if it should be only one index form or two separate zones.

3. The Homerian begin with a very well known index zonal taxon *lundgreni*. Very common in the lower part of this zone is *radians*, while in the upper part *testis* is abundant. It is a matter for agreement if the two taxa should form two subzones.

4. The zonal subdivision of the Upper Homerian cannot be accepted. The proposition of Jaeger, who established five independent zones in this part of the column should be taken into consideration (from the bottom to the top: *parvus, nassa, praedeubeli,* and *ludensis*).

5. Two Gorstian zones (*nilssoni* and *scanicus*) should be monomial as well as *leintwardinensis* of the lower Ludfordian. The situation seems to be more complicated above *leintwardinensis* where in the borehole sections on the East European Platform in Poland, in Wolhynia, Podolia, in the Barrandian, Tien-Shan and also most probably in Arctic Canada occur graptolites whose vertical ranges are not yet perfectly recognized.
In the place of *bohemicus* should be introduced the *inexpectatus* Zone and underneath the *auriculatus*. The *formosus* is not a good index species because of its long vertical range. In some places it even crosses the Ludlow/Pridoli boundary.

   The *spineus* Zone may be one of the index zonal species above the Kozlowsky event(Upper Ludfordian)in the near future. The time equivalents of that part of the Ludfordian, but without graptolites are known in several sections around the world. This is the situation in Great Britain where the Ludfordian stratotype was created.

6. The graptolite zonation of the whole Pridoli Series is at the moment fully documented only in the Barrandian and Poland. According to the present state of knowledge, it can be stated that the Series begins with the *parultimus* Zone, followed by *ultimus*. Both should be separated. The younger *lochkovensis* Zone is marked by the index taxon, but within its vertical range occur species which are very close to the index taxon. They may be helpful for construction of the scheme, but their presence should not be overrated.

   The younger *bouceki* Zone is very well documented by the index taxon, which like the higher one *perneri*, is completely omitted for reasons incomprehensible to me.

   The youngest *transgrediens* Zone is put together with *bouceki* which I cannot accept because in the Barrandian and in Poland it is separated by a very distinct *perneri* Zone.

   In Poland the *transgrediens* morphotype graptolites can be followed through the whole Pridoli but in each particular case we are dealing with different subspecies which form an evolutionary lineage but they differ distinctly from the typical *transgrediens transgrediens*. In the Polish sections we have at least two subspecies both occurring below the *bouceki* Zone and about 60 m below the first appearance of the true transgrediens transgrediens.

The errors shown here make the version under discussion unacceptable as an international standard. The approval of it would be a step backward in the present knowledge of Silurian graptolites.

GRAPTOLITES

uniformis		
PRIDOLI		transgrediens perneri bouceki lochkovenis ultimus parultimus
LUDFORD	L	spineus
	U	new zone (acer)
	D	balticus
	F	
	O	new zone (hamulosus)
	R	new zone (latilobus)
	D	
	I	kozlowski
	A	inexpectatus
	N	auriculatus
WENLOCK	G	leintwardinensis
	O	scanicus
	R	nilssoni
	H	ludensis
	O	eubeli
	M	praedeubeli
	E	nassa
	R	parvus
	I	lundgreni
	A	
	N	
	S	ellesae=perneri
	H	rigidus
	E	belophorus
	I	riccartonensis
	N	murchisoni
	W	entrifugus
	O	insectus
LLANDOVERY	T	grandis
	E	spiralis
	L	tullbergi
	Y	griestonensis
	C	crispus
	H	turriculatus
	I	linnaei
	A	sedgwickii
	E	convolutus
	R	simulans
	O	triangulatus
	R	cyphus
	H	vesiculosus
	U	acuminatus

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Acta Palaeontologica Polonica is in the process of expansion in scope and coverage. The *Acta* publishes papers in all areas of theoretical, systematic and morphological paleontology. It is intended for global dissemination of paleontological knowledge. The journal solicits papers on all subjects from abiogenesis to zoogeography, and from acritarchs to zooxanthellae. There are no page charges, and all papers not exceeding 100 manuscript pages will be considered.

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SECOND INTERNATIONAL SYMPOSIUM ON THE SILURIAN SYSTEM: THE JAMES HALL MEETING IN 1996

Plans made under the principal sponsorship of the Subcommission on Silurian Stratigraphy (IUGS) are announced to convene the Second International Symposium on the Silurian System during the first week of August, 1996 in Rochester, New York. During the last week of July, the meeting will be preceded by a pre-conference field trip concentrating on Silurian, clastic-dominated strata in the Appalachian Basin of the eastern United States. Of special interest are the cyclic "Clinton" ironstones, which occur from Alabama to New York State bordering the Silurian highlands of Taconia. The meeting will be followed by a post-conference field trip during the second week of August, concentrating on Silurian, carbonate-dominated strata from the rim of the Michigan Basin on the Bruce Peninsula and Manitoulin Island of Ontario, Canada.

Western New York State exposes a fascinating mix of clastic and carbonate Silurian strata, with a long history of detailed study by James Hall, A.W. Grabau, and most recently Carl Brett (University of Rochester). Four days of meetings in Rochester, N.Y. will be broken by a day trip to the classic Silurian sequence exposed at Niagara Falls on the border between the U.S. and Canada.

The previous and 1st International Symposium on the Silurian System (the Murchison Meeting) was convened in 1989 at Keele, England where the theme session was topical, covering issues such as the control and distribution of major lithofacies, as well as aspects of marine circulation and eustasy. The 2nd International Symposium will be known as the James Hall Meeting, in honor of the North American geologist who in the context of his far-ranging studies on Silurian strata during the mid-1800s, advanced our understanding of regional paleogeography through his concept of the "Geosyncline" concept. Appropriately, the major theme of the symposium will be regional paleogeography. Invited papers will concentrate on the regional geographic features of each Silurian continent, as delineated by their shelf margins and/or lands bordered by typical "geosynclinal" deposits. A symposium volume is expected, tentatively entitled *Silurian Lands and Shelf Margins*.

Two important auxiliary themes of the 1996 meeting will focus on "Silurian economic geology" and "Silurian recovery from the Ashgillian extinction." Origination and extinction trends throughout the full Silurian may be considered under this venue.
Volunteered papers will be actively solicited for presentation on these topics.

This posting represents the first official circular for the 1996 James Hall Meeting as distributed with the 1994 issue of *Silurian Times*, the official newsletter of the Subcommission on Silurian Stratigraphy.

The organizing committee for the 2nd International Symposium on the Silurian System will be aided by your initial response to this circular.

PLEASE FILL OUT THE FORM ON PAGE 31 TO EXPRESS INTEREST IN THE JAMES HALL SYMPOSIUM

It is presently too early to determine dollar estimates for the cost of the symposium and associated field trips. Organizers will make every effort to keep expenses as reasonable as possible using university dormitory space and vehicles. Response to the on the form (p. 31) questions should bear this in mind optimistically.

NEWS AND CURRENT RESEARCH OF SILURIAN WORKERS

RICHARD ALDRIDGE (United Kingdom) is involved with conodont taxonomy, biostratigraphy and paleoecology; integrated stratigraphy; Silurian sedimentary and biotic episodes and events (with Lennart Jeppsson, Ken Dorning, Viive Viira and others). Research students at Leicester (Ruth Elliott, Gary Mullins, Jane Washington-Evans) are working on integrated microfossil biostratigraphy of U.K. sequences.

HOWARD ARMSTRONG (U.K.) works on Ordovician and Silurian conodonts, including their biostratigraphy (graphic correlation), geothermometry, paleobiology, evolutionary responses to glaciation, and biomolecular paleontology.

WILLIAM AUSICH (U.S.A.) is working on Silurian echinoderms, especially in Llandovery and reef and reef-associated Middle Silurian crinoids.

GUDVEIG BAARLI (U.S.A.) is working on Lower Silurian brachiopods of southern Norway: work is in progress on a monograph covering the Orthacea and Strophomenida.

CLAUDE BABIN (France) continues his work on the systematics, evolution and paleobiogeography of bivalves and nautiloids.

RICHARD BATCHELOR (U.K.) is working on the geochemistry of bentonites and its application to chemostratigraphy, particularly in Lower paleozoic successions. Chemical data are used for correlation, igneous classification, petrogenesis and tectonic setting. Current work is focussed on Norway, Sweden, Poland, Ireland and Scotland with a specific interest in the bentonites that occur at the top of the Llandovery.

STIG BERGSTRÖM (U.S.A.) is working on Silurian K-bentonites in Europe and North America.

MERETE BJERRESKOV (Denmark) continues work on Silurian graptolites and biostratigraphy.

ALAIN BLIECK (France) continues work on the systematics, biostratigraphy and paleobiogeography of Early and Middle Paleozoic agnathan vertebrates, mainly heterostracans.

OLGA BOGOLEPOVA (Russia) works on stratigraphy of the Ordovician and Silurian of Siberia and on taxonomy, paleoecology and paleobiogeography of Ordovician, Silurian and Devonian cephalopods and bivalves.

ART BOUCOT (U.S.A.) is working on Silurian brachiopods, paleoecology, paleobiogeography, distribution of climatically sensitive sediments, gastropods, higher land plant spores and more.

ANDY BUTLER (U.K.) is conducting integrated basin analysis of Caledonian terranes, aiming to blend subsidence analyses with a refined sequence stratigraphy. He is working primarily in the Welsh Basin and its adjacent platform, extending to other basins as time allows.

RICHARD CAVE (U.K.) is working on the development, sedimentation and stratigraphy of the Welsh Basin in the Ordovician and Silurian.

KAREN-ROSE CERCONE (U.S.A.) works on diagenesis of Silurian pinnacle reefs in the Michigan Basin and on tectonic evolution of the Michigan Basin.

XU CHEN (China) continues his work on Ordovician and Silurian graptolites and biostratigraphy with particular emphasis on the Silurian of Eastern Asia, Ordovician and Silurian graptolites from Tarim, Xinjiang and the base of the austrodentatus Zone for global subdivision of the Ordovician. He is also studying the Phanerozoic climatology of China.

IVO CHLUPÁČ (Czech Republic) continues to work on trilobites and non-trilobite arthropods (especially Phyllocarida and Euryptida). He is also studying the stratigraphy of the Late Silurian and Devonian and exploring biostratigraphic methods.

MURRAY COPELAND (Canada) continues his work on Lower Paleozoic ostracodes.

TIM DeFREITAS (Canada) is working on the stratigraphy, sedimentology and paleontology (including Silurian sponges and bivalves) of the Franklinian succession (Early Cambrian to Late Devonian) of the Canadian Arctic Islands.

KEITH DEWING (Canada) is working on aspects of strophomenid brachiopods including taxonomy and shell microstructure, the Ordovician - Silurian boundary and the Llandovery - Wenlock of Anticosti Island and the Canadian Arctic. He is also studying the graptolite biostratigraphy and thermal maturation of the Canadian Arctic Islands.

OWEN DIXON (Canada) continues his work on Ordovician and Silurian corals of the Canadian Arctic and Anticosti Island, especially tabulates, their systematics and paleoecology. He is also working on Silurian reefs of the Canadian Arctic and related sedimentology and stratigraphy.

KEN DORNING (United Kingdom) continues to study Paleozoic palynology and stratigraphy.

STEVEN DRIESE (U.S.A.) is studying the sedimentology, paleopedology and stable isotope geochemistry of the late Ordovician and late Silurian paleosols in the central and southern Appalachian basin of the United States. This work is to be extended to the Ludlow paleosols of the Arisaig section of Nova Scotia, Canada. He is also interested in trying to reconstruct the terrestrial ecosystems preserved in the paleosols.

ANNALISA FERRETTI (Italy) works on biofacies, biosedimentology and community evolution of some Silurian limestones in Ireland, Italy and Bohemia.

LIPU FU (China) has completed a major study of the Silurian of Qinling and Dabashan but cannot find funds to publish it, Current work is on stratigraphy of northern Qinling and northern Qilian.

MAURIZIO GNOLI (Italy) works on nautiloid cephalopods and biostratigraphy.

ALEXANDER GUBANOV (Russia) works on paleontology, paleoecology, stratigraphy and paleobiogeography of Silurian gastropods.

WOLFGANG HANSCH (Germany) works on the taxonomy, stratigraphy and paleobiogeography of Silurian ostracodes worldwide, but especially of Baltoscandia and central Europe. He is also working on the stratigraphy, sedimentology and paleogeography of the Silurian of Germany.

MARK HARRIS (U.S.A.) works on carbonate sedimentology and sequence stratigraphic analysis of Upper Ordovician -Silurian strata in the Great Basin (Nevada and Utah) and eastern Wisconsin. Goals are to define sequences across shelf to basin transects within a constrained biostratigraphic framework (Great Basin); relate facies and sequence patterns to hydrologic flow patterns (eastern Wisconsin); and compare the sequence interpretations in the two areas.

ALDAN HASSAN (Algeria) is working on the stratigraphy and palynology of Lower Devonian rocks in the northwestern part of the Algerian Sahara.

LENNART JEPPSSON (Sweden) is working on empirical and theoretical aspects of global oceanic cyclic changes and on all aspects of Silurian conodonts to develop an improved Silurian standard conodont zonation. Recent work has focussed on a new zonation for the "early and middle" Wenlock and improved correlations between Gotland and Estonia (with Viira and Mannik). He is working (with Aldridge) on recurrent conodont associations and with Aldridge and Dorning on the Wenlock sequence of oceanic episodes and events and their effects on faunal and sedimentary sequences. Work is progressing with Batchelor on the geochemistry of bentonites on Gotland.

FREDRIK JERRE (Sweden) studies Silurian conulariids.

CHUNTAI JIN (China) works on the biostratigraphy of the Silurian and on corals in southwestern China.

MARKES JOHNSON (U.S.A.) continues his work on Silurian eustacy, attempting to find sea level patterns in common on the various Silurian paleocontinents and to use these trends in paleogeographic mapping.

STEPHEN KERSHAW (United Kingdom) works on Paleozoic sponge paleoecology and paleobiology as well as reef sedimentology.

GENNADY KISSELEV (Russia) works on the taxonomy, paleoecology and biostratigraphy of Ordovician, Silurian and Lower Devonian cephalopods.

TANYA KOREN (Russia) continues her research on Ordovician, Silurian and Lower Devonian graptolites, including their evolution, bioevents, morphology and biostratigraphy.

JIRI KŘÍŽ (Czech Republic) continues his work on Silurian stratigraphy of the Prague Basin (Barrandian) and on paleogeography, correlation, biostratigraphy and Lower Paleozoic Bivalvia.

NIKOLAI KULKOV (Russia) works on stratigraphy, paleontology, brachiopods and paleobiogeography.

SVEN LAUFELD (Sweden) is working on the environmental impact of volcanic eruptions and other natural hazards worldwide.

ALAIN LE HÉRISSÉ (France) continues his work on Paleozoic palynomorphs and mazuelloids with emphasis on their systematics, biostratigraphy and paleobiogeography.

PIERRE LESPÉRANCE (Canada) is currently working on Early Silurian trilobites, notably phacopids. His main research interest at the moment is the Early Devonian of the Appalachian region of eastern Canada.

DAVID LOYDELL (United Kingdom) is working on taxonomy and high resolution biostratigraphy of Silurian graptolites. Currently, the main focus is on uppermost Llandovery - Lower Wenlock graptolites from Wales; cyrtograptids, monoclimacids, retiolitids, and streptograptids will be revised taxonomically.

TIIU MÄRSS (Estonia) continues her work on the taxonomy and biostratigraphy of Silurian vertebrates.

TATJANA MODZALEVSKAYA (Russia) is studying the systematics, biostratigraphy and paleoecology of Silurian and Lower Devonian brachiopods of Russia, Byelorussia, Ukraine, Kazakhstan and Middle Asia.

PETRAS MUSTEIKIS (Lithuania) works on Silurian biostratigraphy and paleogeography, brachiopod taxonomy and ecology and brachiopod communities.

BRIAN NORFORD (Canada) continues Silurian biostratigraphic studies in western and northern Canada. Syntheses of Ordovician and Silurian rocks in outcrop and in the subsurface have been completed with Mike Cecile and others. Compilation of correlation charts for the Arctic Circumpolar region continues as part of a Canada-Russia agreement (with Nowlan, Bondarev, Spassky and Harris). A study of the Late Telychian graptolite, conodont and shelly faunas from the Tegart Formation is complete.

GODFREY NOWLAN (Canada) continues work on the biostratigraphy of Silurian conodonts and thelodonts (with S. Turner) in eastern Canada and on the Ordovician - Silurian boundary in Laurentia. Preparation of correlation charts for the Arctic Circumpolar region continues (with others). Most effort at the moment is focussed on the pre-Devonian stratigraphy, sedimentation and biostratigraphy of the subsurface of the Western Canada Basin.

FLORENTIN PARIS (France) works on biogeography, paleogeography and paleoenvironment of Ordovician to Devonian chitinozoans from Europe, North Africa, Middle East and South America.

JOSÉ PIÇARRA D'ALMEIDA (Portugal) is working on stratigraphy and paleogeography of the Lower Paleozoic of Portugal and Silurian graptolite biostratigraphy.

BARRIE RICKARDS (U.K.) continues his work on Lower Paleozoic graptolites; particular emphasis has been on shelf sea graptolite evolution.

MADIS RUBEL (Estonia) continues his work on Ordovician and Silurian brachiopods of the Baltic and on quantitative stratigraphy.

CASIBE SAYAR (Turkey) is working on Paleozoic brachiopoda, biostratigraphy, chronostratigraphy, paleoecology and paleogeography. Mainly dealing with Lower Paleozoic brachiopods, particularly benthic assemblages and the Ordovician - Silurian boundary. Also working on Carboniferous and Permian brachiopods.

PAUL SELDEN (U.K.) works on paleobiology of Chelicerata.

NIKOLAY SENNIKOV (Russia) is describing the Silurian lithostratigraphy of southern Siberia. He is also working on the taxonomy and biostratigraphy of Cambrian to Silurian graptolites and on Silurian planktonic communities (graptolites, chitinozoa and acritarchs) in Siberia and eastern Europe. He is also studying Paleozoic pterobranchs and has interest in the Ordovician - Silurian boundary event.

ENRICO SERPAGLI (Italy) continues his work on conodont biostratigraphy and is also working on the bivalve communities and their correlation with conodont zones.

DALIP K. SETHI (Sweden) studies Silurian palaeocope ostracodes of Gotland and Scania.

PETER SHEEHAN (U.S.A.) is working on brachiopods and sequence stratigraphy of the western U.S.A. and on Ordovician - Silurian extinction and recovery.

RICHARD SMOSNA (U.S.A.) works on Silurian paleogeography of the Appalachian Basin, eastern north America.

CONSTANCE SOJA (U.S.A.) continues her research on Silurian deposits in the Alexander Terrane of Alaska. She is studying fossil assemblages and carbonate platform evolution to determine whether Siluro-Devonian deposits of S.E. Alaska were deposited were deposited close to, or far away from, ancient North America. She is investigating sphinctozoans (aphrosalpingids) of Ludlow-Pridoli age to test the hypothesis that a marine corridor (the Uralian Seaway) enabled migratory exchange along the northern rims of Laurentia and Baltica.

PHILIPPE STEEMANS (Belgium) works on the biostratigraphy and paleogeography of spores and cryptospores in the Ordovician, Silurian, Lower and Middle Devonian.

CARL STOCK (U.S.A.) is studying Silurian and Devonian stromatoporoids, including systematics, paleoecology, evolution and paleobiogeography. Specifically, this work includes upper Wenlock stromatoporoids of Kentucky, New York and Virginia. Future plans are for study of Pridoli stromatoporoids of Alabama and Tennessee, and Llandovery stromatoporoids of New York, Alabama and Oklahoma.

PETR STORCH (Czech Republic) continues his study of the taxonomy, stratigraphy and correlation of Silurian graptolites of Gondwanan Europe.

YANGZHENG SU (China) is working on Silurian brachiopods and biostratigraphy of Nei Mongol and Northeast China; also participating in the project "Stratigraphic Units of China" for Silurian of northern China.

STUART SUTHERLAND (United Kingdom) completed his doctoral dissertation in 1992 (see Publications section) and is working on oceanic cyclicity in the Early Silurian using palynomorphs and microfossils as sensitive indicators of paleoenvironmental change.

PAUL SWIRE (Malta) is working on the palynology of the Silurian (particularly Llandovery and Wenlock) of the Welsh Borderlands and on the palynology of Paleozoic sections in Libya.

LECH TELLER (Poland) continues his work on Silurian graptolites and biostratigraphy.

SUSAN TURNER (Australia) continues her work on Silurian vertebrates, especially Thelodonti and Condrichthyes worldwide. Recent work concentrated on Canada, Ireland, Australia and Norway.

ADAM URBANEK (Poland) continues his work on the morphology, taxonomy, stratigraphic distribution and evolution of graptolites.

JEAN VANNIER (France) works on Ordovician, Silurian and Recent ostracodes.

JACQUES VERNIERS (Belgium) continues work on the lithostratigraphy, biostratigraphy, sedimentology and basin analysis of the Brabant Massif and Condroz Ridge, Belgium and surrounding areas.

VIIVE VIIRA (Estonia) continues her work on Ordovician and Silurian conodonts and biostratigraphy.

NIAN-ZHONG WANG (China) studies Silurian and Devonian vertebrate microfossils and stratigraphy of China.

RODNEY WATKINS (U.S.A.) is working on the paleoecology of Silurian benthic marine communities.

CHARLES WELLMAN (United Kingdom) is working on Silurian land plant microfossils (sporomorphs and dispersed fragments) and megafossils.

JOHN WHITAKER (U.K.) works on Silurian sedimentology, paleontology and paleoecology of the Welsh Borderland.

NIGEL WOODCOCK (U.K.) continues work on sequence stratigraphy, sedimentation and tectonics in the Lower Paleozoic basins of southern Britain.

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(see p. 11 for details)

Please complete and return to: Dr. Markes E. Johnson, Dept. of Geology, Williams College, Williamstown, Massachusetts, 01267 USA

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ADDRESS:

I am interested in attending the August 1996 symposium in Rochester, N.Y. The likelihood of my attendance is:

___ definite
___ probable
___ possible but uncertain

I would like to make a presentation (or be part of a research team making a presentation) at the symposium regarding:

___ paleogeography/correlation
___ extinction/origination patterns
___ economic geology

All delegates to the five day conference will be able to participate in a one day field trip to Niagara Falls, but the pre- and post-conference field trips will be organized separately at additional cost. I am interested in attending:

___ long version of the pre-conference Appalachian Basin field trip (Alabama to New York State)
___ short version of the pre-conference Appalachian Basin field trip (Virginia to New York State)
___ the post-conference Michigan Basin field trip (Bruce Peninsula and Manitoulin Island)
___ both the pre- and post-conference field trips