

# SILURIAN TIMES No. 13 (2005)

A NEWSLETTER OF THE  
INTERNATIONAL SUBCOMMISSION ON SILURIAN STRATIGRAPHY (ISSS)  
INTERNATIONAL COMMISSION ON STRATIGRAPHY  
INTERNATIONAL UNION OF GEOLOGICAL SCIENCES  
INTERNATIONAL UNION OF GEOLOGICAL SCIENCES  
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## INTERNATIONAL SUBCOMMISSION ON SILURIAN STRATIGRAPHY (ISSS)

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A. Le Hérissé (France)	S. Peralta (Argentina)
D.K. Loydell (UK)	P. Štorch (Czech Republic)
M.J. Melchin (Canada)	

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## **CHAIRMAN'S CORNER**

Dear all colleagues,

The new issue of Silurian Times makes for welcome reading with its news of recent situations and contributions to Silurian investigations from around the world during the last year. Our secretary, Jacques Verniers has taken over responsibility for editing the newsletter from Michael Melchin, and he has done an excellent job to assemble all the materials for this issue. I hope you will enjoy reading it. I am grateful to all the voting members for replying to Jacques' requests and hope you will continue your strong support for the work of the SSS.

One of the most important tasks before the SSS is to finish our restudy of the base of the Silurian System. It now becomes clear that the SSS voted to accept the proposal by Michael Melchin for a very modest redefinition of the base of the Silurian at Dob's Linn, Scotland. The revised definition makes the boundary assignment at the base of the Akidograptus ascensus Biozone, defined by the first appearance of that species together with *P. praematurus*. Many of our voting members were very happy to cast their vote to accept this proposal.

Regarding the restudy of the Llandovery-Wenlock boundary, David Loydell has done considerable work to investigate much data regarding the type area, and elsewhere at this stage. However, how we should define this boundary has not yet been resolved. This indicates that more work on the subject needs to be done. I hope we may revisit the situation and provide additional comments this year.

During the summer of last year, the Silurian Field Meeting held on Gotland, Sweden, was highly successful and I would like in particular to acknowledge Drs. Mikael Calner, Mats Eriksson, and their colleagues for their splendid organization and preparation for the conference.

The SSS website <<<http://www.silurian.cn>>> has recently gone on line. I thank Fan Juanxuan, who has taken on this responsibility and contributed much work towards its success. I encourage you all to log onto this platform and to take full advantage of the opportunity to add various related subjects regarding our Silurian research.

Finally, I would like to take this opportunity, together with Prof. Chen Xu, the chair of the Subcommittee of Ordovician Stratigraphy, to invite all of you to attend the next Ordovician-Silurian Conference that will be held in Nanjing in June 2007. I am looking forward to meeting you in China in the near future!

All the best,

Sincerely yours,

Rong Jiayu

## **EDITOR'S NOTES**

This my first issue of Silurian Times. I wish to thank all of those who contributed to this issue and apologise to anyone whose contributions I may have inadvertently left out. We have received the current projects and recent publications of about 40 voting or corresponding members. The list of Silurian workers who showed an interest to receive "Silurian Times" contains close to 200 persons. Possibly more researchers could send the Silurian community about their current projects and publications.

Jacques Verniers

5 July 2006

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## SCIENTIFIC QUESTION RAISED BY PHILIPPE LEGRAND

Philippe Legrand raises two questions to the Silurian community:

- (1) Does anyone know a section in which *Akidograptus ascensus* and *Spinachitina fragilis* have been collected in the same bed ?
- (2) Do you know a section in which *Parakidograptus acuminatus* and *Spinachitina fragilis* have been collected in the same bed ?

He is concerned by this question because he encounters difficulties to let the FAD's coincide at the base of the Silurian. Maybe the vague definition of the biozone could be the origin of this problem.

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## Suggestion for rapid communication of publications

By Lennart Jeppsson

Here is my contribution and a suggestion regarding modern way to distribute 'reprints'. Reprints are very expensive today - as a result most of us have been forced to stop sending reprints. Most journals do send a pdf file to the author for free distribution. Unfortunately, that is usually only sent to a small group of colleagues. The group is small for different reasons, e.g. the time it takes to find and type in lots of addresses, missing addresses, etc. To make sure we do not miss any important new Silurian contributions, there may be different ways to make distribution more efficient. I am no expert on electronic mass distribution but I am aware of two alternatives.

At my department there is a joint address system: type in the code and everybody get the mail. I suppose that may require that everybody are in the same local net, but perhaps it could be arranged so that we sent a mail with the pdf to one address and that a local computer, or server, automatically forwarded it to everybody that has agreed to have their address included in the list.

The other alternative is a joint repository from where we could download those papers listed in the yearly list of Silurian publications. A joint address (list?) would result in immediate distribution instead of a delay of up to >12 months for a repository. I suppose that we all get so many junk mail that trashing unwanted pdfs would only be a minor extra work for those that are only interested in a special field.

With best wishes, Lennart

Please address your comments to Lennart Jeppsson, to the chairman or the secretary.

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## NEW WEB SITE FOR THE SILURIAN SUBCOMMISSION

All members of the Silurian Subcommittee should note that a new website for the SSS is. This site is being designed and prepared by Fan Juanxuan and Zhao Hui at the Nanjing Institute of Geology and Palaeontology, with input from the SSS executive. The site will have a very similar format to the new site for the Ordovician Subcommittee. The new web site is to be found at: <http://www.silurian.cn/>.

# ANNUAL REPORT OF THE INTERNATIONAL SUBCOMMISSION ON SILURIAN STRATIGRAPHY (ISSS) OF THE INTERNATIONAL COMMISSION ON STRATIGRAPHY FOR



## International Commission on Stratigraphy Subcommission on Silurian Stratigraphy ANNUAL REPORT 2005

### 1. TITLE OF CONSTITUENT BODY

#### Subcommission on Silurian Stratigraphy

*Submitted by:*

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### 2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

- Rationalization of global chronostratigraphical classification.
- Intercalibration of fossil biostratigraphies, integrated zonations, and recognition of global datums.
- Establishment of magneto- and chemo-stratigraphic scales.
- Definition of Stage boundaries and restudy of global stratotype sections.
- Correlation of Silurian rock successions and events, including marine to non-marine.
- Climatic evolution and modelling.

The objectives satisfy the IUGS mandate of fostering international agreement on nomenclature and classification in stratigraphy; facilitating international co-operation in geological research; improving publication, dissemination, and use of geological information internationally; encouraging new relationships between and among disciplines of science that relate to Triassic geology world-wide; attracting competent students and research workers to the discipline; and fostering an increased awareness among individual scientists world-wide of what related programs are being undertaken.

### 3. ORGANIZATION

SSS is a Subcommission of the Commission on Stratigraphy.

Officers (chair, one vice-chair, secretary), voting members (15), (*see Appendix for complete listing*) and corresponding members (50).

#### **Officers for 2004-2008:**

Chair: Rong Jiayu, Nanjing, China.

Vice-Chair: T. N. Koren', St. Petersburg, Russia.

Secretary: J. Verniers, Ghent, Belgium (*began, Jan. 2005*)

*Former Secretary* M. J. Melchin, Antigonish, Canada (*ended Dec, 2004*)

Subcommission members represent a broad spectrum of specialized stratigraphical disciplines from those countries or regions where Silurian rocks are extensively studied in relation to fundamental and/or applied geological research. Current research activities and future plans are communicated through publication of an annual SSS newsletter *Silurian Times* in both hardcopy and as a web release.

**Websites:** <http://www.silurian.cn/home.asp> contains newsletters, meeting announcements, discussion posting-boards, bibliography of Silurian articles, links to related sites, and other information.

The former web site for the Silurian Subcommittee:

<http://iago.stfx.ca/people/mmelchin/SILURIAN.HTML> has access to pre-2005 issues of *Silurian Times* in PDF format.

#### 4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

Jointly with the **International Subcommittee on Ordovician Stratigraphy**.

- Co-sponsored meeting in Argentina and planning a joint meeting in Nanjing in 2007.
- Joint working group on the restudy of the Ordovician-Silurian Boundary.
- Collaboration on an IGCP Project N° 503 entitled “*Ordovician Palaeogeography and Palaeoclimate*”.

#### 5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2005

A new web site for the SSS was prepared by **Fan Juanxuan and Zhao Hui at the Nanjing Institute of Geology and Palaeontology, under the direction of Rong Jiayu, SSS Chair**. The web site at <http://www.silurian.cn/home.asp> has a format and design that follows closely those of the new site for the Ordovician Subcommittee: <http://www.ordovician.cn/home.asp>.

**Silurian Field Meeting in Gotland, Sweden August 15-22, 2005. Information can be found at:** <http://www.geol.lu.se/events/silconf.htm>. The theme for the field meeting was the global dynamics of the Silurian Period. In particular, the meeting and field trips focussed on important events of biotic and palaeoenvironmental change as represented in the fossil, sedimentological, and chemostratigraphical record and their interpretation

*Silurian Times*: edited by Jacques Verniers in late 2005, with a progress report on restudy of the Base of Wenlock.

#### Revision of base-Silurian and base-Wenlock GSSP's

A GSSP should be defined at a point in a section that affords the potential for confident, precise, and high-resolution correlation into as many facies as worldwide as possible. Unfortunately, there are many serious problems for the GSSP's of the Silurian as defined in the 1980's. Now, fifteen years later, SSS has restudied two of these poorly defined GSSP's. This GSSP restudy had no objections from the voting membership.

**A restudy of the GSSP for the Base of Silurian was prepared by a working group under the leadership of Mike Melchin.** The working group has unanimously agreed that the current GSSP, at 1.6 m above the base of the Birkhill Shale, at Dob's Linn, Scotland, should be maintained as the GSSP, but the biostratigraphical definition of the boundary needs to be revised. The GSSP should be regarded as coinciding with the first appearance of *Akidograptus ascensus*, defining the base of the *A. ascensus* Biozone at that section. **Once approved by the SSS membership this recommendation will be forwarded to ICS.**

**The working group to restudy the Base of the Wenlock Series (base of Sheinwoodian Stage) is led by David Loydell, and is currently in the process of studying potential GSSP sections in the Czech Republic and Wales, as possible alternatives to the current GSSP in England. The primary marker for the base-Wenlock was a graptolite, but the GSSP in England is notably poor in allowing exact determination of their ranges.** Recent evidence has shown that the current GSSP does not coincide with the base of the *Cyrtograptus centrifugus* Biozone, as was supposed when the GSSP was defined. **It has been suggested to retain the GSSP location in England but revise the level of the GSSP slightly to coincide with a conodont event -- the Ireviken conodont datum 2, which coincides approximately with the base of the lower *murchisoni* graptolite biozone (instead of the current *centrifugus* graptolite zone). Alternatively, another GSSP locality with a precise base of the *Cyrtograptus centrifugus* Biozone could be chosen (e.g., potential sections in Great Britain and the Czech Republic), but this process would be quite lengthy. A report of this work was made at the Silurian Field Meeting in Gotland, in August, 2005.**

There was a general agreement that there is no time left to rediscuss the bases of the other stages (such as Aeronian, Telychian, Ludlow, and Ludfordian), although many participants considered that all these GSSP have serious problems.

## 6. CHIEF PROBLEMS ENCOUNTERED IN 2005

No major problems.

## 7. SUMMARY OF EXPENDITURES IN 2005 (ANTICIPATED THROUGH MARCH 2006):

Travel for SSS Vice-Chair (Dr. Koren) to SSS Field Meeting in Gotland.

Transportation, accommodation, food, registration **\$600**

*Note that Dr. Koren had no funds for international travel from her institute in Russia.*

All costs associated with the production of *Silurian Times* are currently paid by St. Francis Xavier University and the Ghent University, the host institution of the SSS secretaries.

## 8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2006):

(1) Reconsideration of the **Ordovician-Silurian boundary** Proposal:

Global spike GSSP should stay, but GSSP redefined as base of *ascensus* graptolite Zone

Vote of titular members **in December 05**

(2) Vote on proposals for revision of the GSSP for the **Base of the Wenlock** by **May 2006**.

## 9. BUDGET AND ICS COMPONENT FOR 2006

Partial support for Working Groups **\$ 500**

NOTE: All travel costs for the SSS Chair, Secretary and other titular members will be paid by their own research funds. It is anticipated that all costs associated with the production of *Silurian Times* will continue to be paid by the host institution of the SSS secretary.

## 10. REVIEW CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2001-2005)

*See Accomplishments in 2005 (above) for additional details.*

Over the period of 2002-2005 the Subcommittee on Silurian Stratigraphy was active in several respects.

New York State Museum Bulletin 493 (Title: "*Silurian Lands and Seas---Paleogeography Outside of Laurentia*") was released in May 2003. The Bulletin consists of eleven contributed papers that cover Silurian palaeogeography, plate tectonic assembly, stratigraphy, and biogeography in North Africa, southern and central Europe, China, Kazakhstan, the Baltic region (including Scandinavia), Avalon, the Russian "Far East," northern Siberia, Australia and New Guinea, and the Himalayan countries and southeast Asia.

The field meeting of the ISSS was held in San Juan, Argentina in August, 2003, in connection with an International Symposium on the Ordovician System and an International Graptolite Conference. Field trips and the conference sessions were well organized and well attended. Accompanying this conference was the publication of the volume entitled "*Proceedings of the 7th International Graptolite Conference & Field Meeting of the International Subcommittee on Silurian Stratigraphy. INSUGEO, Serie Correlación Geológica. 18 Comunicarte Editorial, Córdoba, Argentina*" edited by G. Ortega and G.F. Aceñolaza.

The Silurian Field Meeting of the SSS was held in Gotland, Sweden between August 15 and 22, 2005. A three day symposium followed by five days excursion was organized by Eriksson, M.E., Calner, M. and L. Jeppsson (Lund University and support of the Swedish Geological Survey). The field guide and the abstract book were published in the volume "*The Dynamic Silurian Earth*". In: Eriksson, M.E., Calner, M. (Eds.), *Field Meeting of the Subcommittee on Silurian Stratigraphy 2005, Gotland, Rapport och meddelanden-Sveriges Geologiska Undersökning vol. 121, pp.1-99*.

An International Symposium on the Silurian System is planned for Nanjing, China, in 2007, to be hosted by the Nanjing Institute of Geology and Palaeontology.

## 11. OBJECTIVES AND WORK PLAN FOR NEXT 3 YEARS (2006-2008)

### September 06--August 07

- a. Discussion on possible re-study of other Silurian GSSP's.
- b. Nanjing meeting and field excursion for the Ordovician and Silurian Subcommittee on Stratigraphy in Nanjing and Southwest China (upper Yangtze Platform: mainly Llandovery--Rhuddanian, Aeronian, and Telychian)  
Discussion on **Llandovery/Wenlock boundary**  
Further work on possible on new GSSP re-studies  
New members for next four years
- c. Silurian *Times* (edited by Jacques Verniers)

### September 07--August 08

- a. Silurian *Times* (edited by Jacques Verniers)
- b. Vote on **Llandovery/Wenlock boundary**
- c. Possible continued further re-study of other GSSP's.
- d. New officers and members

**Integrated Silurian Stratigraphy**, in which all studies on refinement of biozonal schemes, sequence and cyclo-stratigraphy, stable isotope curve are combined. This will allow researchers to apply national or other research money when their projects are framed in this large international project, patronized by the SSS.

## APPENDIX [*Names and Addresses of Current Officers and Voting Members, 2004-2008*]

### SUBCOMMISSION ON SILURIAN STRATIGRAPHY

#### Subcommission officers

**Chairman:** Rong Jiayu, Nanjing Institute of Geology and Palaeontology, 39 East Beijing Road, Nanjing, 210008, P R China, e-mail: [jyrong@nigpas.ac.cn](mailto:jyrong@nigpas.ac.cn)

**Vice Chairman:** Tatiana Koren', All-Russia Geological Research Institute (VSEGEI), Sredny Pr. 74, 199026, St. Petersburg, Russia, e-mail: [koren@vsegei.sp.ru](mailto:koren@vsegei.sp.ru)

**Secretary (until Dec. 04):** Michael Melchin, Department of Earth Sciences, St. Francis Xavier University, Antigonish, Nova Scotia, Canada, B2G 2W5, e-mail: [mmelchin@stfx.ca](mailto:mmelchin@stfx.ca)

**Secretary (beginning Jan. 05):** Jacques Verniers, Research Unit Palaeontology, Department of Geology and Pedology, Ghent University, Krijgslaan 281 S8, B-9000, Gent, Belgium, e-mail: [Jacques.Verniers@ugent.be](mailto:Jacques.Verniers@ugent.be).

#### List of Task Groups and their officers

**Base of Silurian:** Mike Melchin, Canada: [mmelchin@stfx.ca](mailto:mmelchin@stfx.ca)

**Base of Wenlock:** David Loydell, England: [david.loydell@port.ac.uk](mailto:david.loydell@port.ac.uk)

#### List of Voting Members

C.E. Brett, Cincinnati, USA, [brettce@email.uc.edu](mailto:brettce@email.uc.edu)

L.R.M. Cocks, London, UK, [R.Cocks@nhm.ac.uk](mailto:R.Cocks@nhm.ac.uk)

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J. Verniers, Ghent, Belgium, [Jacques.Verniers@ugent.be](mailto:Jacques.Verniers@ugent.be)

## **Report on the Past Field Meeting of the Subcommittee on Silurian Stratigraphy 2005, The Dynamic Silurian Earth Gotland, Sweden**

Organized by Mikael Calner, Mats E. Eriksson & Lennart Jeppsson

GeoBiosphere Science Centre, Lund University, Sölvegatan 12, SE-223 62 Lund, Sweden.

The Field Meeting of the Subcommittee on Silurian Stratigraphy was held on Gotland, Sweden, in August 15-22 last year. The meeting attracted 57 researchers and students from 17 different countries from around the globe. Following three days of scientific sessions at the Visby University, all participants traveled across the island and visited several classical key localities and enjoyed the first-class paleontology and geology offered by these remnants of stacked carbonate platforms. As organizers we are happy to say that not only was the scientific sessions successful and interesting but first-time visitors got to see Gotland from its very best side with warm and sunny days. The medieval city of Visby served as a welcoming place for extracurricular activities and nice meals in between the sessions.

The theme of the meeting – as indicated by its name ‘*The Dynamic Silurian Earth*’ – was the global environmental changes that are associated with this period of time in Earth history. The view of the Silurian as a time of stable greenhouse environmental conditions has been successively challenged during the last decade. Recent biological and geochemical data suggest that this time interval was characterised by recurrent anomalies in the ocean-atmosphere system coupled with diversity changes and extinctions among marine faunas. The major positive  $\delta^{13}\text{C}$  isotopic excursions indicate that the global carbon cycle went through considerable changes and more frequently so than during any other period of the Phanerozoic. During the meeting, it became very clear that Silurian research has entered new paths.

In connection with the meeting a combined field guide and abstracts volume was published by the Geological Survey of Sweden (Eriksson and Calner, 2005). Short scientific articles are now being edited for a thematic issue of *GFF* that will become published later this year.

### Reference

Eriksson, M.E. & Calner, M. (eds.) 2005. The Dynamic Silurian Earth - Subcommittee on Silurian Stratigraphy Field Meeting 2005. Field guide and Abstracts. *Sveriges geologiska undersökning, Rapporter och Meddelanden 121*, 1-99. [This volume can be purchased from the survey; [www.sgu.se](http://www.sgu.se)].

**Report on other Meetings of interest to Silurian specialists: North American Paleontology Convention;** June 19-26th 2005 Dalhousie University, Halifax, Nova Scotia Canada; Report and photos can be found on <http://meguma.earthsciences.dal.ca/napc/napc.htm>

There were about 300 participants, about half of which were students. There were representatives from all over North America as well as Europe, Asia, Australia, New Zealand and several countries in South America. In Nova Scotia they are fortunate to have several world class fossil sites within 2 hours drive of Halifax and field trips were planned for the middle day of the conference to Wasson's Bluff (Triassic extinction site), Blue Beach (possible first tetrapod site, Tournaisian Gap), Joggins (world famous first reptile and classic tree site, proposed UNESCO World heritage site), and Arisaig (classic Silurian invertebrate site). Over half the participants went on these trips as well as the pre-meeting trip to Mistaken Point Ediacarian fauna (lead by Guy Narbonne, Jim Gehling and Doug Boyce) and the post-meeting trip to Gaspé Peninsula (lead by Pierre-Andre Bourque and Patricia Gensel) for some stunning Devonian reef exposures and the Miguasha Silurian fish site. For our public lecture we were fortunate to have Dr. Paul Olsen to talk about his work on Wasson's Bluff and the Triassic extinctions where there was quite a lively discussion following the presentation as well and into the reception that followed.

During the conference there were three oral sessions running together for four days together with posters and exhibitors every day (June 20,21, 23, 24). There almost 300 hundred presentations (both oral and poster). These presentations included a wide variety of topics (as our theme implied). These included on June 20: Jaws! False teeth and gums-what makes a vertebrate a vertebrate; Theory and applications for Quantitative models of fossil form; Polar Paleontology: the fossil record of high latitude environments; and Astropaleontology; June 21: Diversity-abundance relationships in the fossil: measure and meaning; Ediacarian paleobiology: paleontological, molecular, embryological, and ecological constraints; Conquering the waters and the land; the first 250 million years of bony vertebrates; and Biases in the record of diversity and phylogeny; June 23: Carboniferous fauna and flora; Correlation of Devonian marine and terrestrial strata; The first step towards the development of taxonomic dictionaries for all Phanerozoic organisms; graptolites: phylogeny, paleobiology and biostratigraphy; early life-pre-Cambrian and early Paleozoic; and taphonomy and paleoecology; and June 24: Extinctions, survivorship and adaptation; Mesozoic-Cenozoic vertebrates; Rates and dates: the promise and prospect of high resolution analysis of evolutionary rates; mollusc systematics and evolution; and Monitoring in coastal environments with microfossils. As you can imagine these symposia covered the world in both geographical as well as in terms of geologic time. There were many lively discussions both in the sessions and afterwards. The poster sessions also prompted much discussion, as always, and gave people a chance to sit down and discuss their results. I cannot detail all the sessions but the Astropaleo session must be mentioned just because it was one of the few venues where people could talk freely and speculate wildly because that's all there is at the moment with virtually no hard data. We were fortunate to have representatives from NASA and private industry come and discuss future directions of paleontology of the solar system and beyond.

Abstracts were published in association with the University of California at Berkeley, Museum of Paleobiology in *PaleoBios*, v. 25, supplement to number 2 (June 2005). The field trip guide books for the day trips were *The Joggins Cliffs of Nova Scotia: a window into the Carboniferous* (J. Calder, M. Rygel, H. Falcon-Lang, M. Gibling, and A. Scott); *Triassic-Jurassic faunal and floral transition in the Fundy Basin, Nova Scotia* (P.E. Olsen, J.H. Whiteside and T. Fedak); *Horton Bluff (Dev/Carb boundary- early tetrapod trackways)* (D.B.Scott, C. Mansky, S. Wood, and R. Godfrey); and *The stratigraphy and paleontology of the Ordovician-Silurian Arisaig Group, Nova Scotia* (M.L. Melchin and R.A. MacRae). The pre-meeting guidebook is *Life after Snowball: the Mistaken Point biota and the Cambrian of the Avalon* (G. Narbonne, R.W. Dalrymple, M. La Flamme, J. Gehling, and W.D. Boyce) and the post meeting book is *Silurian-Devonian Biota and Paleoenvironments of the Gaspé Peninsula and Northern New Brunswick* (P.-A. Bourque, S. Desbiens and P. G. Gensel).

## **DEVONIAN VERTEBRATES OF THE CONTINENTAL MARGINS**

Report on the IGCP 491 meeting in Yerevan, Armenia, May 23-25, 2005. Followed by a field trip on the Upper Devonian - Lower Carboniferous of Armenia, May 26-27, 2005. Contacts : vachik@khuistf.ac.ir OR vh\_hai@yahoo.com (Vachik Hairapetian) ; fiszbit@uw.edu.pl (Michal Ginter).

## **ORDERS FOR "SILURIAN LANDS AND SEAS: PALEOGEOGRAPHY OUTSIDE OF LAURENTIA"** (New York State Museum

Bulletin 493, 400 p.) may be placed by sending a request to the following address:

New York State Museum

Publication Sales

Room 3140

C.E.C.

Albany, NY 12230

The cost of the volume is \$54.95 plus \$4 for shipping and handling. Method of payment may be by personal check (payable to the "New York State Museum") or by credit card. For more information, you may contact the publisher by e-mail at: nysmpub@mail.nysed.gov.

Plans are moving forward for publication of a third volume of Silurian research to be released as a bulletin of the New York State Museum. Markes Johnson and Ed Landing will edit a volume with the tentative title: "Silurian Lands and Seas - Paleogeography of Laurentia and Oaxacia." The volume will include manuscripts updated from presentations originally made regarding North America at the 1996 Second International Symposium on the Silurian System held in Rochester, New York. Six manuscripts are now in hand and are being circulated for reviews. The editors will welcome participation from other authors who would like to become involved with the project. Only one contribution has been submitted for Canada, for example, and some parts of the United States have yet to be represented. Please contact Markes Johnson via e-mail at: Markes.E.Johnson@williams.edu.

## **REPORT OF THE SUBCOMMISSION ON SILURIAN STRATIGRAPHY RESTDYING A GLOBAL STRATOTYPE FOR THE BASE OF THE SILURIAN:**

In Newsletter 12 Mike Melchin gave a report on the restudy of the GSSP

This was discussed in Argentina 2003 and again in Gotland 2005. The votes from titular members were organized in the fall and winter 2005-2006 and all 15 members accepted the proposal. A report with the discussion, the results of the votes and the final conclusion. will be send to the ICS.

## **REPORT OF THE WORKING GROUP ON THE RESTUDY OF THE LLANDOVERY-WENLOCK BOUNDARY**

David K. Loydell gave in **Silurian Times 11** details from two papers (then in press) on the problem. Further research was discussed in **Silurian Times 12**, where he cited that “it was of course originally intended that the Llandovery-Wenlock boundary should be at the base of the *Cyrtograptus centrifugus* Biozone (Martinsson *et al.* 1981) as the vast majority of authors used to do”. At the Field Meeting of the International Subcommittee on Silurian Stratigraphy in Argentina, the Titular Members present were unanimous in their view that stratigraphical stability would best be served by retaining the base of the *Cyrtograptus centrifugus* Biozone as that of the Wenlock and that therefore a new GSSP should be sought.

At the Field Meeting of the International Subcommittee on Silurian Stratigraphy in Gotland the results of that quest for a new GSSP for the base of the Wenlock was presented by David Loydell. (see his report below). Additional information came from Dick Aldridge who restudied the conodonts in the GSSP. His report is also below. Remarks and/or votes for the base of the Wenlock by the titular members (25 June 2006).

Carlton E. Brett

24/06/2006: I fully **support** David Loydell’s proposal to retain the Llandovery/Wenlock boundary at the Hughley Brook section and applaud the very thorough job he has done in preparing this case. Although it is apparent that this is not an ideal section, it may be a false hope that any locality chosen will be perfect in all senses, which is why a series of auxiliary sections is critical. This section has the advantage of a tie point close to the base the *Ps. bicornis* conodont biozone and offers the possibility to correlate this point with the Ireviken datum 2. This moves us closer to the goal of linkage with a global event stratigraphic framework, which, in my view, should be a priority for the subcommissions. Moreover, Hughley Brook is accessible and stability is served by its retention as a stratotype.

**Robin Cocks**

30/1/2006: I have no extra comments about the base of the Wenlock at this stage.

9/06/2006: Robin Cocks: The base of the Wenlock

Golden Spikes are both objective and arbitrary. They are objectively placed so as to act as a datum point for future research, but they are arbitrary in that time, past, present and future, is seamless. The world never changes in a day (apart from because of an enormous meteorite impact!), and thus it is a certain bet that no golden spike would really mark the turn of an era. It is impossible even to define a species, however good its fossil record, since its real “first appearance” is impossible to detect. However, the Golden Spike concept is excellent, since because of it all stratigraphers can speak in a common language across the world.

The basal Wenlock Golden Spike at Hughley Brook reflects that arbitrariness. It was defined over 30 years ago, but the crucial underlying question now must be – is there a correlation problem? My answer is – probably not! The Silurian is one of the few systems which has got a workable correlation web. The impressive work done at the cm level on the microfossils occurring above and below the Golden Spike means that, in practice, the base of the Wenlock can be correlated globally, as reviewed in David Loydell’s

document. However, what subsequent work on the spike's position has also now revealed is that it does not appear to be at the base of any graptolite zone, being (if I read the evidence right!) somewhere between the upper parts of the centrifugus Zone and the middle parts of the *murchisoni* Zone. Is that a good enough answer? I think it is, not least because correlation can be achieved. The base of a graptolite zone will never be at an identical level as the base of, say, a conodont zone, but over time, most graptolite, conodont, or any other biozone may be reviewed or refined.

I therefore conclude that (a) **Hughley Brook should be retained** as the GSSP; (b) that is all that needs to be defined since a workable correlation web exists surrounding that GSSP; and (c), it follows from that that the Silurian Subcommittee does not need to seek any action from the parent Commission on the topic.

### **David Holloway**

06/01/2006 "I am less positive about the proposal by David Loydell to redefine the base of the Wenlock, which does involve a change of stratigraphic level. I am in agreement with the view that a stratotype should not be changed unless the change offers clear and long-term advantages. I am not yet convinced that this is the case with the current proposal. For example, there appears still to be uncertainty in the indirect correlation of the proposed new boundary "to about the base of the *murchisoni* graptolite Biozone " (see report of 2005 Gotland meeting). Also, there remains a divergence of opinion amongst graptolite, conodont and chitinozoan workers about the appropriate level for the boundary. I note that at the meeting of the SSS in Argentina in 2003 there was a unanimous view that the base of the Wenlock should be retained at the base of the *centrifugus* Biozone. I can't help feeling that long-term stability would best be served by seeking an alternative GSSP, even if that cannot be achieved by 2008, and then deciding whether the base of the Wenlock should be retained at its present level or changed. Certainly, any change now would make another one more difficult in the future should it be found desirable."

31/05/2006: I **vote against** the proposal by David Loydell to redefine the base of the Wenlock at Hughley Brook. This has been a problematic boundary stratotype and the problems are compounded by Dick Aldridge's information on small-scale faulting in the section near the boundary, as reported in your message. I am not convinced that redefining the boundary higher in the section will be a satisfactory and long-term solution, and this seems to be reinforced by comments made by you and Alain Le Hérissé. I believe that alternative sections with graptolites should be investigated, such as the one in the Prague Basin suggested by Jiri Kříž or those in Wales mentioned earlier by David Loydell, even though a change in stratotype could not be achieved by 2008. David Holloway

### **Jisuo Jin**

June 4, 2006: I **support** in principle the proposed redefinition of the base of the Wenlock. From my own experience with brachiopod shelly faunas in the Llandovery-Wenlock boundary interval, the major faunal turnover seems to be in the middle part of the Telychian, rather than at the Llandovery-Wenlock boundary. In recent years, the subdivision of the Ordovician System has been going through a fundamental change. Thus, there is no reason why the Silurian System should not be updated. Meanwhile, I agree with the comments of a few others in our group that a major change should make the stratotype more useful in several ways: 1) A higher level of biostratigraphical resolution that should be reproducible across tectonic plates and major sedimentary facies. A section with interbedded graptolite shales and shelly carbonates would be ideal (such as the Darriwilian section of South China), but such a section is not always available. Conodont and chitinozoan biozones can help bridge the correlation between graptolitic shale and shelly carbonate facies, but these biozones tend to be too broad to serve as primary fossil groups for the Llandovery-Wenlock boundary stratotype (at >least for most of the North American epicontinental Silurian strata). 2) Several colleagues in our group have commented on the long-term stability of a stratotype section. In my opinion, only a graptolite-bearing section can offer a stability and reliability for international correlation. Most Silurian workers dealing with carbonate strata of North America, for example, will not have the good luck of using graptolitic biozones, but that is where conodonts and chitinozoan biozones can help bridge the correlations across shaly and carbonate facies. In short, it seems to me that we need a graptolite-bearing stratotype to avoid any further "redefinition" of the stratotype. If we have a very good

chance to redefine a reliable stratotype, we should go for it. Otherwise, we may have to leave our current stratotype alone.

### **Markus Johnson**

10/02/2006: I write to give my full endorsement to the report of David K. Loydell regarding the status of the boundary stratotype for the base of the Wenlock Series at Hughley Brook, Shropshire, England. This has been a problematic boundary stratotype location; none of the alternatives appear to be any better. Biostratigraphical tie points with respect to first occurrences very close by with/to the Upper *Pseudooneotodus bicornis* conodont biozone suggest a considerable improvement on the previous definition. This biozone is said to be equivalent to the Ireviken Event Datum 2. I would merely wish to register my strong opinion that extinction events NOT be made part of formal definitions for any stratotype. Golden spikes, by definition, are driven with respect to first occurrences of index fossils

28/05/2006: I vote in favor of both proposals put forward by Mike Melchin and David Loydell regarding the base of the Silurian and the base of the Wenlock.

### **Tania Koren**

14/06/2006: For the purpose of stability we have to admit for the moment that the Hughley Brook GSSP should be retained but the biostratigraphical definition has to be changed according to the present palaeontological evidences. I appreciate the meticulous work done by David Loydell and support his proposal. However, I am a bit sceptical about a global correlation potential of the Datum 2 level based on conodonts. We must define the GSSP by the appearance of globally recognizable species and not by the LADs of several conodont taxa. That is why in near future (after the year 2008 at least) we have no other choice as to continue seeking an alternative GSSP (see comments by I. Kříž). Tania Koren'

### **Jiří Kříž.**

02/01/2006: "What concerns the Llandovery-Wenlock boundary problem I would like to inform that in the Czech Republic (Prague Basin) there exists a richly graptolitic section similar to that mentioned in the Prague suburb by Petr Storch. It is located in the same northern segment of the Prague Basin near Lodenice and was described by Pribyl 1941 (Beitrag zur Kenntniss des Obersilurs aus der Umgebung von Lodenitz; Zpravy Geologickeho Ustavu pro Cechy a Moravu, 17, 50-59, Praha). According to my opinion the section may be easily re-exposed and studied. It is located (see sketch map no. 57 in the Silurian Field Excursions, Prague Basin, Bohemia by Kříž, 1992) about 250 m east of limeworks in the old truck road of the south direction. I would recommend retaining Hughley Brook as GSSP for the base of the Wenlock until the study of the Lodenice Section for the detailed graptolite biozonation will be realized (in cooperation with Petr Storch). According to Pribyl 1941 the interval from the *Octavites spiralis* Biozone up to the *Cyrtograptus purchisoni* Biozone is here developed without volcanics and contains rich graptolite fauna. "

29/5/2006: He thanks for the information but adds no new comments.

### **Alain Le Hérisse 13/01/2006**

"I am not definitively convinced by the choice of Hughley Brook section for GSSP for the base of the Wenlock Series for several reasons:

1. The absence of graptolites to the GSSP
- 2 because a lot of samples are barren in the Purple Shales and it is difficult to be sure about the FAD of chitinozoan species (and for example the real extension of the *M. margaritana* biozone
- 3 If we consider the conodonts: we can suspected after the discussion of Mabillard and Aldridge (1985, 98-99), and the extension of the *amorphognathoides* biozone in the Type area (restricted to 95cm) that the succession in Wales concerns a condensed series, compared to the series in Baltica, where the *amorphognatoides* biozone is extended on 11m in the Gotland succession (Gale et Odin, 1984), or 30m in the Oslo series.
- 4 Why we need to consider the work is finished for this problem? It is necessary in my opinion to reconsider the problem and maybe to have the same detail as in the Hughley brook section elsewhere, e.g. for the Gotland succession that seems not to bad as parastratotype (1. come back to

the work on Chitinozoa of S. Laufeld and Y. Grahn, 2. integration of the results on acritarchs that are available: myself + David Ghelsthorpe) and to compare the results from the outcrops and cores (e.g. När). For this example, I suggest myself than the boundary could be just below the 2<sup>ND</sup> bentonite bed in the Ireviken 3 section in the upper part of Lower Visby beds, and equivalent between 330 and 337m in the När borehole (not 326m as suggested by Hermann Jaeger with occurrence of graptolites of the *centrifugus/murchisoni* biozone at this level).

- 5 Correlations of bentonites from the different sites in Baltoscandinavia can be integrated in the discussion

### **David Loydell**

30/05/2006: As proposer, not surprisingly, I vote in favour of retaining Hughley Brook, BUT only because the time frame imposed by the ICS makes examination of other sections impossible. In the absence of this time constraint I would recommend that the sections in Wales and in the Czech Republic be studied and a decision made only once this has been completed.

### **Mike Melchin**

18 June 2006: Based upon the comments made by Dr. Aldridge on 31/01/2006 it appears that the current GSSP does not correspond to the FAD or LAD of any particular biostratigraphically useful taxon and does not match precisely with any recognizable biozonal boundary. Furthermore, the level is seriously complicated by faulting. Therefore, I am afraid that I cannot support the proposal that this section be formally accepted as a redefined GSSP. Since this section is already a GSSP I do not see any need for this task to be complete by 2008. As long as nothing is done, the section will remain the GSSP we will correlate to it with the conodont and chitinozoan information available. I support the suggestions of Drs. Holloway, Kříž and Le Hérissé that we keep this GSSP for now (without formal re-ratification) but continue to search for a more suitable alternative over the longer term. I am particularly interested in the suggestion by Dr. Kříž that there may be a suitable section with graptolites near Prague. Likewise, if we decide to go with a new definition based on conodonts, then we should use a section with a more complete conodont record, such as one on Gotland, as suggested by Dr. Le Hérissé. I am sorry that I cannot provide more positive support for this proposal.

### **Silvio Peralta**

no comments yet

### **Jiayu Rong**

8/06/2006: New investigation of the GSSP for the base of the Wenlock Series suggests that the 'golden spike' at Hughley Brook was selected poorly. No direct evidence indicates that the base of the Wenlock Series correlates with the base of the *Cyrtograptus centrifuges* Biozone. In fact, this correlates with a level at the base of or low within the *Cyrtograptus murchisoni* Biozone, that is inconsistent with the original GSSP definition. Hughley Brook is not a well-qualified section, particular when one insists that the aim was to place the base of the Wenlock Series at that of *centrifugusi* Biozone, although it has a priority. Thus the restudy of the GSSP is necessary in order to get better correlation worldwide. However, at the present stage of our knowledge, this thorny and problematic problem cannot be resolved soon. The restudy including graptolites, conodonts and chitinozoans has not been clear yet and not convinced by a majority of the voting members. Thus it is not a ripe time to have a vote at the moment. I agree that we may keep the original GSSP until we have found a much better resolution with a precise definition that is accepted by the great majority of the voting members.

**Jacques Verniers** 31/03/2006: By the deadlines set up by the ICS there is no time left, to look for a new GSSP after hearing the results of the extensive research presented in the report by D. Loydell in Visby, last august. So I have to support the proposition of David Loydell with reservation. With chitinozoans it will still be difficult to indicate the exact base of the Wenlock, although G. Mullins and D. Loydell enhanced much the biozonation around the boundary. For the moment with the deadline of ratification of all GSSP's before the IGC in Beijing 2008 the evidence cannot be refined in a better way.

**Petr Storch**

1/06/2006: I would have the following comments on the Llandovery-Wenlock boundary affair. **Hughley Brook should be retained as a GSSP until the time when a better section is found.** I do not recommend *Cyrtograptus murchisoni* as a world-wide marker of the Llandovery-Wenlock boundary due to its rarity and palaeogeographical distribution that seems to be rather limited. Some occurrences of *C. murchisoni* have been misidentified with those of *Cyrtograptus bohemicus* Bouček. The latter species is more common and has a slightly different (?longer) stratigraphic range. *Cyrtograptus centrifugus* is much better zonal index graptolite in this respect.

Formerly described Barrandian sections that exposed Llandovery-Wenlock boundary interval are no longer accessible (Velka Ohrada) or suitable (Vyskocilka). As suggested by J. Kříž, however, other section could be excavated in Barrandian near Lodenice. This prospective section is continuous, covering the interval in question, with common graptolites and without basalt. An excavator is needed, however, to make a section and expose the rocks that are fresh enough to exhibit reasonably well-preserved graptolites. This section should be exposed and thoroughly examined first of all and a team-work approach would be unavoidable.

**P. Mannik**

09/01/2006 I discussed the Llandovery-Wenlock boundary with David Loydell before he prepared his final proposal. **I support his proposal.**

**Dick Aldridge** (not as titular member but asked as an expert) gave on 31/01/2006 gave the following report after restudying the conodonts of the GSSP at Hughley Brook:

Professor Richard Aldridge has completed his re-examination of the Hughley Brook conodont collections. These consist of two sets of samples, one collected by Prof. Aldridge before the face was cut back to show visiting members of the Silurian Subcommittee and a second collected later, by John Mabillard and Prof. Aldridge, for the former's Ph.D. thesis.

The following conclusions have been drawn from this re-examination.

1. The FAD of *Pterospathodus amorphognathoides amorphognathoides* is 650 mm below the base of the Wenlock in both sets of samples.
2. Ireviken Event Datum 1 presumably lies within the overlap in range of *Pseudooneotodus tricornis* and *Ps. bicornis* between 650 mm and 280 mm below the base of the Wenlock.
3. Ireviken Event Datum 2 appears to be very close to (or coincident with) Datum 3, c. 60 mm above the base of the Wenlock in the second set of samples. It was very difficult to recognise this datum in the first set of samples.
4. Ireviken Event Datum 3 (LAD of *P. am. amorphognathoides*) is 270 mm above the base of the Wenlock in the first set of samples, but only c. 60 mm above the base in the second set. Prof. Aldridge suggests that this could be explained by a fault just above the boundary, between the sites of the first and second samplings, cutting out approximately 200 mm of strata.

## **FUTURE MEETINGS**

### **INTERNATIONAL SYMPOSIUM ON THE SILURIAN SYSTEM, NANJING, CHINA, 2007**

This symposium will be held in conjunction with an International Symposium on the Ordovician System. Field trips will focus on classic Silurian sections in South China. More details will follow.

### **SILURIAN FIELD MEETING IN SARDINIA, ITALY, IN 2009.**

*“Time and life in the Silurian: a multidisciplinary approach”*. Petr Storch, Enrico Serpagli and Annalisa Ferretti announce the SSS field-meeting in Sardinia 2009.

We are pleased to invite you to participate in a Subcommittee on Silurian Stratigraphy meeting and field trip in the late spring of 2009 in Cagliari (Sardinia, Italy). Final dates are not yet fixed, but the most probable period would be the first half of June. A preliminary schedule includes three days of scientific sessions and the Subcommittee business meeting. Main emphasis will be paid to integrated multidisciplinary studies in Silurian rocks and fossil biota. Scientific sessions will be followed by three days of field trip: relatively deep water limestone and black shale facies will be demonstrated in a selected number of outcrops and sections. The first circular can be expected in early 2007.

All information: Prof. Carlo Corradini Dipartimento di Scienze della Terra Università di Cagliari via Trentino 51 - I-09127 Cagliari (Italy) ph. (+39) 070 6757744; fax. (+39) 070 282236 [corradin@unica.it](mailto:corradin@unica.it)

## SILURIAN RESEARCH 2005

**Albanesi, Guillermo L. (Argentina).** I continue working on diverse projects regarding early Paleozoic conodont faunas from west and northwest Argentine basins. An integrated conodont-graptolite biostratigraphic chart is being assembled for the Ordovician and Silurian systems of Argentina in cooperation with Gladys Ortega. I am collaborating with colleagues from universities of Argentina, Spain, UK, USA, and Canada, on related topics of historical geology and paleontology from the Lower Paleozoic. New supported projects on high resolution biostratigraphy, sequence stratigraphy, events, and paleothermometry on the Lower Paleozoic of the Eastern Cordillera and the Precordillera, Argentina, began current year, participating colleagues from different universities, as well as two new graduate students under my supervision. A paper on conodont-graptolite biostratigraphy of Silurian sequences from the Argentine Precordillera is in press (see references).

**Dick Aldridge (UK)** - Richard J. Aldridge. Current projects are principally directed at the Cambrian and Ordovician, but I have made some progress over the last year on a study of Silurian conodonts of South China with Wang Cheng-yuan.

**Howard A. Armstrong (UK)** - Following the completion of the second edition of *Microfossils*, work largely (and by necessity!) turned away from microfossils for much of 2005. Projects on the earth system changes associated with the Ordovician glaciation are ongoing in Libya, Jordan and Wales (with Tom Challands). Collaboration with Geoff Abbott (Univ. Newcastle) has expanded this work into: Ordovician biomarkers and water column conditions during deglaciation; Ordovician SSTs and pCO<sub>2</sub> levels. A new PhD student starts in May 2006 to work on GC-IRMS of Ordovician biomarkers. Conodont work resurfaced occasionally with projects on bias and completeness, histology and functional morphology of *Panderodus* nearing completion.

**Chris R. Barnes**, The final papers based on extensive field-based Lower Paleozoic stratigraphic and conodont studies in the Canadian Cordillera with Leanne Pyle have been published or are in press. Work with Shunxin Zhang is using my extensive conodont database to relate conodont biostratigraphy, biofacies and biogeography to the pattern of eustasy and tectonism that affected northern Laurentia in the early Paleozoic. Several joint papers have appeared recently with others in press, which deal with Silurian (and Ordovician) conodont taxonomy, evolution, paleoecology, cladistic analyses and the response of the conodont communities to eustatic change. The geochemistry and ultrastructure of Lower Paleozoic conodonts is being pursued further in collaboration with Julie Trotter (Australian National University and CSIRO). Other work in press includes: Late Ordovician-Early Silurian sea level patterns deduced from conodont communities (Paleo3); Late Ordovician-Early Silurian conodonts from the Edgewood Group, Missouri-Illinois (with Tyler Kuhn and Felicity O'Brien; *Jour. Paleol.*); Late Ordovician-Early Silurian conodonts from the Kolyma Terrane, NE Russia (with Shunxin Zhang; *Jour. Paleol.*). Other work nearing completion includes: Ordovician-Silurian conodonts from Hudson Bay (with Shunxin Zhang); and Ashgill-Wenlock conodonts from the Canadian Arctic with David Jowett.

**Alain Blieck (France)** - I have not been working on Silurian vertebrates last year, but I am supervising the Ph.D. thesis of Z. Zigaite (Vilnius University, Lithuania) on "Early Vertebrates of the Silurian of North Eurasia and their role in palaeogeographical and palaeoclimatic reconstructions.

**Olga K. Bogolepova (Sweden)** I'm continue to work on the Lower Palaeozoic palaeontology, biostratigraphy and palaeogeography of the Eurasian high Arctic. These studies are related to the on-going INTAS - NEMLOR (Northern Eurasian Margin & Lomonosov Ridge) project. However, in the coming three years my time will be mostly occupied by the 33rd International Geological Congress Science Committee activities; this committee is established in Uppsala under the head of David G. Gee.

Mikael Calner (Sweden) – My interest for the recurrent coupled extinction-stable isotopic events of the Silurian continues. Primarily I use the island of Gotland as a laboratory for studying the sedimentary rocks that formed during each of these events. I now hope to expand my studies and include the entire Late Ordovician–Devonian time span in order to put the recurrent Silurian anomalous periods into a broader perspective. Together with colleagues (Mats E. Eriksson and Lennart Jeppsson) and students from Lund University, I was happy to arrange the SSS Field Meeting on Gotland in 2005. Together with Mats E. Eriksson I am now compiling a thematic volume for that meeting (published in GFF volume 128 No 2, out in June).

**Euan Clarkson** (Scotland) - Having been retired for three years now I have had time to work upon a Palaeontological Association Field Guide to the Silurian fossils of the Pentland Hills, near Edinburgh. I first became interested in these rocks and their contained fossils over 40 years ago, and have been much involved ever since. Valuable new data have recently accumulated from colleagues in the National Museums of Scotland, University College Galway, Geological Museum Copenhagen, and the Ghent University. The field guide was proposed many years ago, but the available time filled up with other things. The editorial team consists of David Harper, Lyall Anderson, Cecilia Taylor and myself, and most of the contributions have now come in. We hope that by the end of March 2006 everything will be ready, and we look forward to the publication of this guide some time during 2006.

**Robin Cocks**, the Natural History Museum, London. I have had a productive year finalising the Ashgill Boda Limestone strophomenate brachiopods, which was published in the autumn, and also in writing with Richard Fortey a short Geology paper on mid-Ashgill global warming, which we have christened The Boda Event. I have started a project on the Lower Aeronian brachiopod fauna from Newlands, Girvan; the only shelly fauna of that age in Scotland. There were two visits to Trondheim to continue working with Trond Torsvik on the successive palaeogeography of Siberia and peri-Siberia through the Palaeozoic, a useful two weeks in Nanjing, China, working with Rong Jia-yu on the earliest Llandovery (Rhuddanian) brachiopod radiation worldwide after the Hirnantian Ice Age, and a guest lecture at Lausanne as a pretext to working with Gerard Stampfli on southern European Palaeozoic palaeogeographical problems. I also finished a short review paper on the changing palaeogeography of the British Isles during the Palaeozoic.

**Paul Copper** (Professor Emeritus, Sudbury, Canada) Visit our PARRC [Paleozoic Reef Research Centre] website: <http://laurentian.ca/geology/faculty/copper.html>

**Carlo Corradini** (Italy) – My research on North Gondwana Silurian to lowermost Carboniferous sequences, mainly in Sardinia and in the Carnic Alps, continues.

In Sardinia it is focused on conodont biostratigraphy of the Ockerkalk facies, and a paper on graphic correlations based on these sections is in press (with S. Gouwy). A project achieving to propose formal stratigraphic units in SE Sardinia is in progress (with E. Serpagli, A. Ferretti, P. Storch and S. Barca), as well as one on comparing conodont and graptolite zonations in Italy and Bohemia (with E. Serpagli and P. Storch).

In the Carnic Alps I'm investigating the Orthoceras Limestone in the Italian side of the chain and some new sections are under study in Wolayer Lake and Monte Zermula areas.

**Bob Elias** (Canada) - Adam Melzak has finished a Ph.D. dissertation on Late Ordovician to earliest Silurian rugose corals of Anticosti Island, Quebec. Raegan Porter recently completed her M.Sc. thesis on paleoenvironmental and paleoecological reconstruction of a stromatoporoid/coral-rich Silurian unit in southern Manitoba. M.Sc. and Ph.D. projects are available on corals, paleoecology and stratigraphy (please see <http://www.umanitoba.ca/geoscience/faculty/elias/elias.html>)!

**Mats Eriksson** (Sweden) - I continue my research on Ordovician through Silurian scolecodonts (the jaws of polychaete annelid worms). Currently I am studying the response of the polychaete faunas to the Ireviken Event on Gotland. Last year much of my work was devoted to the SSS Field Meeting on Gotland and right

now Mikael Calner and myself are in the process of editing the contributions for the special thematic issue of GFF, which is an outcome of the same meeting. I am still deeply involved in the Lund Cambrian Research Group in Lund and we have a couple of forthcoming papers this year and two Ph.D. students, Fredrik Terfelt and Niklas Axheimer, are nearing completion of their work. I have my position at Lund University, funded by the Swedish Science Council, until the end of this year.

**Barry Fordham** (Australia), Barry Fordham is now involved in sustainability science, but is working on Ordovician to Carboniferous conodonts from Queensland, Australia, in his spare time.

**Maurizio Gnoli** (Modena, Italy). I continue to work on Silurian Nautiloid cephalopods from Sardinia and Carnic Alps. In close co-operation with Dr. Paolo Serventi I have concluded a paper on new Phyllocarid remains from SW Sardinia. A description of new Actinoceratid from the Italian side of Carnic Alps is in progress and of a new Pallioceratid from the same area.

**Vachik Hairapetian** (Iran). I'm actively working on Silurian Niur Fm. in Derenjal Mountains, east central Iran with Giles Miller (London). Numerous ostracods, conodonts and fish (thelodonts and a few acanthodians) have been collected.

**Olle Hints** (Estonia) -- The focus of my research is on Ordovician and Silurian scolecodonts (polychaete jaws) and other microfossils (chitinozoans, conodonts) and on various problems of regional stratigraphy and geology. A current project with my colleagues Viuu Nestor and Peep Männik (both from Tallinn) is devoted to microfossil dynamics in the upper Llandovery and lower Wenlock of several core sections from western Estonia (one paper currently in press, other in preparation). Together with Mats E. Eriksson (Lund) we have an ongoing project devoted to Silurian scolecodonts from Estonia and Gotland, with particular emphasis on the Ireviken Event interval.

**David J. Holloway** (Melbourne, Australia). My current research on the Silurian is concerned with scutellid trilobites from limestones of mid-late Wenlock to Ludlow age near the city of Orange in central western New South Wales. The fauna, which is being described in collaboration with Phil Lane ( Keele University, UK ), is very diverse and includes representations of the genera *Australoscutellum*, *Decoroscutellum*, *Eoscutellum*, *Iliaenoscutellum*, *Japonoscutellum* and *Kosovopeltis*.

**Lennart Jeppsson** (Sweden) - Collecting and processing for conodonts, other fish, scolecodonts, etc. from the Linde and Klev events, and the recently discovered early Wenlock Ansarve Event have continued to yield much new data. These data are critical for achieving a high-resolution stratigraphy for these intervals, to identify localities for future work (on other major clades, isotopic and sedimentological changes), to judge the strength of these events, and to reveal how bad the conodonts fared during these events. (Due to bentonites shelly fossils from the Ansarve event are silicified; hence, the potential for studying the effects on the whole fauna is excellent). My manuscript work included papers now in the list of publications (see both Jeppsson and Calner et al.), one submitted manuscript, and the next in line: using the subzones of the *O. s. rhenana* Zone for stratigraphy. These subzones can be followed across different facies belts in the Silurian sequence of Gotland. Application of them results in unexpected large revisions in the local stratigraphy but also makes the range of other clades conform with those found elsewhere. The submitted one is: Jeppsson, L., Talent, J.A., Mawson, R., Simpson, A.J., Andrew, A.S., Calner, M., Whitford, D.J., Trotter, J.A., Sandström, O., & Caldon, H.-J.. High-resolution Late Silurian correlations between Gotland, Sweden, and the Broken River region, NE Australia: lithologies, conodonts and isotopes. During 2005, it was also shown, by Lena Gustavsson and Eva Nilsson, that the Lau Event markedly affected both brachiopods and (non-conodont) fish respectively (see their abstracts in the publication list).

**Markes E. Johnson** (USA) – I attended the Subcommittee on Silurian Stratigraphy Field Meeting on Gotland, Sweden, in August 2005 and made a presentation under the title "Relationship of Silurian sea-level

fluctuations to oceanic episodes and events." Documentation of the timing and extent of Silurian transgressions associated with the paleotopography of geological unconformities continues to be of much interest to me.

**Anna Kozłowska** (Warszawa, Poland). I'm actively working on morphology, taxonomy and evolution of Silurian retiolitid graptolites from Poland, Arctic Canada, Spain and Bulgaria. Collaboration with Denis Bates, Alf Lenz, and Juan Carlos Gutiérrez-Marco. I also contribute in a project of the retiolitid part of the new Graptolite Treatise, together with Denis Bates and Alf Lenz.

**Jiří Kríž** (Czech Republic) In cooperation with Stepan Manda the environment and palaeocommunities in the Ludlow (Silurian) of the Prague Basin (Perunica, Bohemia) are studied. The project supported by grant (including artificial exposures) is in progress and will be completed in 2008. In progress is also my revision of the genera *Kenzieana*, *Spanila*, *Tenka* and *Tetinka* (Bivalvia) from the Silurian of Europe which started in 2004.

**Philippe Legrand** (France) - I am actively working on the final description of the Oued In Djerane Ordovician-Silurian graptolites (Algeria). I prepare a comparison between the lowermost Silurian Algerian graptolite and the lowermost Silurian graptolites of other North African Gondwana countries.

**Alain Le Herisse** (France) - I have been actively working on acritarchs from different periods of time: the Middle Ordovician of Saudi Arabia (collaboration with Mansour Al-Ruwaili and Marco Vecoli, paper submitted); the Ordovician from southern and southeastern Turkey, for the revision of the lithostratigraphy with Florentin Paris as coordinator and others collaborators (paper submitted); the upper Ordovician, and Ordovician/Silurian boundary in relation to the impact of the glaciation on the phytoplankton evolution. Several papers on the subject are in preparation ( e.g the Upper Ordovician of the northern Tchad with F. Paris, Ph. Steemans and D. Massa); the Silurian and mainly recently on North African material from Algeria, Libya and Tunisia ; the Upper Silurian and Lower Devonian with a contribution in preparation for the Phytopal project issued from a collaboration with Reed Wicander, Gary Mullins and Ken Dorning; the Devonian and particularly the Devonian of north Africa (Libya, Tunisia) and South America (Brazil and Bolivia) with active collaboration with J.H Melo and Y. Grahn from Petrobras, Claudia Rubinstein and Philippe Steemans. A first monograph is in preparation on the Upper Devonian Acritarchs of the Amazon Basin, Brazil, that I hope should be published this year.

Work with Emmanuelle Javaux from Liege and Craig Marshall from Sydney on biomarkers , and collaboration with Edwige Masure from Paris, give me opportunity last year to finish a contribution dealing with «Evolution of the marine phytoplankton: from acritarchs to dinocysts» (submitted to RPP).

A substantial part of my activity was also devoted this year to the applied palynology, in contact with different oil companies (2 internal reports in 2005), and to supervise two PhD projects: Miguel Perez-Leyton on the Palynostratigraphy of the iluro-Devonian of Southern Bolivia and Benson M. Modié on the Permian Ecca-Dwyka Group of Botswana. They are on the way to finish.

**Lenz, Alfred** (Canada). I'm working on Silurian graptolites from Arctic Canada, primarily in collaboration with A. Kozłowska. To date we have monographed those of the upper Wenlock, and Ludlow and Pridoli, and are planning to prepare a monograph on the older Wenlock graptolites. As an expansion of research, I am collaborating with A. Kozłowska and M. Masiak (Poland), and P. Noble and S. Poulson (USA), integrating paleontological (graptolites, radiolarians, palynomorphs), and sedimentological and geochemical (<sup>13</sup>C) data from around the *lundgreni* extinction event (lower-upper Homerian). The first paper on the subject has been submitted. We plan to expand our studies to the entire Wenlock and Ludlow. Related to the graptolite Treatise revision, A. Kozłowska, Denis Bates and I have published a paper on retiolitid morphology, morphological terminology and cladistic analysis

**Steve LoDuca (USA)** - Steve LoDuca (USA) - Work continues on the taphonomy, systematics, and evolution of Silurian noncalcified algae, especially dasyclads, and on the sedimentology and stratigraphy of the distinctive Konservat-Lagerstätten that yield them. Descriptions of several new and surprisingly morphologically complex Silurian noncalcified dasyclad taxa are currently underway in collaboration with Don Mikulic and Joanne Kluessendorf (Illinois and Wisconsin material), Denis Tetreault (Ontario material), and Mike Melchin (Arctic Canada material). Research also continues in the areas of (1) evolutionary constraints on dasyclad form (using biophysical modeling in conjunction with empirical data from Silurian taxa) with Ernest Behringer (Department of Physics, EMU), and (2) taxon-specific stable carbon isotopic compositions of Silurian "organic macrofossils" (especially algae and graptolites) with Lisa Pratt.

**David Loydell (UK)** - In addition to the work on the Llandovery-Wenlock boundary, 2005's research focused on two projects which should be completed early in 2006: an integrated biostratigraphical study of the Williamson Shale of New York State, with Mark Kleffner, Gary Mullins, Anthony Butcher, Damon Matteson and Jim Ebert; and a study of the (mostly Rhuddanian) graptolites of Jordan. Future projects will involve further work on Swedish isolated graptolites with Jörg Maletz and a new integrated biostratigraphy project with Viuu Nestor and Peep Männik.

Two students were awarded their Ph.D.s this year: Stephen Doherty for his thesis on the graptolite biostratigraphy of the Wenlock of North Wales; and Anthony Butcher for his thesis on the chitinozoan biostratigraphy of the Llandovery of Illinois and Jordan.

**Jörg Maletz**, Buffalo, New York, USA. I'm currently working on a number of projects on Ordovician and Silurian graptolite and radiolarian faunas. Work on isolated Llandovery graptolites from the *Lituigraptus convolutus* Biozone of Dalarna is in progress with David Loydell. A paper on the genus *Plectograptus* with Denis Bates, Anna Kozłowska-Dawidziuk and Alf Lenz is nearly finished and will include retiolitid material from North German Glacial boulders, collected and prepared by Hermann Jaeger.

New work includes research on Silurian (Llandovery) radiolarians from Dalarna, Sweden.

Silurian in Germany: The German Subcommittee on Silurian Stratigraphy has nearly finished work on a monograph on the Silurian of Germany, in which the graptolite biostratigraphy is updated and important biostratigraphic data will be included. I am also working on a long-term project to document type and illustrated graptolite material from the Silurian of Germany. In most older monographs and papers on graptolite faunas from Germany no information is given as to the deposition of illustrated material. In most cases the material is preserved and accessible even though often not yet catalogued in a number of museum collections.

**Štěpán Manda** (Czech Republic) see Jiri Kriz.

**Peep Männik** (Estonia)- I am actively working on evolution, taxonomy and palaeoecology of conodonts, conodont-based high-resolution stratigraphy, bioevents and palaeogeography. In the last years my studies have been mainly concentrated on the Baltic region and Russian Arctic (Severnaya Zemlya, Novaya Zemlya, Timan-northern Ural region, etc.).

**Sandy (Alexander D.) McCracken** (Calgary, Canada): - I continue to work on Middle to Upper Ordovician, Silurian, Devonian, and Carboniferous conodonts from various locations in Canada. Much of my time is now assigned to outreach and paleontological databases.

**Tatiana Modzalevskaya** (St.Petersburg, Russia) - I'm actively working on Silurian Stratigraphy and Paleogeography of Russian Arctic regions. The manuscript on the earliest terebratulids is prepared and accepted for publication in *Palaeontology*.

**Viuu Nestor** (Estonia) – is involved in a project, dealing with dynamics of different fossil groups (chitinozoans, scolecodonts, conodonts, telodonts) in Silurian sections of the East Baltic area. Up to now the

absolute and relative frequency and diversity of these groups, as well as different taxa have been analyzed in the Llandovery and lower Wenlock of the Paatsalu drill core (paper in press).

All studied chitinozoan taxa (180) from Llandovery and Wenlock of 41 drill cores of Estonia and North Latvia were analyzed by methods of graphic correlation to construct a composite standard like more detailed zonal scheme. Algorithm DISTR was used to get the scale of 83 taxa, successive first and last appearances of which defined 41 datum planes. It provides a high-resolution time scale for dating the studied sections. A multi-author paper was prepared for publication.

**Godfrey Nowlan** (Calgary, Canada). My work on conodonts has been severely curtailed for the last three years as I continue to work on public geoscience education in northern Canada. I am working slowly on a few projects: (1.) Conodont biostratigraphy and paleoecology of the Ordovician and Silurian rocky shoreline exposed on the shore of Hudson Bay near Churchill, Manitoba. Work is joint with Graham Young (Manitoba Museum) and Bob Elias (University of Manitoba). (2.) The Nd isotope ratios and Sm/Nd ratio and conodont paleoecology of late Ordovician strata in the subsurface of Saskatchewan. Work is joint with Chris Holmden (University of Saskatchewan) and Fran Haidl (Saskatchewan Industry and Research). (3.) Early Cambrian embryos and small shelly fossils from the Wernecke Mountains, Yukon. Joint work with Leanne Pyle (University of Victoria) and Guy Narbonne (Queens University). Manuscript is in press. (4.) Service reports for clients of the Paleontology Laboratory at the Geological Survey of Canada.

**Honours:** Godfrey Nowlan was the 2005 recipient of the J. Willis Ambrose Medal of the Geological Association of Canada. The medal is awarded for sustained, distinguished service to the Earth Sciences in Canada through outstanding accomplishments in one or more of the following realms: education; research; management and administration; promotion; and institutional, society or professional affairs.

**Silvio H. Peralta** (Argentina) - As Researcher of CONICET and Professor of Regional Geology in the National University of San Juan, Argentina, I'm focused on the Tecto-sedimentary analysis of siliciclastic, Ordovician to Devonian, basins of Western Argentina, mainly in Precordillera. A new extensional model to understand the evolution of the Silurian and Lower Devonian basin of Precordillera has been proposed (Peralta, 2005b; in press; in review), based on a "yo-yo tectonic" mechanism, producing forced regressions and flooding surface, controlling the geometry and infilling of the Silurian-Devonian basin. Since 3 years ago, study on the Silurian of the Sierra de la Dehesa, at Central Precordillera, are carried out together with my PhD student, Estela Pereyra. The project "Stratigraphy, Structure and Natural Resources of the Ordovician and Silurian of the Del Salto Creek, Sierra De La Dehesa, Central Precordillera of San Juan Province", founded by National University of San Juan, is evolved. These studies are addressed to demonstrate that both, Silurian and Devonian basins have evolved as pool-apart basin as result of a strike-slip mechanism, and not as foreland basin. On the other side, another Ph.D. student, the geologist Eduardo Toro, carry out the study of the Upper Silurian-Lower Devonian stratigraphy and tecto-sedimentary basin evolution, in the Central Precordillera of San Juan Province. From a biostratigraphic point of view, graptolite faunas and trace fossils assemblages from the Silurian of Precordillera, are also focused in these studies. In 2006 I attend the Field Meeting of Subcommittee on Silurian Stratigraphy, held in Gotland, on August 15<sup>th</sup> to 22<sup>nd</sup>, where I have been the opportunity to now the amazing stratigraphy of the Low Latitude Silurian carbonate succession well exposed mainly on the coast of the island. This has been a good experience for me to compare such succession with the High Latitude Silurian siliciclastic succession of Precordillera but also of the rest South-America.

**Jose Manuel Picarra** (Portugal) - I'm actively working on the Lower Palaeozoic stratigraphy of South Portugal (Ossa Morena Zone) and also on the Silurian graptolites from Portugal. I have a project with Juan Carlos Gutiérrez-Marco ("The Silurian of the Galiza-Trás os Montes Zone, Portugal-Spain") and I am studying the Silurian graptolites of Armorican Massif (integrated in a Portuguese-French project with Rémy Gourvenec and M. Robardet).

**Sergio Piras** (Modena, Italy) - I'm a PhD student of the University of Modena (Italy) and working for my PhD thesis on the graptolites of the lower Ludlow of the Prague basin in the Czech Republic, under the supervision of Prof. E.Serpagli (University of Modena, Italy) and Dr. P.Storch (Academy of Sciences, Prague, Czech Republic).

**Rong Jiayu** (China) - I have been working on (1) three Palaeozoic mass extinctions and their subsequent recoveries based on the brachiopod evidences from South China; (2) Brachiopod survival from the Latest Ordovician mass extinction; (3) The Early-Middle Ordovician brachiopod radiation. (4) Silurian marine red beds of China.

**Andrew Simpson** (Sidney, Australia) - Unfortunately there has been little time available to me during 2005 for Silurian research. Work with conodont faunas for some ongoing collaborative projects with colleagues has been possible interstitially between other commitments. These include work on Late Silurian Lau event faunas with John Talent and Ruth Mawson (Macquarie University) and Lennart Jeppsson (University of Lund) and others, plus a project with Damian Cole and James Valentine (Macquarie University) on Silurian faunas from Murruin Creek in New South Wales, and finally work on abundant Early Silurian faunas with Peter Molloy (Macquarie University) from Boree Creek in New South Wales. It is hoped that some of the results of these collaborative efforts will see the light of day in 2006.

**David Siveter** (Leicester, UK) - My research on Silurian ostracods (especially myodocopes), world-wide, continues, as does research on the Konservat-Lagerstätte from the Silurian (Wenlock) of Herefordshire, UK (jointly with Derek Siveter, Mark Sutton, and Derek Briggs) and the Chengjiang Cambrian Biota of China (with colleagues from Leicester, Oxford and Kunming).

**Derek Siveter** (Oxford, U.K.) My Silurian research continues to be focussed on the fossils from the Herefordshire Konservat-Lagerstätte, which preserves soft-part anatomy in three dimensions, and which is providing unparalleled insights into the palaeobiology of a Silurian range of invertebrates. This work is being carried out together with Derek Briggs (Yale), David Siveter (Leicester) and Mark Sutton (London). Various arthropods (ostracode, phyllocarid, chelicerate, barnacle, pycnogonid), a polychaete, a brachiopod, an aplacophoran-like mollusc and a starfish have been described so far, and there are other taxa in various stages of the publication process.

**Petr Štorch** (Czech Republic) – A manuscript accepted for publication deals with facies development, depositional settings and sequence stratigraphy across Hirnantian and Llandovery succession of the Barrandian area, Bohemia. I continue my collaboration with Dominique Massa (France) on early Silurian graptolites and graptolite biostratigraphy of Libya and adjacent regions of Algeria and Tunisia. A paper on Aeronian graptolites has been published in *Palaeontology*; a study on some Telychian graptolites was also submitted for publication. My current work includes a manuscript on lowermost Silurian graptolites of Montagne Noire, France (in collaboration with Raimund Feist, France) and another manuscript on Early Silurian graptolites of Hlinsko area, eastern Bohemia. Sergio Piras (Italy) and I will complete a large paper on lowermost Ludlow graptolites and graptolite radiation, based upon new sections in the western part of the Barrandian Silurian synform. Collaborations with Enrico Serpagli, Annalisa Ferretti and Carlo Corradini (Italy) integrate conodont-graptolite stratigraphy in Sardinia and Bohemia.

**Des Strusz** (Australia) - I am taking a hopefully brief side track from my work on the brachiopods of the Yass Syncline to update the Silurian chapter of the Geoscience Australia Timescales volume (whose first edition was published in 1996). As for Yass, the remaining groups are the athyrids, rhynchonellids, and spiriferids. On the longer-term agenda, I look like being involved in planning for the next brachiopod Congress, to be held at Deakin University in 2010 (if the five-year interval is maintained).

**Jacques Verniers** (Belgium) - I'm still working on the Chitinozoa around the Silurian-Ordovician boundary. This year I'm looking at the Rostanga borehole (Scania, Sweden) where Tania Koren made a detailed

graptolite biozonation. Most Chitinozoa work in our research unit is now on the Ordovician. Thijs Vandenbroucke obtained his PhD in September 2005 with chitinozoans of the Upper-Ordovician of China, Sweden and U.K. and Jan Vanmeirhaeghe finishes his PhD on a revision of the lithostratigraphy and biostratigraphy with chitinozoans of the Ordovician of the Condros inlier (Belgium). Both their research however extended into the basal Silurian strata. Two MSc students work this year on Ashgill–Rhuddanian chitinozoans of either Wales (Cwm Hirnant) or the Condros inlier.

**Ryszard Wrona** (Warszawa, Poland) - I'm actively working on chitinozoans from the Silurian/Devonian transition sequences of the Dnestr Basin, southern Ukraine. This study is conducted in the frame of the Polish-Ukrainian project supported by NATO Collaborative Linkage Grant “**Environmental changes at the Silurian/Devonian boundary in the Dnestr Basin, Ukraine**”. The beds are transitional between the shallow water platform sediments of the East European Platform and the deeper water facies of western Ukraine and Poland, and are characterized by a number of local complex facies changes. Most of the Silurian-Devonian sequence in Podolia is part of a regressive cycle. The uppermost Silurian, belonging to the Přídolí stage/subsystem, is represented by over 150 m thick Skala Formation, composed of nodular dolomitic limestones interbedding the dominantly argillaceous succession. The Formation consists of Raskov and Dzvenygorod Members. The carbonates are largely algal bioherms (mainly stromatoporoids) but macrofossils, such as brachiopods, trilobites and corals, and microfossils, such as conodonts, scolecodonts and chitinozoans are also present. The Skala Formation ranges from the *Ozarkodina crispa* conodont zone through the *Oulodus elegans detorata* conodont zone and is considered the equivalent of the Hamra and Sundre Beds of Gotland. The Formation comprises *Eisenackitina barrandei* up to *Urnochitina urna* chitinozoan biozones.

The Lower Devonian of Podolia is represented by over 530 m thick continuous marine sequence composed of flysch-like deposits of limestones and shales, containing a rich assemblage of fossils. This is one of the most completely developed Lower Devonian sections in the world. The fauna is comparatively evenly distributed throughout the section. However, studies of the fauna, including the most recent ones, do not provide details on localities nor positions within the section of even the biostratigraphically most important fossils (conodonts, brachiopods, chitinozoans). Szaniawski (2005) published the first informal article on this project.

## **SILURIAN PUBLICATIONS 2005**

### **(and publications of 2004 not yet mentioned in Silurian Times 12)**

**Albanesi, G.L. and Aceñolaza, G.F. 2005.** Conodontes de la Formación Rupasca (Ordovícico Inferior) en el Angosto de Chucalezna, Cordillera Oriental de Jujuy: Nuevos elementos bioestratigráficos para una localidad clásica del noroeste argentino. *Ameghiniana*, 42(2): 295-310.

**Albanesi, G.L. and Bergström, S.M. 2004.** Conodonts: Lower to Middle Ordovician record. In: *The Great Ordovician Biodiversification Event* (B.D. Webby, F. Paris, M.L. Droser and I.G. Percival, eds.), pp. 312-336, tabs. 1-3, figs. 1-4. Columbia University Press, New York, 484 p.

**Albanesi, G.L. and Bergström, S.M. 2004.** The Early Ordovician paleobiogeographical position of the Argentine Precordillera as suggested by conodont faunas. In: *32nd International Geological Congress, Florence, Italy. Abstracts*, part 2: 213-7.

**Albanesi, G.L., Carrera, M.G., Cañas, F.L. and Saltzman, M. (in press).** Definition of a global boundary stratotype section and point (GSSP) for the base of the Middle Ordovician Series: The Niquivil section, Precordillera of San Juan, Argentina. Informe de la International Subcommission on Ordovician Stratigraphy (ICS-IUGS), publicación electrónica: <http://seis.natsci.csulb.edu/ordstrat1>. (Episodes, in press).

**Albanesi, G.L., Esteban, S.B., Ortega, G., Hünicken, M.A. and Barnes, C.R. 2005.** Bioestratigrafía y ambientes sedimentarios de las formaciones Volcancito y Bordo Atravesado (Cámbrico Superior - Ordovícico Inferior), Sistema de Famatina, provincia de La Rioja, Argentina. In: *Geología de la provincia de La Rioja: Precámbrico – Paleozoico inferior* (J.A. Dahlquist, E.G. Baldo and P.H. Alasino, eds.), pp. 41-64, figs. 1-8. Asociación Geológica Argentina, Serie D: Publicación Especial N° 8.

**Albanesi, G.L., Ortega, G. and Hünicken, M.A. (in press).** Bioestratigrafía de conodontes y graptolitos silúricos en la sierra de Talacasto, Precordillera de San Juan, Argentina. *Ameghiniana*.

**Albanesi, G.L. and Voldman, G.G. 2004.** Ordovician Paleothermometry of the Argentine Precordillera based on Conodont Color Alteration Index. In: *International Symposium on Early Palaeozoic Palaeogeography and Paleoclimate* (Erlangen, Germany). *Erlanger Geologische Abhandlungen*, Abstract 18.

**Aldridge, R.J., Siveter, David J., Siveter, Derek J., Lane, P.D., Palmer, D. and Woodcock, N.H. 2000.** *British Silurian stratigraphy*. Joint Nature Conservation Committee, Peterborough, England, 542 p.

**Armstrong, H.A. 2005.** Genome elaboration and the cause of cryptogenesis in panderodontid conodonts. *North American Paleontology Convention* (Halifax, Nova Scotia). *PaleoBios*, Museum of Paleontology, University of California, Berkley, volume 25, supplement 2: 14.

**Armstrong, H.A. 2005.** Modes of growth in the euconodont oral skeleton: implications for bias and completeness in the fossil record. In: *Conodont biology and phylogeny - interpreting the fossil record* (M.A. Purnell and P.C.J. Donoghue, eds.), pp. 27-38. *Special Papers in Palaeontology*, 73.

**Armstrong, H.A. and Brasier, M.D. 2004.** *Microfossils*, 2nd edition. Blackwell Scientific Publications, 296 p.

**Armstrong, H.A. and Sansom, I.J. (in press).** Developmental disparity and ecospace occupation in the stem gnathostome *Panderodus* (Ethington: Conodonta). *Biology Letters*.

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- Beznosova, T., Majdl', T. and Männik, P. 2005.** Yaptiknyrd Formation – a new stratigraphical unit proposed for the uppermost Ordovician strata in the Subpolar Urals. In: *The Sixth Baltic Stratigraphical Conference* (St. Petersburg, Russia, August 23-25, 2005) (T. Koren, I. Evdokimova and T. Tolmachova, eds.), pp. 14-16. VSEGEI, St. Petersburg.
- Beznosova, T.M. and Männik, P. 2005.** The Llandovery–Wenlock Boundary in the Northern Part of the Baltica Paleococontinent. *Transactions (Doklady) of the Russian Academy of Sciences*, 401A: 374-377.
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