INTERNATIONAL UNION OF
GEOLOGICAL SCIENCES
COMMISSION ON STRATIGRAPHY

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SUBCOMMISSION ON DEVONIAN STRATIGRAPHY

NEWSLETTER No. 22

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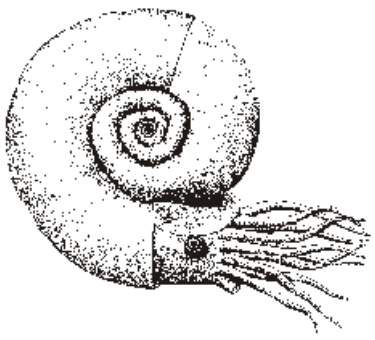
Germany



February 2007

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MESSAGE FROM THE CHAIRMAN

Dear SDS Members:

SDS activities continued successfully in the last year but there are both good and bad news. As circulated earlier by email, we have lost again one of our most experienced, outstanding and respected Devonian specialists, **Vladimir V. Menner**. Until the "SDS renewal" in Florence, 2004, Vladimir served two terms as our Titular Member for the western parts of Russia and he was one of the driving forces behind several successful field meetings to the Timan, including our magnificent SDS excursion in 1994. In the course of two INTAS projects, Vladimir became a very good friend and his broad knowledge, enthusiasm, humour and friendliness will be deeply missed. He died unexpectedly late in September, 2006. I feel that we should dedicate one of our forthcoming or planned volumes on Devonian stratigraphy to him.

Among the good news is the fact that our SDS volume in honour of our past chairman Michael R. HOUSE ("**Devonian Events and Correlations**") is eventually in the final stage of printing. The volume will be **No. 278** in the **Geological Society, Special Publications** series. It was edited by Bill KIRCHGASSER and myself, consists of 13 chapters, has 273 pages, and covers a wide range of stratigraphical disciplines, all of the Devonian, from the Lochkovian to the D/C boundary, very different fossil groups, and many areas (e.g., Morocco, Algeria, France, Germany, USA, and Great Britain). Some more advertisement can be found under the heading SDS/Devonian publications. It is the first volume that is published in the frame of the new ICS/Geological Society of London cooperation and puts the Devonian in the first position with respect to publications within ICS. It is our product and you should obtain a copy when it is out late in March. This is the right place to thank the editorial board of the publication series, especially Angharad HILLS and Sarah GIBBS, for their very helpful cooperation. Other publications are in preparation: Peter KÖNIGSHOF from the Senckenberg Institute has assembled manuscripts in relation to our joint IGCP 499/SDS meeting in Novosibirsk, to be published in "Bulletin of Geosciences". TM Carlton BRETT is seeking manuscripts on the Middle Devonian for a special volume to be published in "Palaeogeography, Paleoclimatology, Palaeoecology". The IGCP 499 board is also working on another Devonian volume on "**Devonian Change – Case Studies in Palaeogeography and Palaeoecology**" to be published in the "Geological Society, Special Publications" series. I like to draw your attention to a very nice and important new Devonian volume on "**Biotic aspects of the Early – Middle Frasnian eventful transition**", published in the Acta Palaeontologica Polonica series, No. 51 (4), and edited by A. BALINSKI, E. OLEMPSKA and our TM G. RACKI. The volume has a wealth on new data, not only from Poland, that is of fundamental significance for event and biostratigraphy around the now defined Lower/Middle Frasnian boundary.

In 2006 we had two highly interesting Devonian meetings, one at the **2nd International Palaeontological Congress** in **Beijing**, and one on Devonian conodonts at **ICOS** in **Leicester**, where our Annual Business Meeting took place. The close cooperation with IGCP 499 has been very productive and stimulating. Unfortunately, there was not enough interest in the offer of our Secretary to have a field trip to the Old Red Continent Devonian. John has promised that we can have such an excursion at a later stage and I feel that the Subcomission should visit such areas where marine/non-marine facies transitions can be examined.

Our Leicester **Business Meeting** saw the breakthrough in the case of the substage subdivision for the Givetian and Frasnian (results see below). Progress in the case of the Emsian is very slow and there is no obvious reason why the membership should have lost interest. There are still very different views concerning the Famennian and we have decided that our meeting in Eureka, **Nevada (9.-17.9.)**, on "**Rapid Global Change**", will have a special Famennian session. Herewith I urge everybody to take part actively in a thorough discussion that does not only involve conodonts, miospores, and ammonoids. We are looking forward brief reviews concerning various regions and concerning brachiopods, corals, trilobites, ostracods or regional events and sea level changes that can be tied with the conodont succession. I hope that many of you will come to Nevada but if this is not possible: written documents are equally welcome ! In the Report Section you will find some contributions, including Leicester Documents, and a post-Leicester reply by CM Maurice STREEL. TM Charlie SANDBERG has sent a

message that a new Upper/Uppermost Famennian statement requires the re-study of Belgian conodonts and more time; you can expect him to present an update and new data at the Nevada Meeting. It will be organized by CM Jared Morrow (fieldtrip) and TM Jeffrey Over (technical sessions). Details and updates can be found at:
http://www.geneseo.edu/CMS/display.php?dpt=frasnian

Starting with this issue, our **Newsletter** is produced here in Münster, with significant help my by secretary, Mrs. S. KLAUS. The success and quality of the Newsletter depends on your contributions. The next issue is planned to be compiled after the Nevada Meeting, with a deadline for submissions at the end of November. At the same time I am glad to announce that we have a new **SDS Homepage** (http://www.unica.it/sds/) that is launched and organized by our Devonian team (CMs Carlo CORRADINI and Soufy GOUWY) in Cagliari, Sardinia. The homepage is currently still under construction/being filled with data, but you are asked to help with suggestions, ideas, data/files or links. For example, it would be nice to display photos of our members, including some field photos that were/are taken during SDS excursions. The homepage should become a useful source of information for a broader audience that is interested in our SDS work and, more generally, in Devonian stratigraphy. I like to express my warmest thanks to Carlo and Soufy.

Following a call by ICS, SDS has announced to the organizers of the next (33.) **International Geological Congress**, to take place in Oslo from August 5-15, 2008 ("Geoscience World Congress 2008"), that it will hold its annual meeting and a Devonian Symposium at the occasion. It is still plenty of time for registration (until 1st February 2008) and you can access details and the forthcoming 2nd circular under www.33igc.org.

With best wishes for this year and looking forward seeing many of you at Eureka,

R. Thomas BECKER
SDS Chairman

RESULTS OF THE VOTING ON GIVETIAN AND FRASNIAN SUBSTAGES

Number of voting members: 21 (no replies from 5 TMs)

base of **Middle Givetian** (base of *rhenanus/varcus* Zone)
13 yes 3 abstentions 0 no

base of **Upper Givetian** (base of (Lower) *hermanni* Zone)
14 yes 2 abstentions 0 no

base of **Middle Frasnian** (base of *punctata* or MN 5 Zone)
12 yes 4 abstentions 0 no

base of **Upper Frasnian** (onset of *semichatovae* Transgression, low in MN 11 Zone)
13 yes 3 abstentions 0 no

In all four cases the required absolute majority was reached. It is remarkable that none of the levels created any objections.

MINUTES OF THE SDS BUSINESS MEETING

Institute of Petroleum Geology, Russian Academy of Sciences, Siberian Branch, Novosibirsk, Thursday 8th August 2005

This SDS business meeting for 2005 took place at the end of the SDS/IGCP 499 Meeting conference *Devonian Terrestrial and Marine Environments: from Continent to Shelf* in Novosibirsk, Russia.

Attendance The Chairman & Secretary, **TM's** E. Yolkin, E. Schindler, J. I. Valenzuela-Ríos, V. Tsyganko, C.E. Brett, **CM's** N. Izokh, M. Snigrieva, Z. Yolkin, U. Jansen, A.I. Kim, C. Ver Straeten, G.C. Baird, W. Kirchgasser, B. Mistiaen. **Guests** V.K. Bakharev, O. Obut, V. Rakhmonov, U. Schemm-Gregory, C. Martinez-Perez, Jau-Chyn Liao, E.M. Kirilishina, P. Königshof, O. Artyushkova, D. Artemyeo, N. Ivanova, F.P. Bigey, A. Bartholomew, V.I. Krasnov, Z.J. Serdjuk, N. Donova, I. Troth, C. Berry, B. Pyemont, A. I. Anfimov, N. Oleneva. O. Rodina, N. Sennikov, L. Popov, J. Frýda, M.C. Göncuöglu.

Documents were presented and numbered as follows:

1. From the Emsian GSSP to the early Late Emsian – correlations with historical boundaries. P. Carls & J. I. Valenzuela-Ríos, 4 pp and 1 figure
2. Correlation of the proposed Middle Givetian substage with the global ammonoid record. R.T. Becker. 2 pp and 4 figures
3. Devonian Correlation Table, K. Weddige *Senckenbergiana Lethaea* 84: 385-415.

1. Introduction and apologies for absence

The Chairman welcomed the participants and noted how pleased we were to be in Novosibirsk and that the joint meeting with IGCP 499 was proving to be a very fruitful co-operation and very good for increasing attendance.
The deaths of the following members were noted CM M. A. Rzhonsnitskaya & D. McLaren and the former ICS Chair J. Remane. The meeting stood in a minutes silence.

Recorded Apologies TM's T. Uyeno, K. Weddige, J. Over, M. Steel, Ma Xueping, R. Mawson, G. Racki, M. C. Perri, CMs J. Garcia-Alcalde, M. Truyols-Massoni, C. Hartkopf-Fröder, L. Slavik, C. Spalletta, J. Talent, T. Wright, N. Ovnatova, C. Hartkopf-Fröder.

2. Approval of the Minutes of the Business Meeting, Florence, 23rd August 2004

The minutes were distributed via email. There were unfortunate problems with the sudden loss of technical support by Rex Crick for the Newsletter. This meant there have been access problems with some members unable to read the Newsletter and Minutes in advance of the meeting. J. I. Valenzuela-Rios commented on item 3.2 Subdivision of the Emsian but the full discussion was held over to the discussion of Document 1. The Minutes were agreed.

3. Chairman's Business

The SDS was compelled by the ICS to meet at IGC meetings. Not many SDS members were present in Florence. Please note the next IGC is in Norway in 2008. This low attendance by members has meant that progress on stage sub-division has not been fast. Pierre Bultynck had hoped to complete the process during his tenure as chair. However, as the new chair Thomas Becker suggested the following topics for SDS during the next 4 years. Clearly members needed to discuss these and this could take place via the newsletter.

1. Pelagic-neritic correlation and regional correlations to the GSSP's
2. Marine-terrestrial correlation and ties to the GSSP's
3. Devonian event stratigraphy correlation i.e. the Kačák and relationship to extinctions
4. Correlation of regional stage names i.e. Siegenian and their ties to international chrono-stratigraphy
5. Numerical time scales, i.e. Kauffman from Munster. This has produced some very odd stage durations and there is still much uncertainty in decay rates. The Chair had been very pleased to see the work of the Secretary using a Milankovitch base.
6. Reconstruction of the Devonian world palaeoclimates and biogeography, perhaps using 2 time slices i.e. 2 conodont zones. To map these out to see how they looked globally, perhaps something for post IGCP 499.

Other suggestions were then made by SDS members

J. I. Valenzuela-Rios suggested an investigation of regional stages and neritic-pelagic correlation. The Secretary then suggested a new compilation of the 'Johnson et al.' Sea-level curve and events. This was supported by both C. Brett & C. ver Straeten who emphasised the need for a new compilation of the oft referenced Johnson curve but to include cycles, biostratigraphy, sequence stratigraphy and sea level. Jiri Frýda suggested chemostratigraphy and the Pragian Sr curve to update what are now clearly incorrect existing curves. E. Schindler commented on the last suggestion. IGCP 499 has a geochemistry working group and geochemistry should be kept within the SDS remit.

In summary, the Chair suggested that in the next 3 years the SDS should focus on the pelagic-neritic correlation, a eustatic cycle chart, modern stratigraphic techniques, time scales and regional stage names. An attempt would be made to set up one of these topics for each SDS meeting. This will initially not be easy given the focus of the next SDS meeting at the ICOS 2006 conodont meeting.

Annual Report from P. Bultynck, 2004 The annual report by Pierre Bultynck highlighted the Morocco meeting and the field excursion to the Draa Valley. The important field guide can be obtained from A. El Hassani. At the Florence IGC there were important sub-stage discussions. There will be no special volume but there is still the Rabat volume to come which will be dedicated to Michael House. It will be published in the *Geological Society of London Special Publication* series. 10 manuscripts have been submitted, some of which are now through the review process. The volume will be completed in the winter and publication is anticipated in the spring of 2006. The volume should number 200-300 pages.

The Seattle volume on the Frasnian/Famennian and Permian/Triassic boundaries (Morrow/Over) is in review for an Elsevier special publication. A *Palaeo*^{3} volume is in planning by C. Brett and is soliciting papers from IGCP 499 on cyclicity, faunal change, land-sea interactions and geochemical tools. Details are available from C. Brett. P. Bultynck noted the proceedings of the substage decisions can't yet go ahead. Although *Kwart Geol* have offered to publish the results.

E. Yolkin noted that there should be a special volume on the Zinzilban stratotype in 1-2 years. C. Brett also suggested that we should promote a Devonian book similar to the recently published Ordovician biodiversity book.

It was emphasised that the SDS is proving to be very active with much achieved and ranks top within the ICS.

Voting Form- The form is in the minutes and members are urged to fill this in. The votes are for the definition of the Middle and Upper Givetian, the Middle and Upper Frasnian and the Middle and Upper Famennian. Please send votes to the Chair or Secretary.

As regards the problems with the Newsletter the Chair will discuss this with Rex Crick and ?move production to Munster where there is technical support.

4. ICS News

The ICS is now much more active with new personnel. Some of this has proved controversial such as the elimination of the Quaternary. The ICS is organising a 2 day September meeting in Louvain for sub-commission chairs. Recent achievements have been the definition of the end Permian and early Triassic stages. The Louvain meeting will involve a fieldtrip to the Devonian and Cretaceous of Belgium run by P. Bultynck. The ICS has approved the new policy that the sub-commission officers now select the TM's but with the consent of the group.

A new book is being produced by the Sub-comissions which will review all chronostratigraphic units. All GSSP's should be finished by the 2008 IGC in Norway. We are required to submit digitised images of maps and stratigraphic columns plus pictures of stage defining specimens. W. Kirchgasser has a collection of pictures of GSSP's. Text contributions will have to be sent to the Chairman.
The ICS is supporting a US programme on a unified stratigraphy data base funded by the NSF (USA).

5. Devonian Substages

Before the main tabled discussion new information was given by M. Murphy, Riverside, CA (now published, in *Revista Española de Palaeontología*, **20**, 177-206) on Pragian conodonts and by E. Yolkin on a suggested 2 fold sub-division of the Lochkovian.

5.1 Emsian The attention of the SDS was drawn to the report by Mawson on the Emsian. TM Valenzuela-Rios then introduced Document 1 on the Emsian correlation of Zinzilban with Iberia and the Ardenno-Rhenish areas. The document included a chart of Emsian taxa. A problem with the definition and application of *Polygnathus gronbergi* and *P. kitabicus* was highlighted. E. Yolkin entered the discussion by stating there were many question but that new data was coming from the Zinzilban area. There was a very good and clear definition of the Lower Pragian boundary based on the sequence of Polygnathids. The work of Kim would be shown shortly. J. Valenzuela-Rios responded by stating that the issue was with the late Pragian elements with the P/E boundary being placed too low worldwide. The Pragian is too short and the base of the Emsian needs to be moved 120m higher. It was not workable at present. This had been discussed by the previous sub-Commission and there was a clear decision on the Emsian boundary species and hence, the problem was to organise the original stratigraphy of the interval. At this point CM Kim gave a powerpoint presentation of the hemi-pelagic facies of the Lower Devonian of the Zeravashan Range. The *excavatus* zone is split into three intervals of different duration with the entire conodont sequence demonstrated. The problem being that the Emsian base was very close to the basal Pragian. The Chair brought the discussion to an end by noting that the boundary could not be reconsidered for 2 years. Zinzilban would be kept as the GSSP section with a view (J. Valenzuela-Rios) that the P/E boundary could be moved up by 120m. However, no decisions could be made now.

E. Schindler introduced an item on the Mid Emsian definition based on a section (Císarská Rokle) in the Czech Republic that included the Daleje transgression. An email from K. Weddige noted that he was still investigating the *P. gilberti* conodont group. Another candidate for the definition was the *Nowakia elegans* to *cancellata* transition. Other elements on which a good definition could be based included brachiopods, goniatites, dacryoconarids, conodonts, forams and even palynomorphs.

E. Yolkin added to the discussion by noting that the position of boundary based on *N. elegans* was not possible and there was a taxonomic problem. The Chairmen commented that *P. gilberti* was known in the USA, South China, Alaska and Tajikistan etc but still too low for the upper boundary of the *Anetoceras* faunas (typically Lower Emsian). The base of the Dajele Shale is somewhat diachronous in the Barrandian Basin.

J. Frýda then noted the advantages of *Nowakia elegans* for definition but the Chair commented that this was at the peak of the *Anetoceras* fauna. A marker was needed above or at the *Anetoceras* extinction. The need for data was stressed.

5.2 Givetian Document 2 suggests boundaries for the Middle Givetian at the base of *rhenanus/varcus* and the Upper Givetian at the base *hermanni*. It was stressed that these ranges were based on eastern North America an they differ across North America. Document 2 included a conodont and goniatite comparison table. TM Valenzuela-Rios queried the ancestry of *hermanni* but was informed that it was known (being derived from *Schm. latifossatus*).

5.3 & 5.4 Frasnian & Famennian No new documents were presented. They were not in the electronic version of the newsletter but would be available in the paper version.

Famennian overheads were supplied. These noted a number of differences with the original definitions. New levels for the definitions could be suggested by the forams.

6. Membership

TM's: Nadia Ishok was nominated as a TM for eastern Russia. **CM's**: Nikolay Bakharev (ostracods) and Olga Obut (radiolaria) were both nominated as CM's. There was an affirmative show of hands and assent from the audience and candidates.

7. Financial Report

The account balance is currently $206. $500 has been given to A. El Hassani to attend the next SDS meeting. The grant from the ICS has been cut and we expect less for 2005. We anticipate spending $500 on the Siberia meeting and $400 for Newsletter 21. This gives an anticipated balance of $100 plus the $206.

8. Future Meetings

The next meeting will be in July 2006 at the ICOS meeting in Leicester, UK with a possible SDS fieldtrip to Scotland. The Secretary gave a brief presentation of such a trip. But it was noted that the 2nd IPC would be in China that June. Future meetings for 2007 would be a business meeting to Eureka, Nevada (organised by Jeff Over). This would be held in early-mid September when the temperature was not 35°C. In 2008 the SDS would meet at the IGC in Norway along with IGCP 499. A further meeting for 2008 was proposed by CM Kim at Zinzilban. It is an exceptional section with an extensive fauna. This would be a fieldtrip rather than a business meeting.

The meeting closed at 19:01, having started at 16:25. The party then adjourned for the conference dinner.

J.E.A. Marshall, SDS Secretary
23rd July 2006

MINUTES OF THE SDS BUSINESS MEETING

Wedgewood Room, Beaumont Hall, University of Leicester, Leicester, UK, 18th July 2006

The SDS business meeting for 2006 took place during ICOS 2006, The First International Conodont Symposium, July 12th-30th, 2006.

Attendance The Chair (T. Becker), Vice-chair (A. El Hassani) & Secretary (J. Marshall), **TM's** J. I. Valenzuela-Ríos, M. C. Perri, J. Over; **CM's** J. A. Talent, Wang Cheng-Yuan, P. Bultynck, P. Sartenaer, B. Mistiaen, M. Ginter; **Guests** Jau-Chyn Liao, C. Martinez-Perez, S. Gouwy, C. Corradini, I. Boncheva, C. Radon, C. Girard, M. Sobstel, J. Sanz-López, J. Barrick, L. Jeppsson, K. Narkiewicz, H. Matyja, S. Kaiser, D. Sparling, L. Krystyn.

Documents were presented and numbered as follows:

1. Emsian sub-stages and the Daleje Event – a consideration of conodont, dacryoconarid, ammonoid and sea-level data by R.T. Becker.
2. The *annulata* and Dasberg Events (Famennian) in the Tafilalt and Maider (Eastern Anti-Atlas, SE Morocco) by S. Hartenfels and R.T. Becker
3. A reference section for the neritic facies at the transition Late to Latest Famennian by M. Streel, N. Maziane-Serraj, J.E.A. Marshall and J. Thorez.
4. Comment on proposed uppermost Famennian "substage" by C.A. Sandberg.

1. Introduction and apologies for absence

The meeting started at 20:48. The Chairman welcomed the large group of participants and noted how pleased we were to be in Leicester. Our hosts for ICOS 2006, Dick Aldridge and Mark Purnell were thanked for their assistance in arranging the meeting. The Chair noted that we were meeting in a late time slot and had a long agenda so participants had to be careful to keep the discussion focused.

The SDS had planned a fieldtrip to the ORS to coincide with this meeting. This was to link in with our long term goal of correlation of the pelagic, neritic and terestrial environments. It was disappointing that there were not enough potential participants. It is planned to make this field trip to the Scottish ORS at a later date.

Apologies: TMs Blieck, Casier, Hladil, Izokh, Ma, Mawson, Sandberg, Schindler, Tsyganko, Young; CMs Blake, Day, Hartkopf-Fröder, Garcia-Alcalde, Jansen, Klapper, Obukovskaya, Obut, Ovnatanova, Slavik, Spalletta, Streel, Troyols-Massoni, Turner, Ver Straeten, Yolkin.

2. Approval of the Minutes of the Business Meeting, Novosibirsk, 8th August 2005

A preliminary version of the minutes had been distributed by email. Following a number of minor corrections and clarifications the minutes were approved.

3. Chairman's Business

The tragic death in a traffic accident of Bill Oliver, our past SDS Chairman, was announced. The meeting stood in a minutes silence. There was a brief discussion about the need for an obituary for the Newsletter.

The Chair then made a review of the previous year. The meeting at Novosibirsk had been a great success with a very good field excursion. This had been a joint meeting with IGCP 499 led by Peter Königshof. There had been a second IGCP 499 meeting with a workshop in Istanbul, Turkey.
Peter Königshof also reported news of the situation with the IGCP programme. These had been under threat of closure and no new projects were being accepted whilst the programme was being reviewed. The IGCP programme would continue for present at a reduced rate. In addition there would be 1) an emphasis on an

annually chosen special topic. 2) the focus would be on basic and applied programs. 3) the applied science included *'global change and life evolution- evidence from the fossil record'* which is relevant to the SDS. IGCP 499 has future plans for 2006. Some 6 SDS members were known to be attending the Beijing 2nd IPC. In addition, there was going to be a joint meeting with CIMP in Prague from September 2nd to 6th. IGCP 499 was also going to have a joint meeting in Leon, 2006. Contact J. Valenzuela-Rios for details.

Geochronology: The Chairman showed an overhead of the new compilation of Devonian dates by Kaufmann, 2006, *Earth Science Reviews*, **76**: 175-190.
http://www.uni-tuebingen.de/geo/gpi/mitarbeiter/kaufmann/devoniantimescale.pdf

It considers all existing high precision zircon U/Pb age dates and gave age dates for the Devonian Period of 418-360.7 Ma. It considered the D-C boundary and reviewed the biostratigraphy. The age dates were calibrated using sediment thickness in homogenous facies. The Emsian was given a duration of 18 my and the Pragian shortened in duration. This time scale will be reproduced in the minutes and placed on the website. Other Devonian stages were now much shorter. The *hemiansatus* zone was now very short on this time scale but is known to be very thick in the Eifelian. The Secretary commented that the duration of the Eifelian now gave problems with the cyclostratigraphy. J. Valenzuela-Rios commented on problems with the base and the use of stratotypes and the placement of certain ash layers. However, the Chair did comment that each measurement took 6 months of work. Dale Sparling and Pierre Bultynck also discussed the position of the *hemiansatus* zone. The requirement for good phylogeny was noted.

4. Devonian Substages

The ICS informal committee had met for 2 days in Paris. They had received a report from the SDS. They congratulated the SDS on its achievements but noted the following, *'the typological definition of standard stratigraphic units by means of boundary stratotypes, such as stage GSSP's, should be extended downwards, below the stage level in the hierarchy.'* This means that sub-stages may require GSSP's in future. The limit of sub-division is not yet reached since the more we learn the more we sub-divide. At this J. Valenzuela-Rios commented that we required more time for research before we started on the sub-division of the Lochkovian.

4.1 Emsian: Document 1. This is a review by the chair, Thomas Becker, on the Emsian and had recognised 11 serious difficulties. Notably that the Daleje Event was not really global and that the mid Emsian conodonts show significant endemism. Thomas was unsure what to do to advance correlation. In Europe and North Africa, the icriodid evolution (entry of *I. fusiformis-corniger ancestralis* faunas) would allow a substage definition but the key species are absent in North America, large parts of Asia, and in Australia. There was discussion with P. Bultynck and J. Valenzuela-Rios. There was hope that new forthcoming data from the Senckenberg Group might prove invaluable. It was a difficult problem with an 18 my interval requiring to be sub-divided.

4.2 Givetian: We had the results of the sub-stage ballot but several TMs had not yet given their votes (final outcome see forthcoming Newsletter)

for a Middle Givetian sub-stage at the base of the *rhenanus/varcus* Zone

10 yes votes from the TM's with 2 abstentions	passed
25 yes votes from TM's plus CM's, 5 abstentions,	no votes against

for an Upper Givetian at the base of the *hermanni* Zone

11 yes votes from the TM's	passed
26 yes votes from the TM's plus CM's, 5 abstentions,	none against

4.3 Frasnian: We also have the result of the sub-stage ballot

for a Middle Frasnian sub-stage at the base of the *punctata* or MN5 Zone

10 yes votes from the TM's with 3 abstentions	passed
26 yes votes from the TM's plus CM's, 4 abstentions,	none against

for an Upper Frasnian sub-stage at the first entry of *Pa. semichatovae* (~MN 11)
12 yes votes from the TM's with no abstentions, none against passed
26 yes votes from the TM's plus CM's, 1 abstention, 3 votes against

We now need to publish reviews and reference sections on all continents where these definitions can be recognised.

4.4 Famennian: This has proved to be difficult. There is one formal proposal for the definition of an Upper Famennian sub-stage

TM 8 yes, 1 against, 3 abstentions
TM's & CM's 17 yes, 5 against, 5 abstentions

Therefore there is clearly no decisive majority unlike the consensus for the Givetian and Frasnian sub-stages.

An initial vote was taken on possible Middle and Upper Famennian sub-stages. The yes votes are:

Base Middle Famennian

	TM	CM
Uppermost *crepida* Zone	3	9
Base *marginifera* Zone	6	13
abstentions	3	8

Base Upper Famennian

	TM	CM
Base Uppermost *marginifera* Zone	4	12
Base *styriacus* (=Lower *postera*) Zone	2	6
abstentions	3	11

There were also 2 new proposals

The chair noted that we needed to rethink the Famennian sub-division. But it was also noted that the pattern of voting was inconsistent. There is a requirement for more data and a more thorough discussion so that all members understood the issues. This would take place in 2007 in Nevada and beyond. There would be a special Famennian session in Nevada.

Document 2: discussed the *annulata* and Dasberg Events in Morocco. Both were truly global and should be considered in the substage discussion. Data from conodonts and ammonoids suggest that there was no significant transgression or event at the base of the Lower *expansa* Zone in southern Morocco.

Document 3: was from M. Streel and colleagues. It showed the good high resolution data that was available from spores and acritarchs in eastern Belgium. The Chanxhe section is proposed as the regional reference section on the Ardenne Shelf for the Uppermost Famennian as defined by the base of the Upper *expansa* Zone. Thomas Becker commented on the spore record from the Refrath borehole (Germany) and the links to conodonts. Both in Morocco and Germany it is now clear that the Famennian V (Dasberg Stufe) begins very close to the boundary of the Lower/Middle *expansa* Zone or just above the upper range of *Po. styriacus*. The suggested significant transgression of the Lower *expansa* Zone in North America may be younger than currently thought since *Po. styriacus* is already lacking in the transgressive beds. The distribution of *Bi. aculeatus*, which defines the M. *expansa* Zone, may be controlled by facies influences. More data are needed.

Document 4 discusses the relationship of *Bispathodus ultimus*, one of the index conodonts of the Upper expansa Zone, to the index foraminifera *Quasiendothyra kobeitusana kobeitusana* which has been

considered in the past to mark the base of the Strunian and hence the uppermost Famennian sub-stage. TM Sandberg reported that this level at Anseremmes (Banc 28) contained conodonts that showed it was from the Middle *expansa* rather than Upper *expansa* Zone. (Banc 28). There was general discussion over the differences with the report of M. Streel and that either the the conodont or the foramifera had a late entry in one of the sections. The problem may be the difference between a first occurrence and an acme. M. Ginter had a discussion with Thomas Becker over the issues.

It was decided to have, at the Nevada meeting in 2007, a special session dedicated to the Famennian. This forthcoming discussion requires not only conodont, spore and ammonoid data but also correlation with neritic groups, such as brachiopods.

5. Revision of Devonian Stage, Series and System Boundaries

4.1 Emsian: J. Valenzuela-Rios discussed the problem of the base of the Emsian Stage. This was a continuation of the discussion with Yolkin in Novosibirsk. The solution was not known but there had to be a change in the definition of the P/E boundary to a much higher level. There is to be an SDS fieldtrip to Zinzilban, Uzbekistan in 2008. The discussion of the redefinition will be part of this meeting.

4.2 Discussion of the Devonian-Carboniferous boundary: Messages from TM Sandberg and CM Spaletta have questioned whether SDS should deal with this topic. SDS can discuss the problems of the definition of the D-C boundary but has no power to change it. There had been a discussion with P. Heckel from the SCS and there would be further discussion at the forthcoming IGC in Norway in 2008. Eventually a new joint SDS/SCS working group may have to be formed. S. Kaiser introduced results from her restudy of the La Serre GSSP on a powerpoint slide. The first *S. sulcata* is, in fact, already found in Bed 85 (the current D/C boundary is higher at the base of Bed 89), with the first ?*S. duplicata* also in Bed 85. Beds 86 and 87 are now known to have typical *S. sulcata*. The boundary definition was intended to be fixed by the first occurrence of *S. sulcata*. Therefore, we either need to redefine the D-C boundary (from Bed 89 to Bed 85) or we must find a new stratotype. Thomas Becker commented on the original definition with the change in angle of twist in siphonodellids from Beds 88 to 90. La Serre was critizised at the Coutmacsherry meeting for not showing the entry of *Gattendorfia*, the traditional (1935 definition) index fossil of the Carboniferous. The new conodont data suggest that the La Serre GSSP falls in the upper part of the *sulcata* Zone or even in the *duplicata* Zone, above the entry of *Gattendorfia* in Germany. The current GSSP position places first *Gattendorfia* still in the Devonian, which is not acceptable and completely against the original intentions when the GSSP was decided. The best solution might be to bring the definition down from Bed 89 to Bed 85 but Bed 84 has no siphonodellids and very few conodonts. There is a long overlooked publication by Gong et al. (1991) that suggests that *S. sulcata* enters also earlier than originally thought at the Nianbiancun auxiliary stratotype in Guangxi. Both at La Serre and Nanbiancun, *S. sulcata* seem to enter just above a facies break and, therefore, there is no record of the *praesulcata-sulcata* transition that was originally decided to define the system boundary. Currently, there is no better section than La Serre. As an alternative the boundary could be even lowered to the base of the Upper *praesulcata* Zone.

5. ICS News

There had been a meeting in Louvain (Belgium) from 1st to 5th September 2005 which would discuss future directions for the ICS. The meeting was attended by all SC chairs. The status of the time scale chronostratigraphic sub-division was discussed with the scheduled completion for the IGC in Norway. Progress has been made on the Pliensbachian, Ordovician and Triassic. The Ordovician GSSP's are now defined first, followed by the names with some entirely new names introduced, e.g. Floian. The is a continuing debate about the Quaternary.

There is now a new organisation, the International Association of Stratigraphic Geologists (IASG) with a new journal (Journal of Stratigraphy). The IGC has abandoned the fusion of geochronology and chronostratigraphy. Both time scales will remain. The will be a new IS code/guide. The SDS has made a 2000-2005 report for the ICS reviewing committee in Paris. SDS was selected as one of the SC to be used as an example for the quality and progress of work within ICS. Unfortunately, the chair could not attend the meeting himself but there was no criticism of the subcomission.

6. Membership

Rex Crick has stepped down. He is thanked for his great efforts on behalf of the Devonian and SDS. There are currently 21 TM's.

CM I Schülke has resigned on leaving geology

The following new CM's were proposed
H. Matya for Poland, proposed by the chair, seconded by TM C. Perri
S. Kaiser (Stuttgart) for conodonts and isotopes, proposed by the chair, seconded by the secretary
C. Corradini, proposed by the chair, seconded by TMs J. Valenzuela-Rios and J. Over
Ilyana Boncheva (Bulgaria) proposed by the chair and seconded by TM C. Perri

TM T. Uyeno has declared his intention to resign. The Chair commented that we needed him to continue to represent Canada.

7. SDS Publications

The Elsevier Devonian/Permo-Triassic volume '*Developments in Sedimentology and Palaeontology*' 20 had been published. It included a sub-division of the *linguiformis* zone by Girard et al. and other important papers on the Frasnian-Famennian boundary, including an extensive review by TM Racki.

7.1 The next SDS Newsletter will be produced in late 2006/early 2007. Newsletter 21 will be available as a printed version but as yet no requests had been received. Newsletter 22: contributions are due end October with publication at the year end. It will be printed in Munster.

7.2 The House volume is *in press*. It is a *Geological Society of London, Special Publication* (No. **278**). It is the first SP that will be available online. A contents list was circulated.

7.3 Sub-stages. These will be described and formally defined in an issue of *Geological Quarterly*. First drafts are due in March 2007 with the volume hopefully available before the Nevada meeting in September. The lead authors are

CM P. Bultynck	base Middle Givetian
Chair R. T. Becker	base Upper Givetian
TM J. Over	base Middle Frasnian
TMs J. Over/C. Sandberg	base Upper Frasnian

These lead authors will receive the volume guidelines and distribute to others.

7.4 A CFS volume is being published for the IGCP 499 meeting in Novosibirsk. At present there are 10 contributions from Russian colleagues with plus one on the Taghanic Event. More contributions were requested, deadline 15th November, details from P. Konigshof.

7.5 There is a Palaeo^3 Middle Devonian volume in progress. The themes are sea-levels, sequence stratigraphy and stratigraphy. Details from TM C. Brett with the deadline of 31st December 2006.

8. Finances

We have carried over	$ 306
Income for 2006 from ICS	$1000
Expenditure	
attendance for 1 member at SDS	$ 500
Newsletter 22	$ 400
Attendance at ICS Louvain Meeting	$ 150

Money remaining $256

This year, after severe cuts within IUGS, we only have $500 from ICS; $500 has been spent sponsoring attendance at Leicester based on a special ICS travel grant plus we have the Newsletter expenditure. The Leicester room hire ($90) has beeen funded from elsewhere.

9. Future Meetings

Jeff Over made a brief presentation of the Nevada Meeting for September 2007. It will start in Las Vegas on the 7th September with a fieldtrip to Alamo and Eureka, followed by technical sessions from the 15-17th. It will be a joint meeting with IGCP 499. The themes of the meeting will be the Famennian, the Johnson Sea Level curve and global change. J. Valenzuela-Rios noted the excellent Lochovian/Pragian boundary which we needed to see. All SDS members were reminded to check US Visa requirements. They have changed.

SDS members were reminded about the 16th Carboniferous and Permian Congress in Nanjing, China, June 21-24th 2007. Sessions included the the Frasnian/Famennian and the Mississippian recovery. SDS members were directed to fieldtrip C4 which was to the Devonian and Carboniferous marine sequence including the Nanbiancun D/C boundary auxiliary stratotype, a marine F/F section and the end Permian stratotype at Ching Yiang.

IGCP 499 is having a meeting in San Juan, Argentina in the summer of 2007.

SDS members were reminded about the SDS meeting at the IGC in Norway in 2008 (August 5-14th). We are obliged to meet at the IGC conferences. Proposals for IGC Symposia will be accepted until August 2006. At that meeting we will need to nominate a new SDS chair and officers.

In September 2008 SDS hopes to visit Zinzilban and the Kitab Reserve in Uzbekistan.

AOB. SDS now has no home page. It has been lost. A webmaster was urgently sought.

The meeting closed at 23:25 and the somewhat diminished group repaired to the bar in time for last orders.

John Marshall
SDS Secretary
February 2007

SDS – REPORTS – FLORENCE

Streel et al. 2005: Missing figures to Newsletter No 21, 17 -20:

Relation of the Neritic Microfaunas and continental Microfloras with the conodont and other Pelagic Faunas within the latest part of the Famennian with a few, new additonal data and a synthetic Correlation chart.

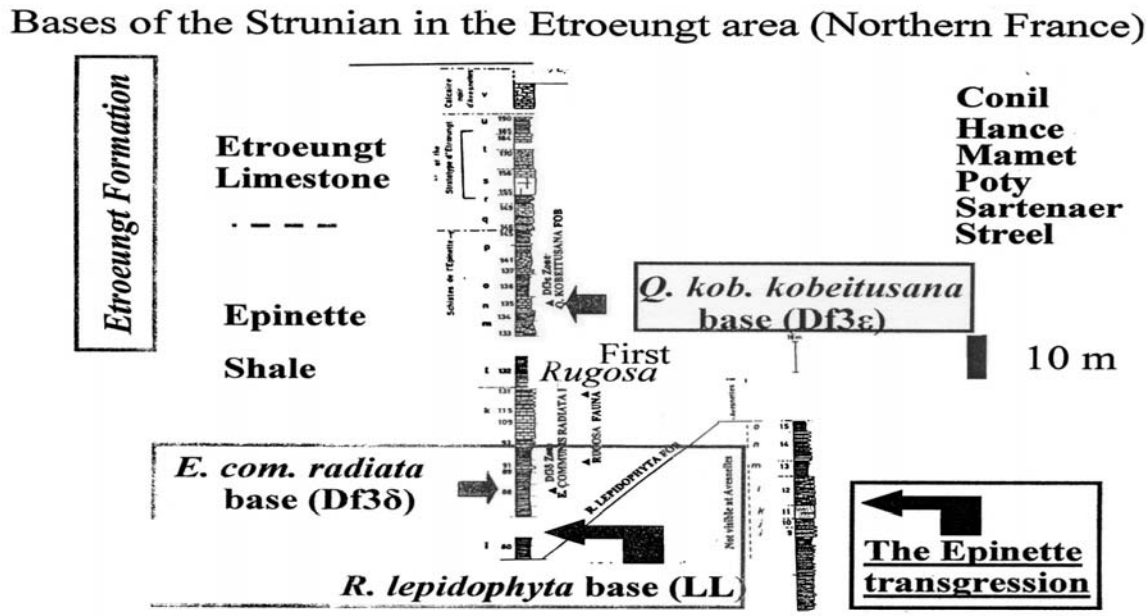

Fig. 1: The Avesnelles-St-Hilaire section in the Etroeungt area (northern France): Litho- and biostratigraphic data.

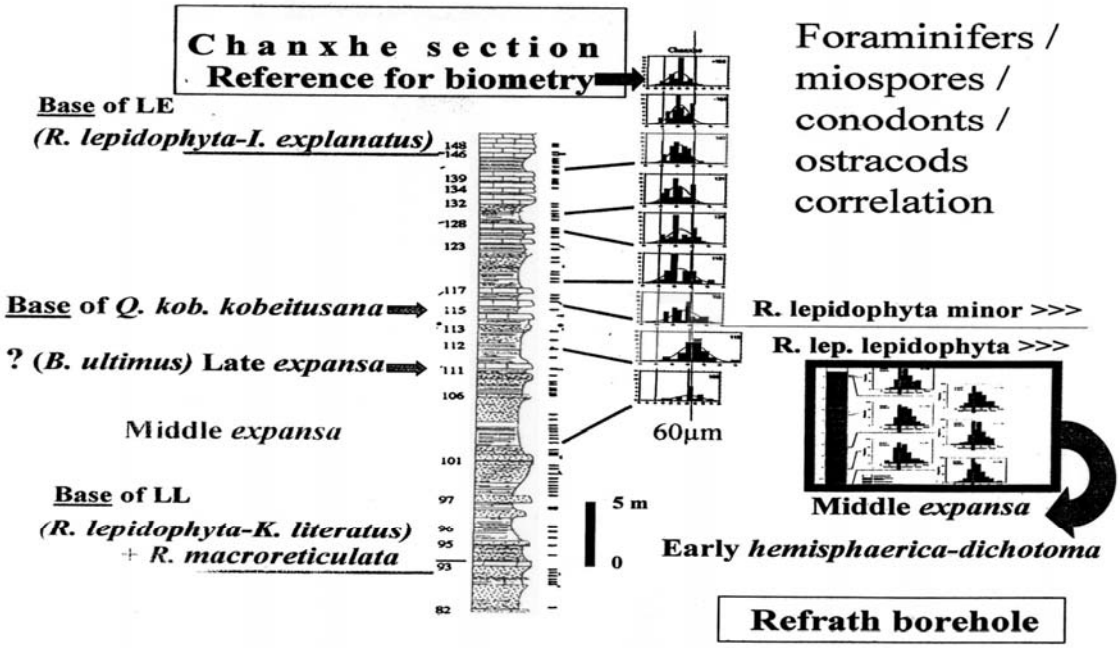

Fig. 2: The Chanxhe section in eastern Belgium and the Refrath 1 Borehole in western Germany: biostratigraphic data. (Groos-Uffenorde, in press ; Hartkoph-Fröder, in press ; Maziane et al. 2002 ; Piecha, in press)

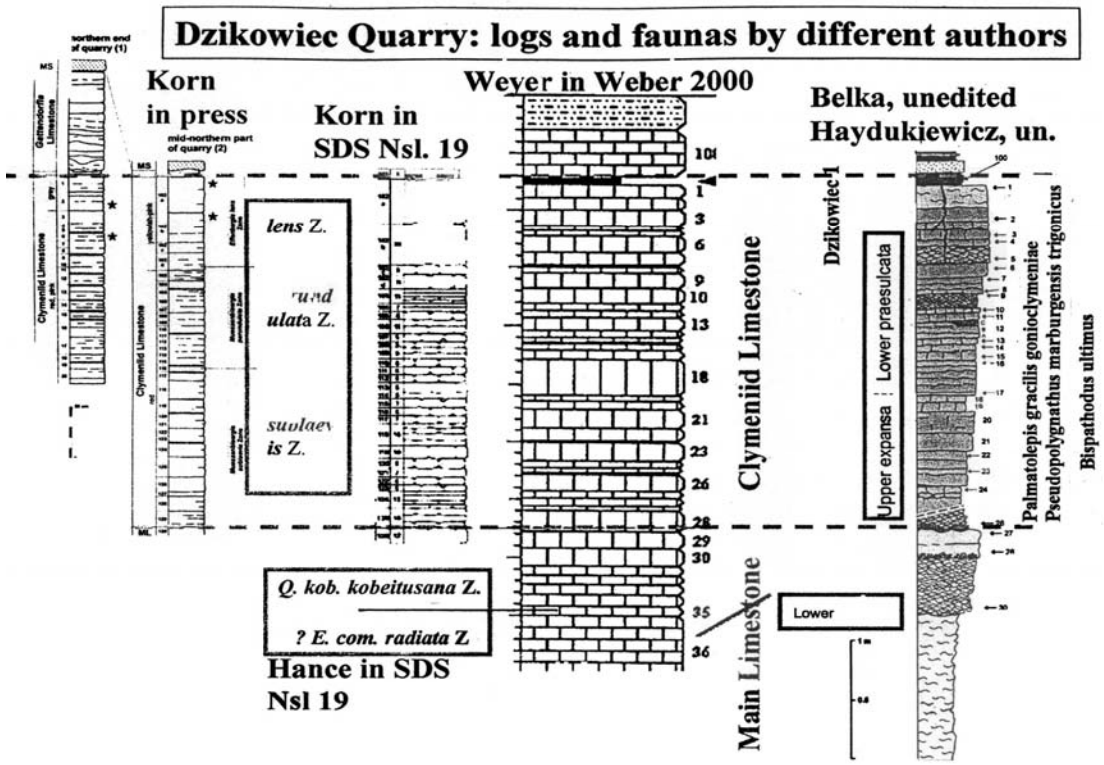

Fig. 3: The Dzikowiec Quarry in the Sudetes Mts (Poland) : biostratigraphic data.

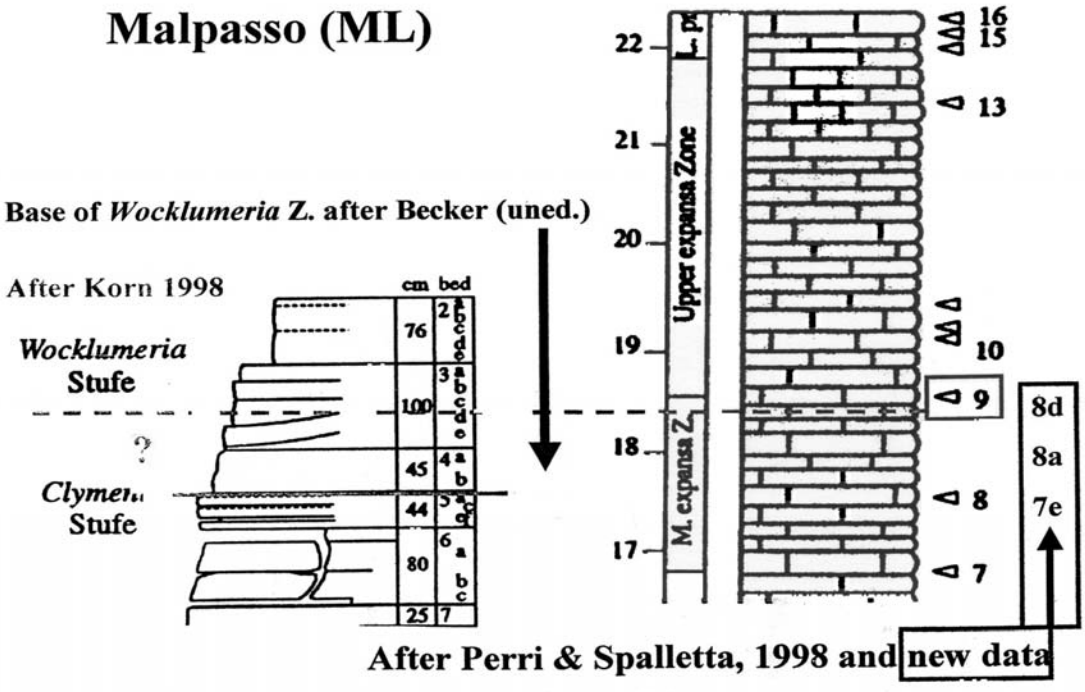

Fig. 4: The Malpasso section in the Carnic Alps (Italy): biostratigraphic data.

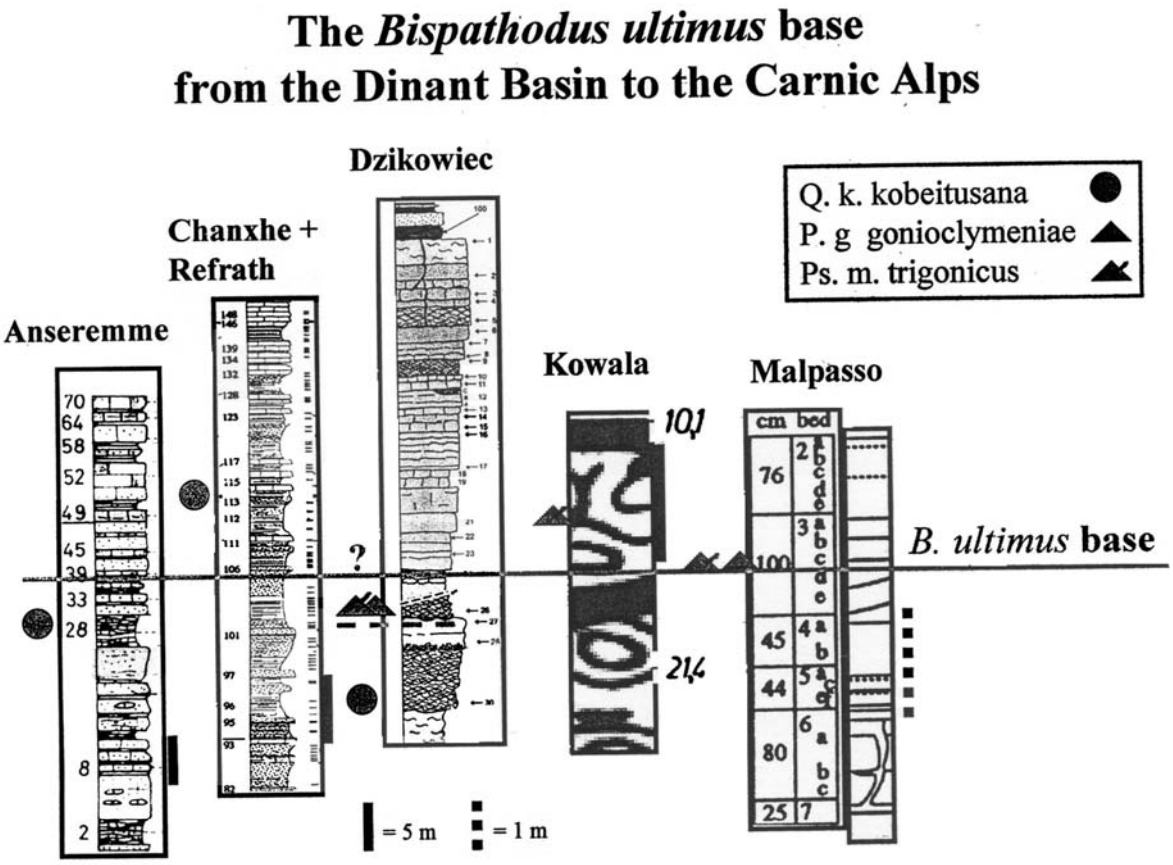

Fig. 5. Uppermost Famennian synthetic correlation chart

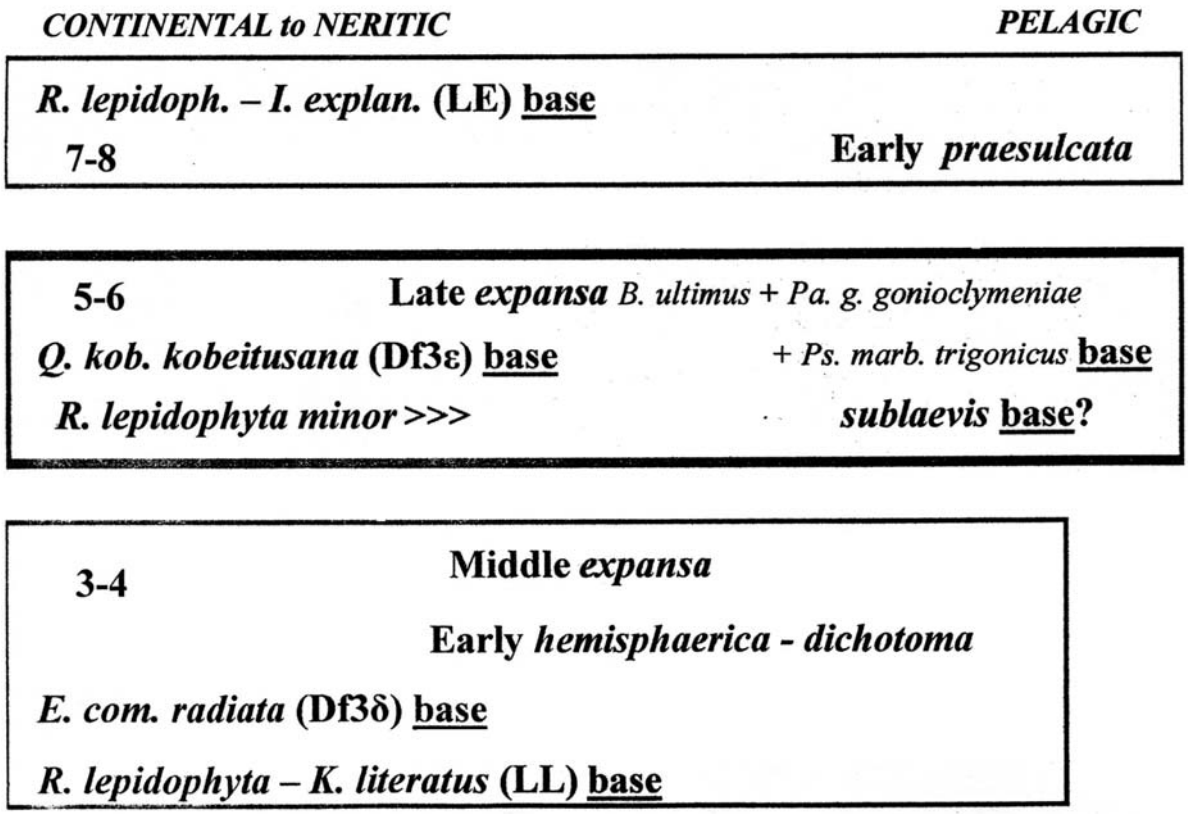

Fig. 6: Biostratigraphic correlation from continental to neritic and pelagic facies in the latest part of the Famennian. (3-4, 5-6, 7-8 see Streel, 2001, tab. 1)

CONODONTS			Proposed Substages
OLD ZONATION	STANDARD ZONATION		
S. sulcata	*sulcata*		
L. Protognathodus	*praesulcata*	L	UPPERMOST FAMENNIAN
U. costatus		M	
M. costatus		E	
L. costatus	*expansa*	L	UPPER FAMENNIAN
U. styriacus		M	
M. styriacus		E	
L. styriacus	*postera*	L	
U. velifer		E	
M. velifer	*trachytera*	L	
L. velifer		E	
U. marginifera	*marginifera*	L*	MIDDLE FAMENNIAN
L. marginifera		L	
U. rhomboidea	*rhomboidea*	E	
L. rhomboidea		L	
U. crepida	*crepida*	E	
M. crepida		L*	LOWER FAMENNIAN
L. crepida		L	
U. triangularis	*triangularis*	M	
M. triangularis		E	
L. triangularis		L	
U. gigas*	*linguiformis*	M	
U. gigas	*rhenana*	E	
L. gigas		L	
		E	

SDS – REPORTS – NOVOSIBIRSK

DOCUMENT OF THE INTERNATIONAL SUBCOMISSION ON DEVONIAN STRATIGRAPHY, ANNUAL MEETING, NOVOSIBIRSK 2005

R. THOMAS BECKER, WWU MÜNSTER

CORRELATION OF THE PROPOSED MIDDLE GIVETIAN SUBSTAGE WITH THE GLOBAL AMMONOID RECORD

INTRODUCTION

Despite the fact that the Givetian was only of moderate duration (ca. 5 ma), compared to other Devonian stages, SDS has decided to subdivide it into three substages that will be termed Lower, Middle and Upper Givetian.

Since most of the *Pharciceras* Stufe of HOUSE (1985), the classical Upper Devonian Iα of the German ammonoid subdivision, has been moved down into the Givetian, this rather distinctive time with unusually multilobed ammonoids was proposed to form the future Upper Givetian. However, since an overlap of *Maenioceras* and *Pharciceras* was discovered in Morocco and in the Montagne Noire (ABOUSSALAM & BECKER 2001, ABOUSSALAM 2003), and due to the relative weak definition of the *semialternans* or former Upper *varcus* Zones, it was eventually proposed to place the base of the Upper Givetian at the base of the (Lower) *hermanni* Zone (ABOUSSALAM & BECKER 2002). In this definition, the Upper Givetian includes five conodont zones (ABOUSSALAM & BECKER 2004): *hermanni* Zone, *cristatus ectypus* Zone (= former Upper *hermanni* Zone), *disparilis* Zone, (revised) *dengleri* Zone (= former Upper *disparilis* Zone, probably with two subzones based on evolution within the index species), and *norrisi* Zone (= former Givetian part of the *falsiovalis* Zone or Lowermost *asymmetricus* Zone). Revised zonal names strictly follow the current names of defining species. Each conodont level correlates with a distinctive goniatite level, based on rapid evolution within the Pharciceratacea.

Since the main part of the Givetian appears to have been much longer, BULTYNCK & GOUWY (2002) proposed a balanced substage subdivision into three substages, with the base of the Middle Givetian placed at the base of the *rhenanus/varcus* Zone sensu BULTYNCK (1987). A global review of Givetian goniatite occurrences allows to correlate both substage levels with regionally different ammonoid levels. Recognition of both levels in different fossil groups strongly supports their utility. The Upper Givetian is recognizable by the appearance of multilobed pharciceratids (*Stenopharciceras* and relatives) in the Tafilalt, Dra Valley, Algeria, the Montagne Noire, Cantabria, and Germany.

BASE OF MIDDLE GIVETIAN

The most complete and detailed Givetian ammonoid successions are currently known from Morocco. BECKER & HOUSE (1994) recognized an important marker unit in two sections of the Central Tafilalt, at Bou Tchrafine and Jebel Amelane. At the level of first *Po. rhenanus, Po. xylus, Po. varcus*, and *Linguipo. transversus* (BT/23, BULTYNCK 1987), there is a mass occurrence of small-sized goniatites that were originally identified as *Wedekindella* aff. *psittacina*. Revision of the British types of that species (HOUSE 2002) confirmed differences and the unconstricted *psittacina* Group will eventually be placed in a related new genus of the Parodiceratinae. Subsequent loose collection showed that a new species of *Sobolewia*, more compressed than *Sob. cancellata*, is equally abundant.
Recent (2004) joint field investigations with Z. S. ABOUSSALAM at Jebel Amelane showed that *Cabrieroceras* and the oldest maenioceratid, *Bensaidites koeneni*, may occur in the topmost Kacak Event Bed. The basal Givetian is not very fossiliferous. Nodular limestones of higher parts of the Lower Givetian yielded *Holzapfeloceras circumflexiferum, Agoniatites* aff. *costulatus, Agon*. aff. *vanuxemi* (= *obliquus* auct., non Whidborne), relatives of *Tornoceras mesopleuron* and *T. arkonense*, some brevicones and

phacopids. At the base of the Middle Givetian there are two goniatite coquinas but preservation is poor. However, *Sobolewia* n. sp. aff. *cancellata* is clearly dominant and should be used in future as the regional index species of the Tafilalt Middle Devonian II-B.

In the Dra Valley of SW Morocco, the best succession is exposed at Oued Mzerreb in the Tata Region and has been shown to the SDS field party in spring 2004 (BECKER et al. 2004). Rare *Po. varcus* suggest that the base of the Middle Givetian falls in beds with *Agon. vanuxemi*, below the entry of a fauna with an advanced new species of *Bensaidites* that locally defines MD II-B1. Somewhat higher, the oldest *Maenioceras* (n. sp. III) enters together with tornoceratids with juvenile ribbing *("T." amuletum* Group, and *"Trevoneites" assessi*, defining MD II-B2.

There are no known German goniatite faunas that can add to the correlation. Assemblages from the Tentaculitenschiefer of the eastern Rhenish Massif have already rather advanced *Maenioceras* and correlate at least with high parts of the Moroccan MD II-B, if not with the younger *terebratum* Zone (MD II-C).

The traditional type level of MD II-B, the *Bensaidites molarius* Zone, is based on the famous fauna from Wolborough, which was recently revised by HOUSE (2002). Apart from a report of *Icriodus brevis*, there are, unfortunately, no modern conodont data for this important fauna. Correlation with the Moroccan succession (*Sob*. n. sp. aff. *cancellata* Zone, see above) is based on the presence of last *Bensaidites*, *"Wedekindella" psittacina*, and of oldest relatives of *Sob. cancellata*.

Correlation of the New York Devonian suffers from poor conodont data, including probably facies-controlled late entries of index species. The oldest *Po. rhenanus* from the Tichenor Limestone places the base of the future Middle Givetian too high since typical Middle Givetian goniatites occur already much lower. The ribbed *"Tornoceras" amuletum* Group, for example, enters low in the Ledyard Shale (HOUSE 1965) and suggests already a MD II-B age. Typical Lower Givetian tornoceratids, such as *T. mesopleuron* and *T. arkonense*, occur in eastern North America (Ohio to Ontario) in levels that project into levels of the Skaneateles Formation well below. From the top of the Ledyard Shale, KLOC (1983) even reported the first *Sellagoniatites unilobatus*; *Sellagoniatites* does not occur below MD II-C in Morocco, Germany or Canada. Consequently, the base of the Middle Givetian has to be placed in New York near the Centerfield Limestone, perhaps slightly above, depending on future new conodont data and on revisions of conodonts previously identified as *"Po. varcus"* from the Hungry Hollow Formation (Ontario) and upper Silica Shale (Ohio). The presence of *I. brevis* in the Arkona Shale of Ontario may indicate a position well above the base of the *timorensis* Zone (see range chart in BULTYNCK 1987) for correlative levels in the higher Levanna Shale of New York, although *Po. timorensis* itself is first only known from the overlying Centerfield Limestone.

Currently no other ammonoid succession or fauna can contribute to the correlation around the future Middle Givetian base. Material from the Montagne Noire is very poorly preserved and there are no modern data for possible Holy Cross Mountain assemblages. *Bens. molarius* (= *excavatus*) may be prsent in southern Algeria (PETTER 1959) but its precise level was not documented by subsequent studies of the area (GÖDDERTZ 1987). Goniatite faunas from MD II-B had a rather restricted distribution that is not explained so far.

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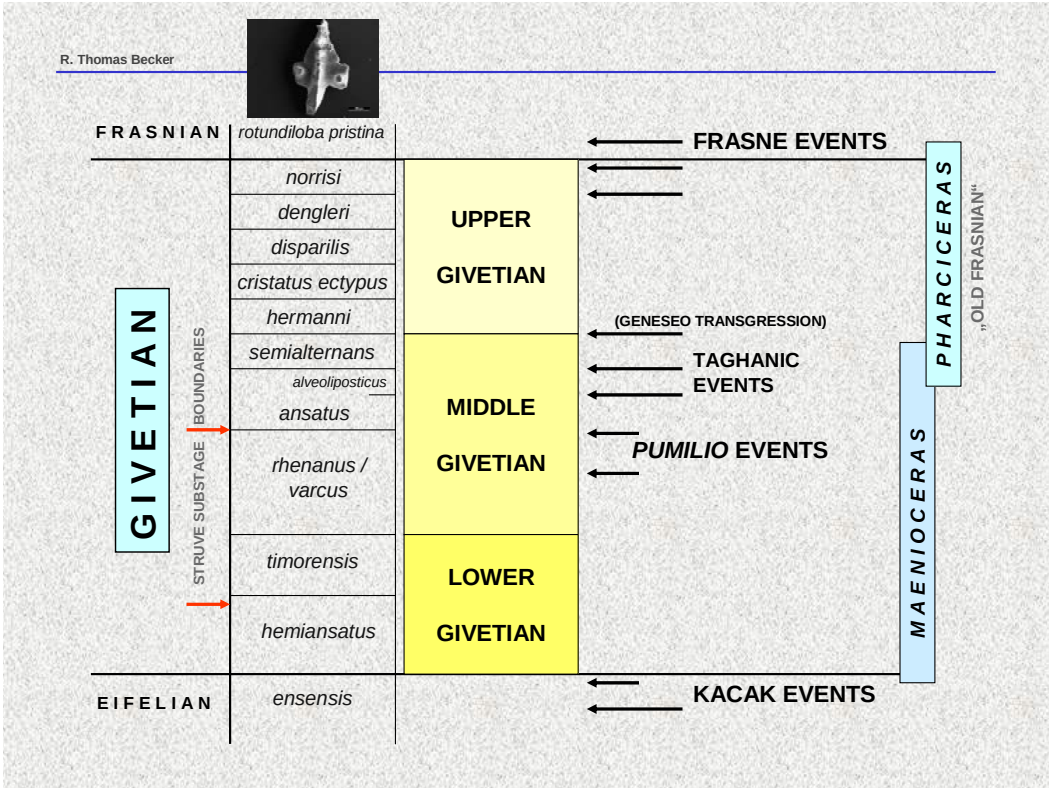
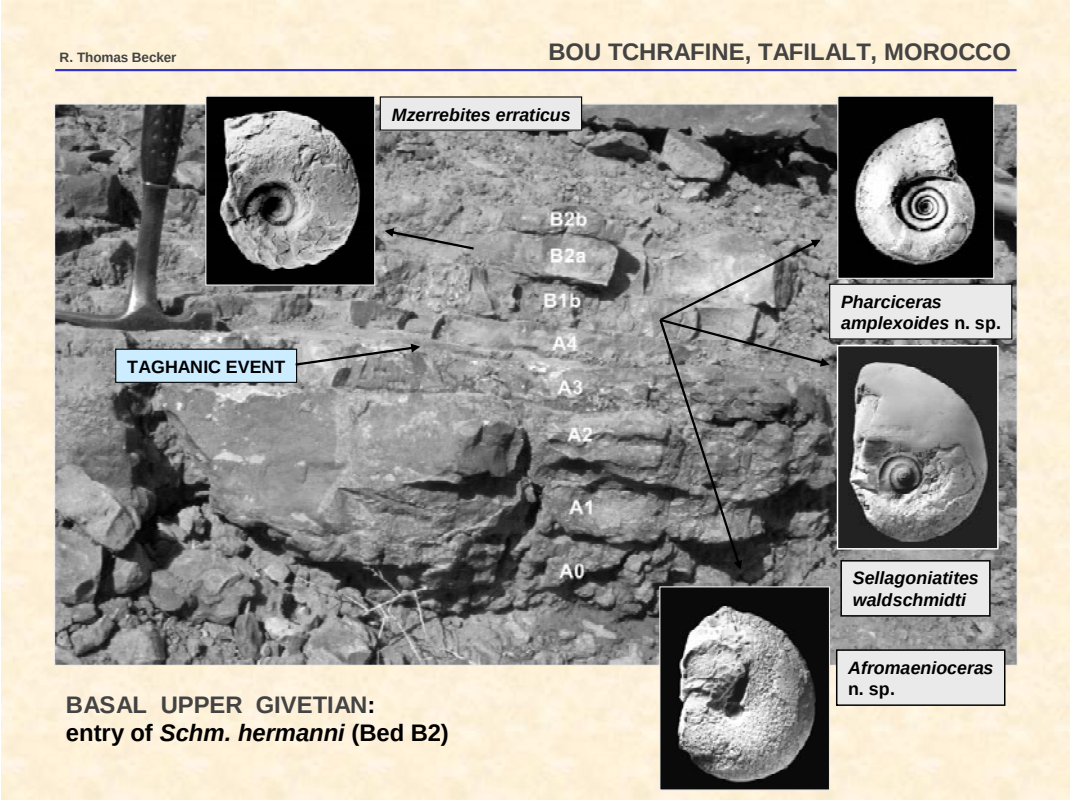
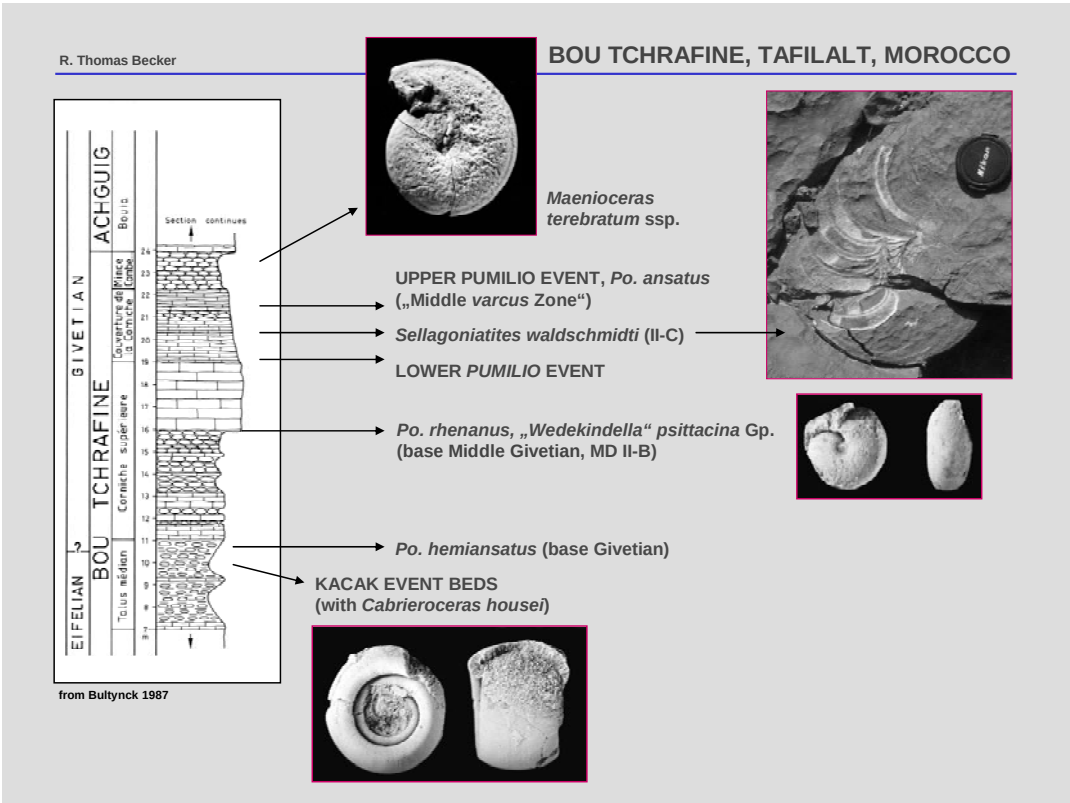
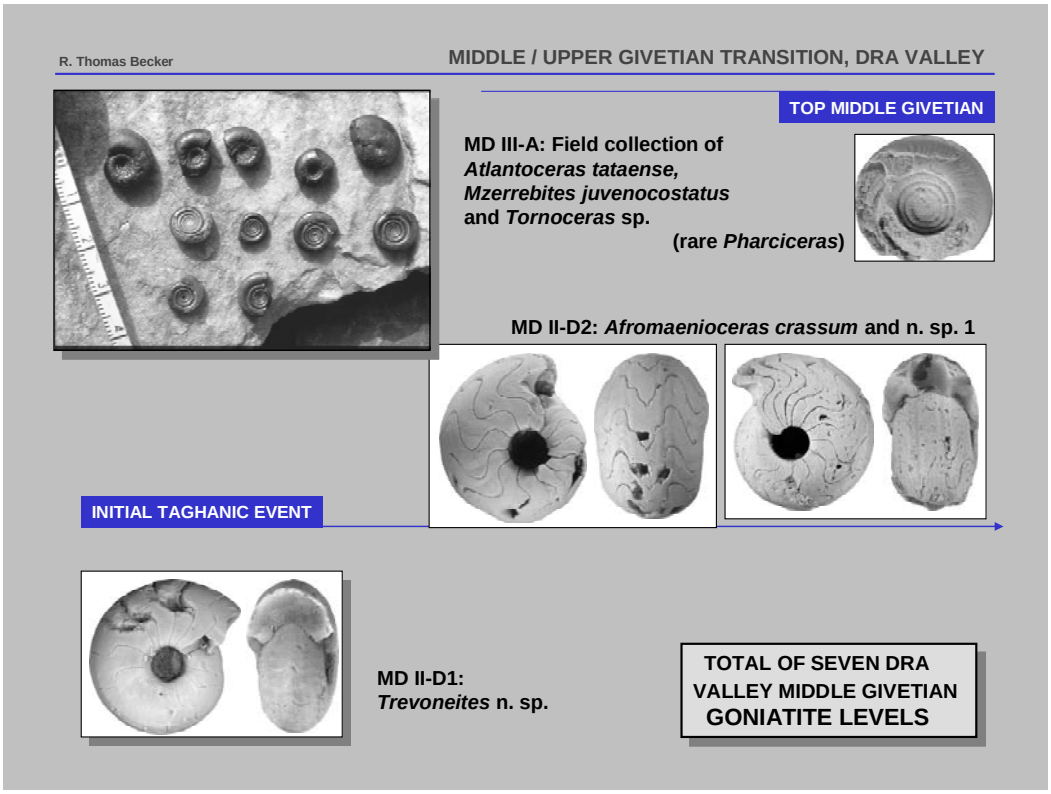
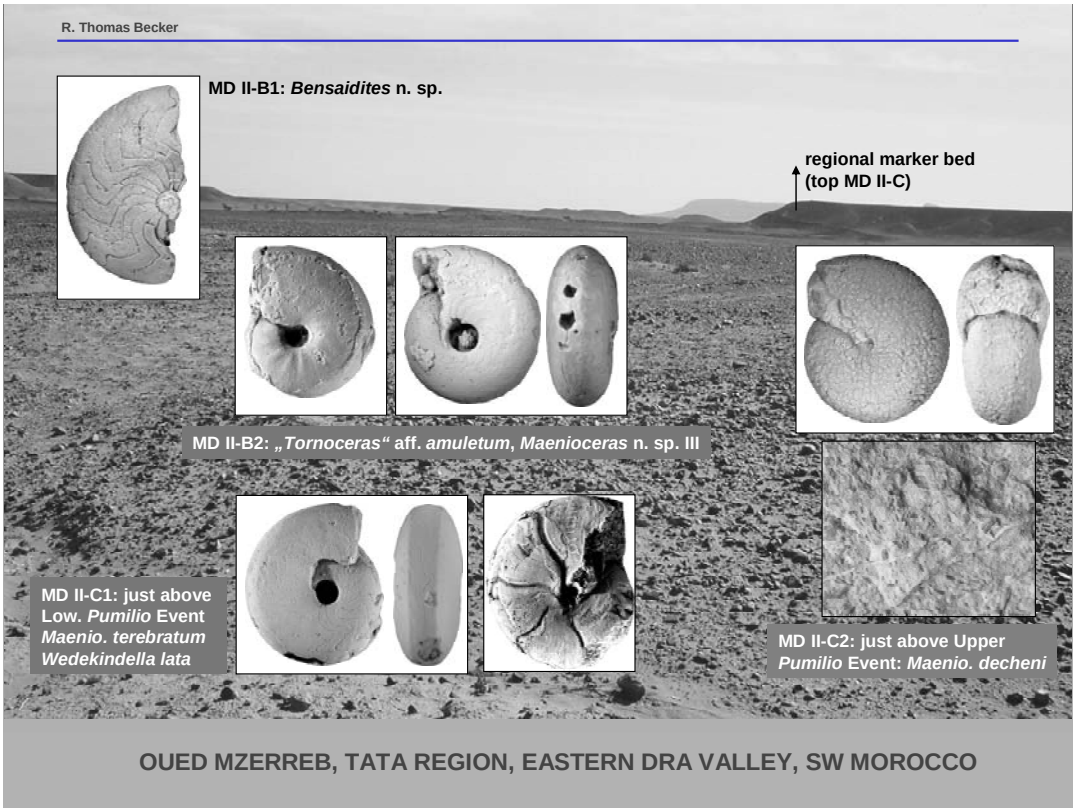


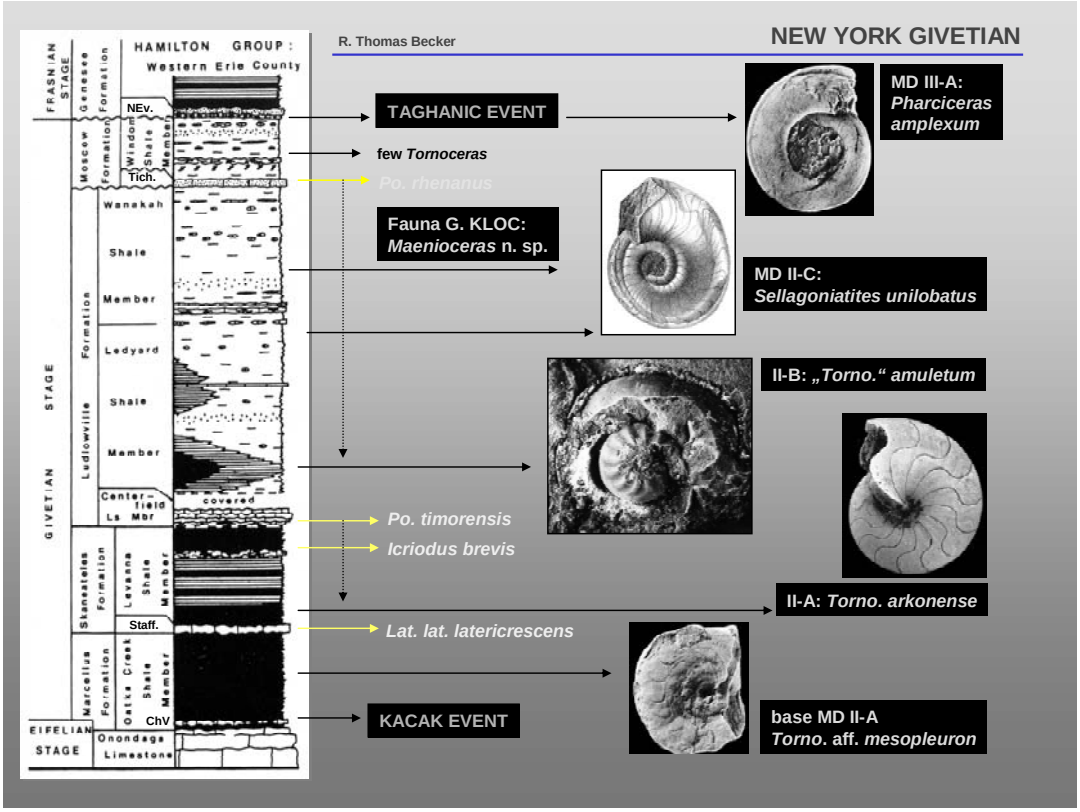
	CONODONTS	SE MOROCCO	DRA VALLEY	GERMANY	SW ENGLAND	NEW YORK	GENERIC MARKERS
UPPER	*Schmidtognathus hermanni*	*Mzerrebites erraticus*	*Stenopharciceras* sp.	*Mzerrebites erraticus*			*Stenopharciceras*
MIDDLE GIVETIAN	*Ozarkodina semialternans*	*Pharciceras amplexoides*	*Mzerrebites juvenocostatus*	*Mzerrebites bifurcatus*		*Pharciceras amplexum*	*Pharciceras/ Mzerrebites/ Atlantoceras*
	Polygnathus alveoliposticus	*Afromaenioceras* n. sp.	*Afromaenioceras* n. sp.				*Afromaenioceras*
	Polygnathus ansatus	*Afromaenioceras sulcatostriatum*	*„Trevoneites"* n. sp.	*Maenioceras* n. sp.		*Tornoceras uniangulare* n. ssp.	
		Sellagoniatites waldschmidti	*Maenioceras decheni*	*Maenioceras decheni*	*Maenioceras decheni*	*Maenioceras* n. sp. *Sellagoniatites unilobatus*	*Wedekindella/ Sellagoniatites*
	Polygnathus rhenanus + Polygnathus varcus		*Maenioceras terebratum*	*Maenioceras terebratum*	*Maenioceras terebratum*		
		Tornoceras cf. *mesopleuron*	*Maenioceras* n. sp. III		*Bensaidites molarius*	*„Tornoceras" amuletum*	*Maenioceras*
		Sobolewia n. sp.	*Bensaidites* n. sp.				*„Tornoceras" amuletum* Gp.
LOWER	*Polygnathus timorensis*	*Agoniatites aff. vanuxemi*	*Agoniatites aff. vanuxemi*			*Tornoceras arkonense*	
	Polygnathus hemiansatus	*Bensaidites koeneni*		*Bensaidites undulatus*		*Tornoceras* aff. *mesopleuron*	*Tornoceras* *Bensaidites*

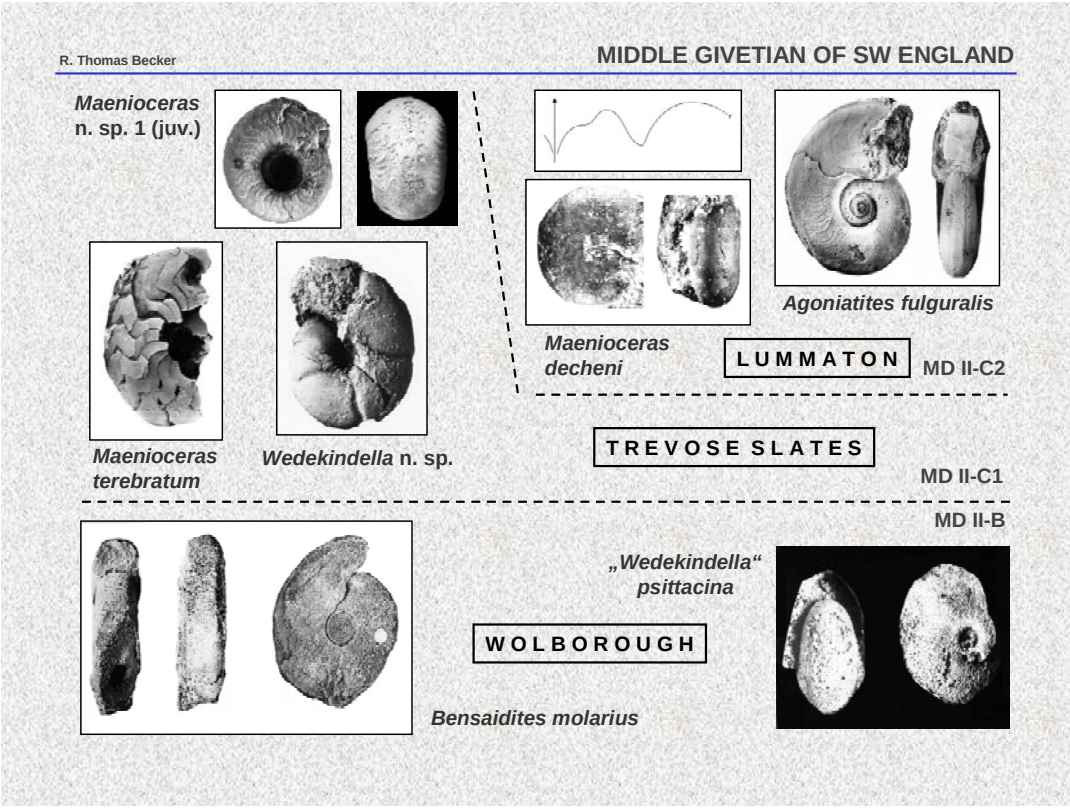

R. Thomas Becker
BOU TCHRAFINE, TAFILALT, MOROCCO
Mzerrebites erraticus
B2b
B2a
B1b
A4
A3
A2
A1
A0
TAGHANIC EVENT
Pharciceras amplexoides n. sp.
Sellagoniatites waldschmidti
Afromaenioceras n. sp.
BASAL UPPER GIVETIAN:
entry of Schm. hermanni (Bed B2)


R. Thomas Becker
BOU TCHRAFINE, TAFILALT, MOROCCO
EIFELIAN ?
GIVETIAN
BOU TCHRAFINE
ACHGUIG
Maenioceras terebratum ssp.
UPPER PUMILIO EVENT, Po. ansatus („Middle varcus Zone“)
Sellagoniatites waldschmidti (II-C)
LOWER PUMILIO EVENT
Po. rhenanus, „Wedekindella“ psittacina Gp. (base Middle Givetian, MD II-B)
Po. hemiansatus (base Givetian)
KACAK EVENT BEDS (with Cabrieroceras housei)
from Bultynck 1987


R. Thomas Becker
MIDDLE / UPPER GIVETIAN TRANSITION, DRA VALLEY
TOP MIDDLE GIVETIAN
MD III-A: Field collection of *Atlantoceras tataense*, *Mzerrebites juvenocostatus* and *Tornoceras* sp.
(rare *Pharciceras*)
MD II-D2: *Afromaenioceras crassum* and n. sp. 1
INITIAL TAGHANIC EVENT
MD II-D1: *Trevoneites* n. sp.
TOTAL OF SEVEN DRA VALLEY MIDDLE GIVETIAN GONIATITE LEVELS


R. Thomas Becker
MD II-B1: *Bensaidites* n. sp.
regional marker bed (top MD II-C)
MD II-B2: „*Tornoceras*“ aff. *amuletum*, *Maenioceras* n. sp. III
MD II-C1: just above Low. *Pumilio* Event *Maenio. terebratum* *Wedekindella lata*
MD II-C2: just above Upper *Pumilio* Event: *Maenio. decheni*
OUED MZERREB, TATA REGION, EASTERN DRA VALLEY, SW MOROCCO


R. Thomas Becker
NEW YORK GIVETIAN
HAMILTON GROUP: Western Erie County
TAGHANIC EVENT
few Tornoceras
Po. rhenanus
Fauna G. KLOC: Maenioceras n. sp.
MD III-A: Pharciceras amplexum
MD II-C: Sellagoniatites unilobatus
II-B: „Torno.“ amuletum
Po. timorensis
Icriodus brevis
II-A: Torno. arkonense
Lat. lat. latericrescens
KACAK EVENT
base MD II-A Torno. aff. mesopleuron
NEv.
Tich.
Wanakah Shale Member
Ledyard Shale Member
Centerfield Ls. Mbr
covered
Staff.
ChV
Onondaga Limestone
GIVETIAN STAGE
EIFELIAN STAGE
FRASNIAN STAGE


R. Thomas Becker
MIDDLE GIVETIAN OF SW ENGLAND
Maenioceras n. sp. 1 (juv.)
Agoniatites fulguralis
Maenioceras decheni
LUMMATON
MD II-C2
TREVOSE SLATES
MD II-C1
MD II-B
Maenioceras terebratum
Wedekindella n. sp.
„Wedekindella“ psittacina
WOLBOROUGH
Bensaidites molarius

DOCUMENT SUBMITTED TO THE SDS BUSINESS MEETING TO BE HOLD IN NOVOSIBIRSK, SIBERIA; AUGUST 2005:

PETER CARLS AND JOSÉ IGNACIO VALENZUELA-RÍOS

FROM THE EMSIAN GSSP TO THE EARLY LATE EMSIAN - CORRELATIONS WITH HISTORICAL BOUNDARIES

We want to correlate two important successions with diverse biostratigraphical information important for Pragian and Emsian stratigraphy. One of them is the Zinzilban section (ZS) with the actual GSSP for the Emsian Stage. The other one is the succession of formations and faunas of the Eastern Iberian Chain (EIC). The first one offers good links to pelagic successions world-wide; we refer to its conodonts, dacryoconarids and goniatites. The second one is well linked to the traditional succession of stages practised in the Ardenno-Rhenish Slate Mountains and has also furnished conodonts and dacryoconarids. Our information fills the span from the GSSP to the *cancellata* boundary.

The ZS is well known; we only want to mention that its base in the Madmon Formation had been compared, by means of its macrofauna, to the Koňeprusy Limestone in Bohemia. As the reefal Koňeprusy Lms. facies in Bohemia ends below a gap, it does not reach the full extent of the original Pragian Stage in its central Barrandian non-reefal type area. The biostratigraphical succession within the ZS has been documented in detail since Sokolov & Garkovets (1978, eds.), however, the interpretation of its conodont zones is still a matter of debate. As the stratigraphical succession of the EIC is more varied, as regards both lithologies and groups of index fossils, we will mostly begin our correlations with the time-marks that can be distinguished there and, then, state their age equivalents in the ZS and elsewhere. However, we have to begin with the characterization of the actual Emsian GSSP in terms of such conodont marks that can be reproduced elsewhere without danger of relevant errors.

In the ZS, a little below the top of the thick Madmon Fm., eognathodontids (*Eognathodus kindlei*) have been found (we don't want to interfere with recent studies on the detailed taxonomy of this group; in the present case, simply the last occurrence of this group in this section is a sufficient mark). Similarly the very primitive *Polygnathus pireneae* has been reported very closely below and above the GSSP together with other very early polygnathids. We do not want to discuss here the taxonomic meanings of these polygnathids as that might provoke fruitless discussions. Just above the appearance of the index *P. kitabicus*, within the lowermost meters of the Zinzilban Beds, there are further conodonts that also have limited ranges. These are *Pedavis mariannae* and *Pelekysgnathus* of the *serratus* stock. The close vicinity of the last eognathodontids, of earliest *Polygnathus*, of latest *serratus* stock and of *Pd. mariannae* can be taken as characterizing a very short time-interval amid which the GSSP is located. This interval (the *kitabicus* boundary interval - KBI) can be reproduced in several important sections world-wide (not always are all taxa present): Salmontrout section, COP II-295' (Central Nevada), several sections in Bohemia with individual finds below the middle of the non-reefal Pragian, Pyrenees. Always a position toward the middle of the Pragian in its original sense is concerned. Therefore, we use these taxa of the KBI for easy and safe preliminary orientation. According to the following correlation with the faunal succession in the EIC, the GSSP would be at 8/15 of the interval from the Silurian/Devonian boundary to the *cancellata* boundary, in other words the Early Emsian as delimited by the GSSP would last about 7 M.y., whereas the traditional German Early Emsian corresponds to 2.5 M.y. (based on the assumption that there are 15 M.y. from the S/D boundary to the *cancellata* boundary of the late Emsian and on the calibration according to faunal "steps" by Carls (1996, Devonian Correlation Table, and 1999).
In the EIC the stock of *Pelekysgnathus serratus* is abundant but degenerates (like in Brittany) in the upper quarter of the submember d2cα of the Nogueras Fm., little before the entry of *Icriodus simulator*, which marks a moderate deepening throughout Ibero-Armorica. Near the top of the overlying submember d2cβ at least 10 characteristic brachiopods of the Koneprusy Lms. of Bohemia are present, although the facies is not reefal. Three more Koneprusy taxa occur in the lower parts of the following Santa Cruz Fm. In the Santa Cruz Fm., besides *Icriodus curvicauda* no relevant conodonts are presently available in the EIC for correlation. Nevertheless, the observations coincide in that the interval from high d2cα to the unit d3bβ1 of the Santa Cruz Fm. is similar in age to middle parts of the original Pragian in Bohemia and includes the KBI (compare Carls, 1999).

In the EIC a next important mark is the origin of the genus *Arduspirifer* that enters in the basal beds of unit d3bγ1 and ends at the base of the Mariposas Fm. It allows correlations with faunas of the traditional late Middle Siegenian to Late Siegenian in the Ardenno-Rhenan, Armorican and Moroccan (Merzâ-Akhsaï Fm.; Jansen, 2001) successions. The next relevant mark is the phylogenetic step from an unnamed ancestor to *Rhenorensselaeria strigiceps*. The origin of the latter has been proposed as a mark for the beginning of the traditional, but now obsolete, "Middle Siegenian Substage". It is associated to *Acrospirifer* aff. *primaevus* an ancestral form (Carls & Valenzuela-Ríos, 1998). *Acrospirifer primaevus* is the main index for the traditional Middle and Late Siegenian. The first conodont fauna of the EIC that allows close correlation with the ZS comes from the basal bed of the Mariposas Fm., the type-stratum of *Polygnathus excavatus excavatus*. In the same bed there is also *Polygnathus excavatus* ssp. 114, in which the posterior half of the basal cavity is rather flat and the ornament of the tongue consists of "semicrossed ridges". The first *Po. exc. excavatus* from the ZS is from a bed 92 meters above the GSSP. The combination of oral and aboral morphology of *Po. excavatus* ssp. 114 is first reported from 114 meters above the GSSP under the name *Po.* "*excavatus gronbergi*" (Yolkin *et al*., 1994). This suggested the "*gronbergi*" Zone, which is, however, refutable (see below). According to this *Polygnathus* the basal bed of the Mariposas Fm. must be correlated 114 m above the GSSP of the ZS or insignificantly higher and is in the Middle *excavatus* Zone of Yolkin *et al*. (1994).

At the boundary between Santa Cruz Fm. and Mariposas Fm. there is a rich brachiopod fauna without reliable indexes of the traditional Emsian Stage in German sense. This level is, therefore, still of Siegenian age, although the prevailing claricolous taxa do not occur in the Ardenno-Rhenan type area of this stage. "*Acrospirifer*" *fallax* which has been proposed as an index of the basal Emsian (Mittmeyer, 1974) appears about two meters above the base of the Mariposas Fm. Already 1.3 m above the base of the formation we obtain steinkerns of *Guerichina* sp. and *Peneauia* sp., both range up to the middle of the submember d4aβ of the Mariposas Fm. where they join with incoming *Icriodus bilatericrescens gracilis* and "*Ozarkodina*" *miae*. On one hand, *Guerichina* ranges in Bohemia mainly towards the end of the original Pragian. In the ZS, Walliser and Kim (2001) identified *Guerichina* at 134 meters above the GSSP. Consequently, the middle of submember d4aβ in the EIC must be correlated to the 134 meters above the GSSP level, and both turn out to be of late Pragian age in the original sense.

In the member d4a, a wealth of *Arduspirifer* appears; among these there are forms like *Ard. prolatestriatus* in d4aβ1 which had been proposed as an alternative mark for the beginning of the traditional Emsian in Germany (basal Ulmen).

Just above the middle of the submember d4aβ forms of *Arduspirifer* warrant age-equivalence with the Erbsloch Grauwacke in Germany. This horizon is embedded in shales with *Guerichina* spp. according to G. Alberti (since 1983). It is early Early Emsian in German sense (lower Ulmen) and very late Pragian in original Bohemian sense.

Still within the range of *Po. excavatus* tota sp., the first bed with *Icr.* aff. *bilatericrescens* (= *Icriodus* n. sp. 21 of Carls & Valenzuela-Ríos, 2000) is 1.3 m above the base of the submember d4aγ. (Older reports from the EIC of *Icr. bilatericrescens* tota sp. concern, as revised, *Icr. gracilis*). *Icr.* aff. *bilatericrescens* has been figured from very low beds of the Zlichovian of Bohemia (Kalvoda, 1995, pl. 1, figs. 2, 6; pl. 2, figs. 5, 7). Therefore, the original Pragian/Zlichovian boundary is very close to the base of the unit d4aγ1. Other important conodont marks in the early part of the Zlichovian are as follows: 1) Amid the d4aγ "*Ozarkodina*" *miae* and "*Ozarkodina*" n. sp. M overlap. (The Pa element of the latter is small, short, equidentate, with subsymmetrical smooth lobes). Within the d4aγ *Nowakia* cf. *zlichovensis* has been reported. 2) Just below the boundary d4a/d4b *Icr. latus* and nowakiids of the *Dmitriella praecursor* group enter together. The lower quarter of submember d4bα still abounds in *Icr. sigmoidalis*, *Icr. multicostatus* and *Icr. bilatericrescens*. At about the lower sixth of the d4bα *Criteriognathus steinhornensis* s.s. enters; initially it is still overlapped by "*Ozarkodina*" n. sp. M, which has often been confounded with "*Oz.*" *miae*.

As to the succession of the polygnathids, we only want to state that there are still forms close to *Po. excavatus* in the lower part of the d4bα. More important, however, is the entry of *Po. gronbergi* in the basal d4bα in the sense that has been applied in former years by students of European, Uzbek and Northwest African material. The application of the name "*gronbergi*" to the taxon that enters 114 m above the GSSP in the ZS (Yolkin *et al*., 1994) has to be distinguished from this form. When it has been stated that *Po. gronbergi* is lacking in Australia, such statements referred to both, the Nevadan holotype and the European and African materials. In this sense, the habitual *gronbergi* Zone begins near the base of d4bα. In the Kim beds of Uzbekistan, (Sokolov and Garkovets 1978, eds., pl. 75, fig. 4), the entry of *Po. gronbergi* in the

European and African sense is shown at a level about 144 m above the Emsian GSSP. From the Uzbek section further specimens have been figured or synonymized as "*gronbergi*"; we will presently not comment on their identifications, but call attention to the fact that their aboral views all show initial inversion of the posterior part of the basal cavity; this feature was the most strongly emphasised one when the taxon *gronbergi* was introduced and applied as a zonal index. On these grounds we correlate the immediate vicinity of the boundary between the submembers d4aγ and d4bα with the level 144 m above the Emsian GSSP. This is stated here in order to prevent further inadvertence in the application of *Po. gronbergi*. Herein we imply no reference to the outlines and oral morphology of the Pa element. Only a thorough taxonomic revision might settle corresponding questions in the future; the failures in correlation cannot be remedied by coining more and more zonations. According to its position closely below oldest goniatites true *Pol. dehiscens*, an Australian endemic, must be correlated in the late range of *Po. gronbergi* and in the time of the *praecursor* group of *Dmitriella*; that concerns middle parts of the d4bα.

In the middle parts of d4bα the Celtiberian conodont succession is not yet completly established. However, the nowakiids and early ammonoids furnish good marks in the upper part of the d4bα. The first goniatite to appear was one *Caeleceras* sp. that seems to be in the final range of *Dmitriella praecursor*. *Nowakia barrandei* and *Anetoceras* sp.sp. together with *Palaeogoniatites and Mimagoniatites zorgensis* enter in the same pair of beds. Above this level, limestones become scarce and the local climax of the Daleje Event approaches. Conodonts are scarce. *Nowakia elegans* abounds 5 m above the boundary d4bα/d4bβ. Following Boŭcek (1964), who had not distinguished *Now. elegans* from *Now. cancellata*, Carls *et al*. (1972) treated this *Now. elegans* under de name of *Now.* "*cancellata*"; however, true *Now. cancellata* seems to have its range higher in the submember d4bβ but it is not yet well delimited. In marly limestones of submember d4bγ *Now.* cf. *richteri* and only one *Polygnathus* cf. *serotinus* have been found. This submember is the type-horizon of *Icriodus fusiformis* and has not yet furnished members of the *Icr. rectirostratus* group.

Brachiopod faunas of Rhenish biofacies occur again in the Castellar Fm. including early *Alatiformia alatiformis* marking the start of the Hondel "Group". First reports of the "*Spirifer*" *mosellanus* stock from the basal meters of the Castellar Fm. are not warranted; it is possible that they rather belong to the wider kinship of "*Arduspirifer arduennensis*" *latronensis*; related forms begin at the lower quarter of submember d4bα in Celtiberia and low in the Reun ar C'hrank Fm. of the Rade de Brest; they have, indeed, similar shapes as the true *mosellanus* stock. The entire group, as a whole, should not be taken as indicative of the Kondel time (late Late Emsian), as it begins amid the Early Emsian (German sense).

With reference to the early Emsian in its historical type region we want to mention two current errors in correlation: 1) Some regional workers in the areas of the Hunsrück and of the southeastern Eifel Hills hold that the entire Hunsrück Shale is a pelitic age-equivalent to the partly arenaceous strata of the Ulmen "Group" in the SE Eifel Hills. The shelly faunas of the Ulmen with rather old (not oldest) *Arduspirifer* represent the oldest unit of the historical early Emsian in German sense (the current base of the Belgian early Emsian follows in age at the end of the Ulmen). High in the Hunsrück Schiefer of the Hunsrück there is the famous Bundenbach fauna that also includes very early goniatites like *Anetoceras* and *Mimagoniatites* of late Zlichovian age. Elsewhere these goniatites have not been found together with shelly fauna of Ulmen age. However, more to the northwest in the Eifel Hills *Anetoceras* has been found in the "Stadtfeld Schichten". These are part of the Vallendar "Group", the third and upper group of the early Emsian succession in the Eifel region. (The top portion of the Vallendar are the Klerf Red beds, which have historically been handled as the "Middle Emsian" of former Belgian stratigraphers; the time interval represented by these thick red-beds appears to be extremely short.) The presence of *Anetoceras* both, at Bundenbach and in the "Stadtfeld Schichten" warrants virtual age equivalence of both horizons; therefore, the Bundenbach fauna cannot be of Ulmen age.

2) In north-western Africa, shelly faunas of hardly Middle Siegenian (Dra Plain, Merzâ-Akhsai Fm., Jansen 2001) respectively conodonts of rather early Early Emsian age (Ma'der, Bultynck 1985) are closely (in terms of thickness) followed by faunas with oldest goniatites; this condition can evoke the impression that the goniatites enter quite shortly (in terms of time) after the beginning of the traditional Emsian (German sense), and such opinion has repeatedly been expressed. Unfortunately, this seems to be in harmony with the inclusion of the Bundenbach *Anetoceras* in the Ulmen time. But above, we have referred quite a number of biostratigraphically relevant marks in a continuous succession in Celtiberia from the ends of *Guerichina* and *Peneauia* up to the entry of ammonoids. This faunal succession has not been shown in north-western Africa, and therefore it is probable that there the interval between the Siegenian and early Early Emsian

shelly faunas below and the first ammonoids above is not represented by relevant faunas. Even comparing the conodont succession documented by Bultynck (1985, text-fig. 4) from the Ma'der in southeastern Morocco, one will find a gap of conodont information between the local range of *Icriodus gracilis* and of *Po. gronbergi* plus *Criteriognathus steinhornensis*, already without *Icr. sigmoidalis* in the Jbel ou Driss Section. In terms of our Celtiberian succession, the Moroccan (Ma'der) interval without conodont record is the equivalent of, probably, the following interval: from the upper part of unit d4aβ2 to the lower fourth of the unit d4bα. According to Carls (1999, text-fig. 4) this interval may have lasted around 1 M.y. (of a total duration of 2.5 M.y. of the entire Early Emsian in German sense). The barren interval at the Dra is even longer.

Having exposed facts and arguments, we claim, as soon as legal terms allow, that the beginning of the Emsian be readjusted closely to the historical German boundary. We have no objection against definition of a future GSSP in the ZS, but about 120 m above the current *kitabicus* GSSP. Most of the above data plus additional ones are contained in Carls & Valenzuela-Ríos (2000).

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SDS - REPORTS – LEICESTER

DOCUMENT OF THE INTERNATIONAL SUBCOMMISSION ON DEVONIAN STRATIGRAPHY ANNUAL MEETING, LEICESTER, JULY 2006

EMSIAN SUBSTAGES AND THE DALEJE EVENT - A CONSIDERATION OF CONODONT, DACRYOCONARID, AMMONOID AND SEALEVEL DATA

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The International Subcommission on Devonian Stratigraphy has decided in 2003 (SDS Newsletter 19, p. 6) to divide the Emsian into two substages, which will be named as Lower and Upper Emsian. There is general agreement that the substage boundary should lie close to the Zlíchovian/Dalejan boundary of the Bohemian succession (CHLUPAC 1976a, CHLUPAC & LUKES 1999), which is characterized by the supposedly global and transgressive Daleje Event (HOUSE 1985). Faunal groups with potentially defining index species are conodonts (especially polygnathids, around the *inversus/laticostatus* Zone), dacryoconarids (near the entry of *Nowakia cancellata*), or ammonoids (near the entry of *Gyroceratitites gracilis* or at the upper boundary of the globally distributed *Anetoceras* Stufe, CARLS et al. 1972, CHLUPAC 1976b). The chosen level should be correlatable into the classical neritic brachiopod successions, for example of the type Emsian of the Eifel Mountains (see review by JANSEN 2001). According to latest radiometric dating (KAUFMANN et al. 2005), it will lie between 400 to 402 ma.

The search for a precise level for the substage boundary has faced a range of serious difficulties:

1. The globally widespread *Polygnathus inversus* enters well within the Lower Emsian (of common understanding) and overlaps with highest parts of the *Now. barrandei* Zone in the Armorican Massif and elsewhere.
2. *Po. laticostatus* enters also in the upper part of the type Zlíchovian (KLAPPER 1977, KLAPPER et al. 1978) and within the *Now. elegans* Zone, also within the interval of youngest *Anetoceras* faunas (BULTYNCK et al. 1999).
3. There is still some uncertainty whether the lower total range of *Po. laticostatus* is younger than that of oldest *Po. inversus*. In Bohemia, both taxa enter at the same level in the Suchomasty Limestone but in many other regions (see below) *Po. laticostatus* enters later. As suggested by KLAPPER & JOHNSON (1980), and re-emphasized by MAWSON (1995), the term *laticostatus* Zone is used in areas where *Po. laticostatus* is known to occur above first *Po. inversus*. Probably controlled by local facies conditions, *Po. inversus*, however, may enter delayed above *Po. laticostatus* in some regions (e.g., in Uzbekistan, discussion in MAWSON 1995).
4. There is no sharp boundary between the *Now. elegans* and *Now. cancellata* Zones but there are transitional forms (ALBERTI 1971a, WALLISER 1997) and even early morphotypes of *Now. cancellata* well within the range of *Anetoceras* faunas in the La Grange Limestone (BULTYNCK et al. 1999). The taxonomy of *Now. cancellata* is currently complex and not settled. This is also indicated by the Chinese *Now. pseudocancellata* WU & YAN 1980 nom. nud., which was reported together with *Now. barrandei*, other new nowakiids, and *Po. perbonus* from the Lower Emsian of Debao County, Guangxi.
5. There is no sharp distinction between *Gyro. gracilis* and its ancestor, *Gyro. laevis*, with forms identified as *Gyro.* aff. *gracilis* occurring with *Anetoceras* faunas in the La Grange Limestone (BULTYNCK et al. 1999). Transitional forms were also noted by CHLUPAC & TUREK (1983) and both species may occur together.
6. *Gyro. gracilis* enters near the base of the Daleje Shales in the Císarská rokle section of Bohemia (CHLUPAC et al. 1979, CHLUPAC & LUKES 1999) but the species is perhaps too seldom found to allow substage definition. It has been recorded from the base of the Daleje Shale and equivalents in the Rhenish Massif, Harz Mts., Armorican Massif, Spain, southern Morocco, Moravia, Urals, and South China. In Northern Spain, *Gyro. gracilis* is replaced by the related *Gyro. pallantianus*.

7. Detailed new data for Bohemian sections are still missing although revisions are under way since several years. The change from the Zlíchov Limestone or Chýnice Limestone to the Daleje Shale is not a sharp boundary, but a gradual and even slightly diachronous transition (CHLUPAC 1976b, CHLUPAC et al. 1979). This explains why the basal Daleje Shale of some sections (Svagerka, Pekárkàv mlýn, Praha-Klukovice) begins in the *Now. elegans* Zone and still with *Anetoceras* faunas (especially with *Mimosphinctes*), whilst at others (Bubovice, Hostim, Císarská rokle) the *Now. cancellata* and *Gyro. gracilis* Zones are recorded near its base.
8. The taxonomy of Emsian polygnathid conodonts has become complex and controversial (MAWSON 2004) following the phylogenetic rather than biostratigraphic study by BARDASHEV et al. (2002).
9. Based on long tradition, oldest anarcestids, such as *Latanarcestes* and *Paranarcestes* (faunas of Lower Devonian IV-A of BECKER & HOUSE 1994, 2000b) should fall in the Upper Emsian but there are no good records of associated polygnathids. The correlation of their first entry with the *Now. cancellata/Now. richteri* Zone boundary is also still unclear since the oldest anarcestid faunas are lacking in the higher Daleje Shale of Bohemia.
10. The Daleje Transgression is not as easy recognizable globally as one would expect from a eustatically controlled sealevel rise. The transgression appears to have been gradual and is not well marked in North America and in further areas. For this reason, it has not been recognized in the global eustatic curves of HOUSE (1983) and JOHNSON et al (1985). In the latter, it is merely recognized as the last subdivision of Depophase Ib.
11. Authors developed variable ideas about the timespan to be included in a Daleje Event Interval (see discussion in GARCÍA-ALCALDE 1997). Based on the Bohemian succession, it should be restricted to the timespan of the Daleje Shale that is the upper part of the *Now. elegans* Zone (upper part of *laticostatus* Zone) to the base of the *serotinus* Zone (within the upper part of the *Now. richteri* Zone).

As a consequence, P. BULTYNCK has proposed in 2004 (SDS Business Meeting, Rabat) to consider *Po. gilberti* as a potential index species for an Upper Emsian since it enters slightly above *Po. laticostatus*. It was first described from Tajikistan (BARDASHEV 1986) and is also known, partly first identified as *Po. laticostatus*, from the La Grange Limestone of the Armorican Massif, from Nevada, South China, and East-Central Alaska (BULTYNCK 1989, synonymy list in BARDASHEV et al. 2002). The currently known total range is from somewhat above the base of the *laticostatus* Zone (BULTYNCK 1989, BARDASHEV & ZIEGLER 1992) to the *serotinus* Zone (specimen re-identified by BARDASHEV et al. 2002, p. 422, from sample 1-57 of LANE & ORMISTON 1979). Unfortunately, even this polygnathid (included in *Linguipolygnathus* by BARDASHEV et al. 2000) enters in the La Grange Limestone (in Bed 3) well below the upper *Anetoceras* faunas of Bed 5. If the species was taken to define the Upper Emsian, typical Lower Emsian goniatites, such as *Erbenoceras* and *Convoluticeras*, would suddenly have an Upper Emsian range and the boundary would pre-date the significant extinction event at the top of the Zlíchov Limestone and of correlative units. The consequences for correlation into the neritic realm are currently unclear and need to be evaluated by brachiopod specialists. Since no alternative polygnathid is currently available for definition, long known major changes in icriodid evolution (e.g., ZIEGLER 1971b, WEDDIGE & REQUADT 1985) are here also considered.

Typical Lower Emsian conodont assemblages of Europe-North Africa contain various species of *Latericriodus*, such as *Lat. beckmanni, Lat. latus, Lat. bilatericrescens*, and *Lat. armoricanus*, as well as *Caud. celtibericus* and *Caud. sigmoidalis*. Endemic icriodids and species of other genera (e.g., *Streptotaxis*) are known from the Lower Emsian of North America, northern Russia and Australia. A completely different fauna with oldest *Icriodus* s. str., especially with *I. fusiformis, I. corniger ancestralis, I. corniger leptus*, and *I. rectirostratus* is known from the Dra Valley, Spain, and Germany to enter below and with the first *Latanarcestes*. This correlates with a level low in the transgressive Daleje Shale of Bohemia or of the Tafilalt and is known (by direct association) to lie in the Armorican Massif still in the *laticostatus* Zone of the polygnathid succession. It represents a significant radiation phase during sealevel rise. It is currently the only known distinctive conodont level above the last *Anetoceras* fauna and from below the *serotinus* Zone with its already advanced anarcestid assemblages. The *fusiformis/corniger ancestralis* faunas are not restricted to shallow facies but are directly associated with typical pelagic faunal elements, such as goniatites, nowakiids and deeper-water Rugosa (see also comment in BULTYNCK 2003). Therefore, correlation both into deeper pelagic and neritic successions seems possible. Russian specialists (e.g., RZHONSNITSKAYA 1983) have previously correlated brachiopod ranges against an *I. corniger ancestralis*

Zone. The base of an *I. fusiformis* Zone (since *I. fusiformis* is thought to be ancestral to *I. corniger ancestralis* and, therefore, may enter slightly earlier) should be considered for the Emsian substage subdivision. Unfortunately, the endemism of Lower Devonian icriodids (KLAPPER & JOHNSON 1980, BULTYNCK 2003) has to be regarded as a serious obstacle. The position of the initial Daleje Event and associated extinctions and faunal changes, with very different regional signatures, may have to be used to aid international correlation.

What are the **alternatives**?

The base of the *laticostatus* Zone is much too old, well correlated with LD III-E faunas of the *Anetoceras* Stufe and, in addition, it is still somewhat unclear whether *Po. laticostatus* has the same total lower range as *Po. inversus* or not.

The entry of *Po. gilberti* is only just a little bit higher within the highest part of the *Anetoceras* Stufe.

The precise entry of *Now. cancellata* is clouded by unclear taxonomy and evidence is mounting that it enters well within the range of the higher *Anetoceras* Stufe.

Gyro. gracilis is widespread but too rare and not well separated from the earlier or co-occurring *Gyro. laevis*.

Now. richteri enters rather high above the initial Daleje Transgression and is not yet well correlated with the entry of oldest anarcestids and with conodonts.

Po. serotinus enters too late, well within the *Anarcestes* Stufe.

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The *Annulata* and Dasberg Events (Famennian) in the Tafilalt and Maider (eastern Anti Atlas, SE Morocco)

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The Devonian is characterized by a complex sequence of global (pan-tropical) short-termed and sudden events and faunal overturns, which was first recognized by House (1983, 1985) and Walliser (1984, 1985). Between the two well known mass extinctions at the Frasnian/Famennian boundary (Upper Kellwasser Event) and at the top of the Famennian (Hangenberg Event), two insufficiently studied transgressive events, associated with the spread of hypoxic facies and of pelagic faunas, interrupted the overall regressive Middle to Upper Famennian, the global *Annulata* and Dasberg Events (Becker 1992, 1993).
The *Annulata* Event was named after a couplet of black shales in the northern Rhenish Massive with mass occurrences of the ammonoid *Platyclymenia*, including the name-giving species *Pl. annulata* that is the zonal marker of the *annulata* Zone (*Prionoceras* Genozone) at the base of Upper Devonian IV-A. In the conodont scale both black shales fall in the Upper *trachytera* Zone and are often followed by goniatite-rich limestones (*Annulata* Limestone or "Wagnerbank") near the *trachytera/postera* Zone boundary. The *Annulata* Event has been recognized in North America, North Africa, Europe, Asia (Iran, Afghanistan, Kazakhstan, perhaps North China), and in Western Australia (Becker et al. 2004).
The base of the Dasberg Event (Becker 1993) forms the boundary between Upper Devonian IV (Hembergian) and V (Dasbergian) and is also characterized by black shales and by the sudden global extinction of Platyclymeniidae and of goniatite groups, followed by the spread of first Gonioclymeniacea near the boundary between the Lower and Middle *expansa* Zone.
Recent detailed investigations in the Tafilalt and Maider of the eastern Anti Atlas has significantly improved our knowledge of event and regional extinctions patterns. Depending on palaeogeography, lithofacies and faunas vary strongly between basins and parts of pelagic carbonate platforms. Almost none of the ammonoids of Upper Devonian III survived regionally into the *Annulata*-Event beds, suggesting significant extinction and re-population by faunal immigration. In the Maider Basin (Mrakib, Rich Bou Kourazia) a fine, relative thick succession of UD III shales, pre-event limestone, poorly fossiliferous lower and upper black shale, intercalated shales and limestone, and a subsequent three-fold, very fossiliferous *Annulata* Limestone can be recognized. Sections of the Rheris (Bine Jebilet) and Tafilalt Basins (Hassi Nebech) display only a single, marly *Annulata* Event Interval, with dominant *Pl. subnautilina*, followed by fossiliferous *Annulata* Limestones. Whilst the bivalve *Loxopteria* may be common, *Guerichia*, occurring in masses in the German *Annulata* Shales, is almost missing. However, it was frequently found in black limestone event facies of the southern Tafilalt Platform (El Atrous, Takhbtit, Amessoui Syncline). On the very condensed northern Tafilalt Platform (Bou Tchrafine, Ouidane Chebbi), there is no hypoxic interval but a sudden mass occurrence of platyclymenids in reddish and micritic cephalopod limestones.
The Dasberg Event is developed as thick, hypoxic shale with pyritized ammonoids (*Endosiphonites*, *Nanoclymenia*, many *Erfoudites*) in the Maider Basin and as a conspicuous red shale with *Endosiphonites* and *Nanoclymenia* on the eastern Tafilalt Platform (Ouidane Chebbi). In the southern part of the platform (Oum El Jerane), mass flow and crinoidal limestones are overlain by black, condensed, very fossiliferous *Endosiphonites* Limestones (Klug et al. 2000; with last *Prionoceras* and first *Discoclymenia*), grading towards the SE (Jebel Ouaouifilal) into a hypoxic shale unit with very rich pyritic (secondarily haematitic) pelagic fauna with *Endosiphonites* but, again, dominated by the sporadoceratid *Erfoudites*.

A REFERENCE SECTION FOR NERITIC FACIES AT THE TRANSITION LATE TO LATEST FAMENNIAN

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The international Subcommission on Devonian Stratigraphy (SDS) has decided to subdivide the Famennian Stage into four substages, which do not require GSSP definitions, but need reference sections in continental, neritic and pelagic facies. We present here a candidate section for a base of the Latest Famennian in neritic facies.

In addition to several macrofossils (algae, brachiopods, crinoids, corals, stromatoporoids, etc), the faunal and floral microfossils at Chanxhe (eastern Belgium) are represented by miospores, acritarchs, conodonts; foraminifers, and ostracods, which allow accurate correlation with other well known sections from western to eastern Europe. The base of the Latest Famennian (Strunian in neritic facies) has already been proposed at the base of the conodont Upper expansa Zone (Streel 2005, Streel et al. 2005) and is used here (see also Thorez et al. 2006) as a chronological limit at the base of bed 111..

The biostratigraphic context of the Chanxhe section is summarized on fig. 1. The miospore zonation has been reviewed by Maziane et al. (1999) and the biometric zonation based on R. lepidophyta diameter sizes, by Maziane et al. (2002). A quantitative analysis of miospores and acritarchs in 111 shaly samples is given on figs. 2 and 3.

Three major limits QC1, QC2, QC3 (QC for Quantitative Change) subdivide the concentration records (amount of miospores or acritarchs per gram of sediment) from the base to the top of the section. QC1 corresponds exactly to the base of the LL Zone and QC3 to the base of the LE Zone. LL and LE Zones start with rather small amounts of palynomorphs (about or less than one thousand per gram). However the LL Zone starts in a marine influenced environment where acritarchs are almost as abundant as miospores. On the contrary the LE Zone starts in an environment where acritarchs are less and less present.(see also fig. 3).

The QC2 limit underlines the first occurrence of Tumulispora rarituberculatus, a miospore species often used in the literature to subdivide the LL Zone. QC2 also corresponds to a quantitative change in the biometry of Retispora lepidophyta as well as in the ratio R. lepidophyta versus miospores originating from “coal” swamp environment as explained in Maziane et al. (2002). Below QC2 limit, the diameter sizes of R. lepidophyta are obviously linked to some sedimentary sorting and the miospores originating from “coal” swamp, more abundant than above, a probable consequence of a high fresh water level on the continent. These limits might well correspond to some minor gaps (hiatus) in the sediment record.

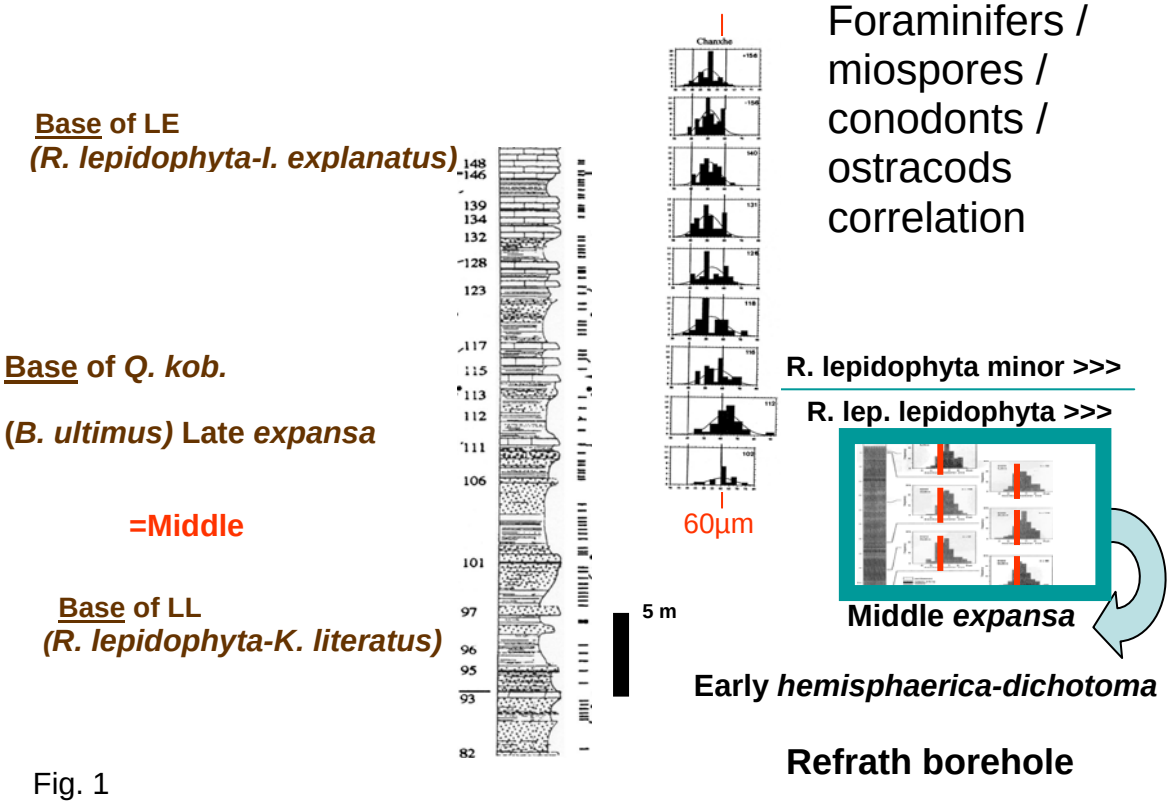

Fig. 1

Fig. 1: Part of the Chanxhe section (below LE Zone occurring between limestones 146 and148 of Conil 1964). *Q. kob. kobeitusana* first occurs in limestone 115, *Bispathodus ultimus* occurs in limestone 111. The base of the LL miospore Zone is in shale on the top of bed 87. Short lines on the right side of the section are very numerous sample locations for palynology. (Maziane 1999). Histograms are diameter distribution of *R. lepidophyta*, ranging from a majority of large specimens of *R. l. lepidophyta* (sample 112 and below) to a majority of small specimens of *R. l. minor (*sample 116 and above). Critical size limit is 60 µm. The Refrath borehole (western Germany, about 100 km east of Chanxhe) has Middle *expansa* conodont Zone and Early *hemisphaerica-dichotoma* ostracode Zone with large specimens of *R. l. lepidophyta* allowing a correlation with the interval 101 to 112 of the Chanxhe section (Streel & Hartkopf-Fröder 2006).

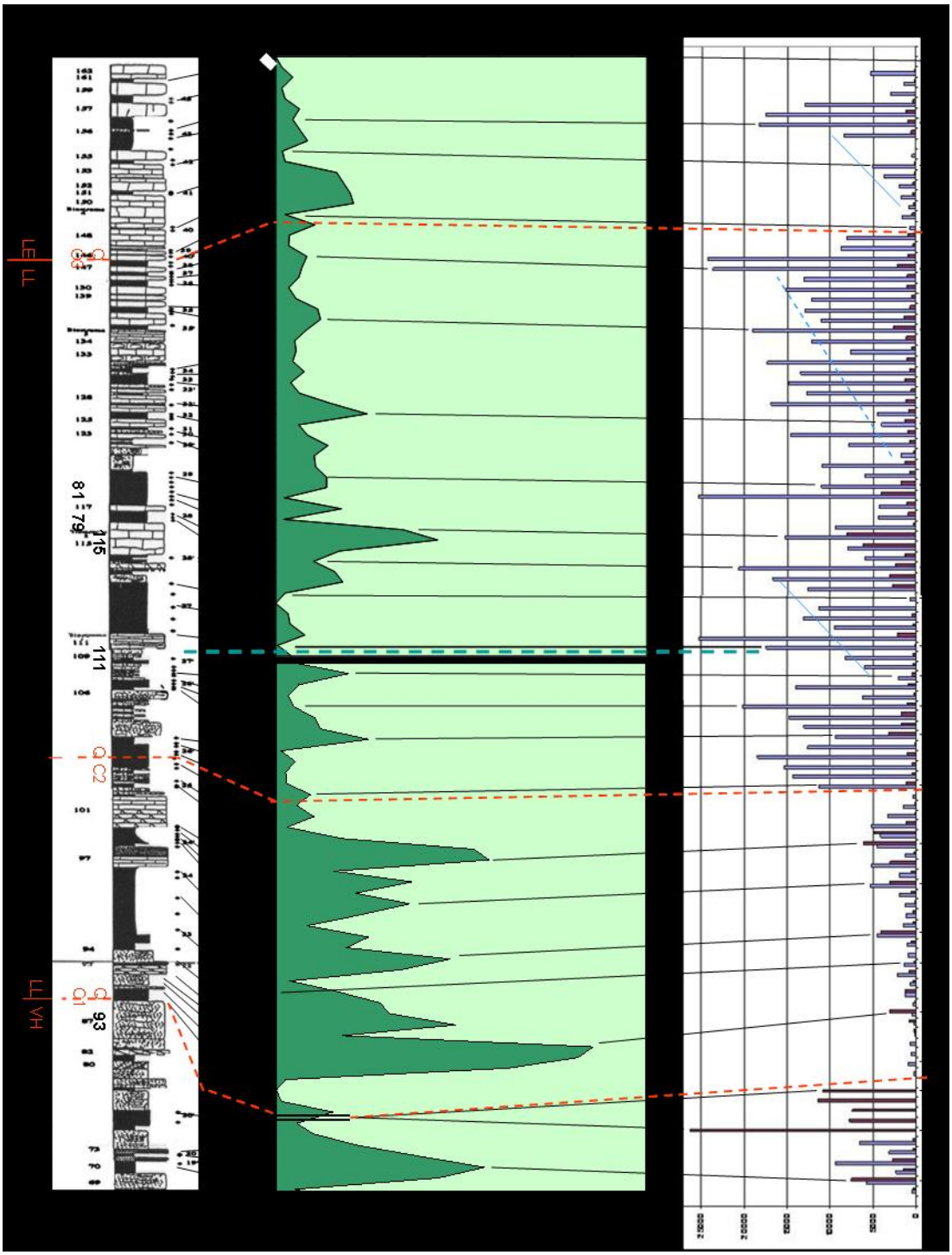

Fig. 2 The lower part (beds 69 to 93) of the Chanxhe section corresponds to the Evieux Formation. The higher part of the sequence (beds 94 to 163) corresponds to the Comblain-au- Pont Formation. At the top of the section a fault prevents to observe the transition to the Tournaisian beds. On the left of the lithological log are Conil (1964) bed numbers. On the right are Maziane (1999) sample numbers for palynomorph studies. Data are distributed in two columns. The left column is a one hundred percents diagram where the dark area represents the percentage of acritarchs / total of acritarchs + miospores and the light area the percentage of miospores / total of acritarchs + miospores. The right column shows histograms of amounts of miospores (light bars) and acritarchs (dark bars) in one gram of sediment. Scale ranges from 0 to 25.000. Cyclic increasing occurrences of miospores in the shaly sediments are suggested in the Strunian part of the sequence. The Strunian base is delineated at the base of bed 111.

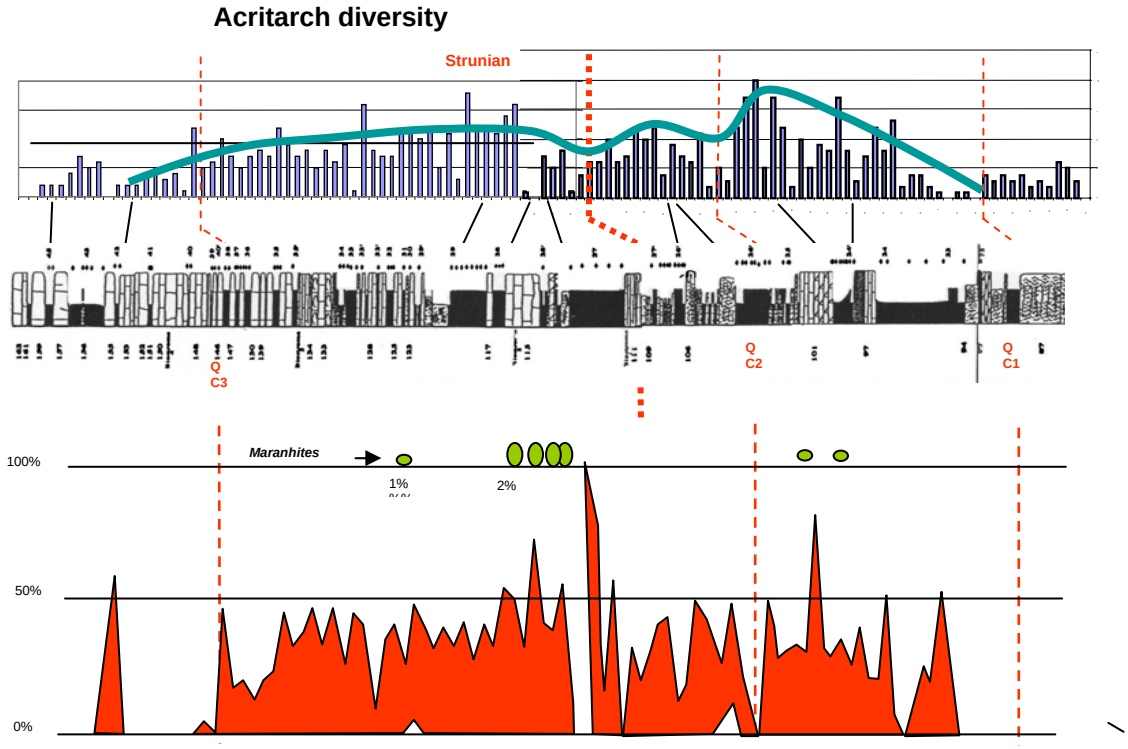

Fig. 3

Fig. 3: Acritarch species number ranges from 0 to 20. The chart below "Acritarch diversity"allows to compare the relative abundance of Prasinophytes specimens (white area) and otheracritarch specimens (dark area). The Prasinophytes show more than 50% to 100% of the total Prasinophytes + other acritarchs. A few percentages of *Maranhites* (1 to 2 %) correspond to the minima of Prasinophytes.

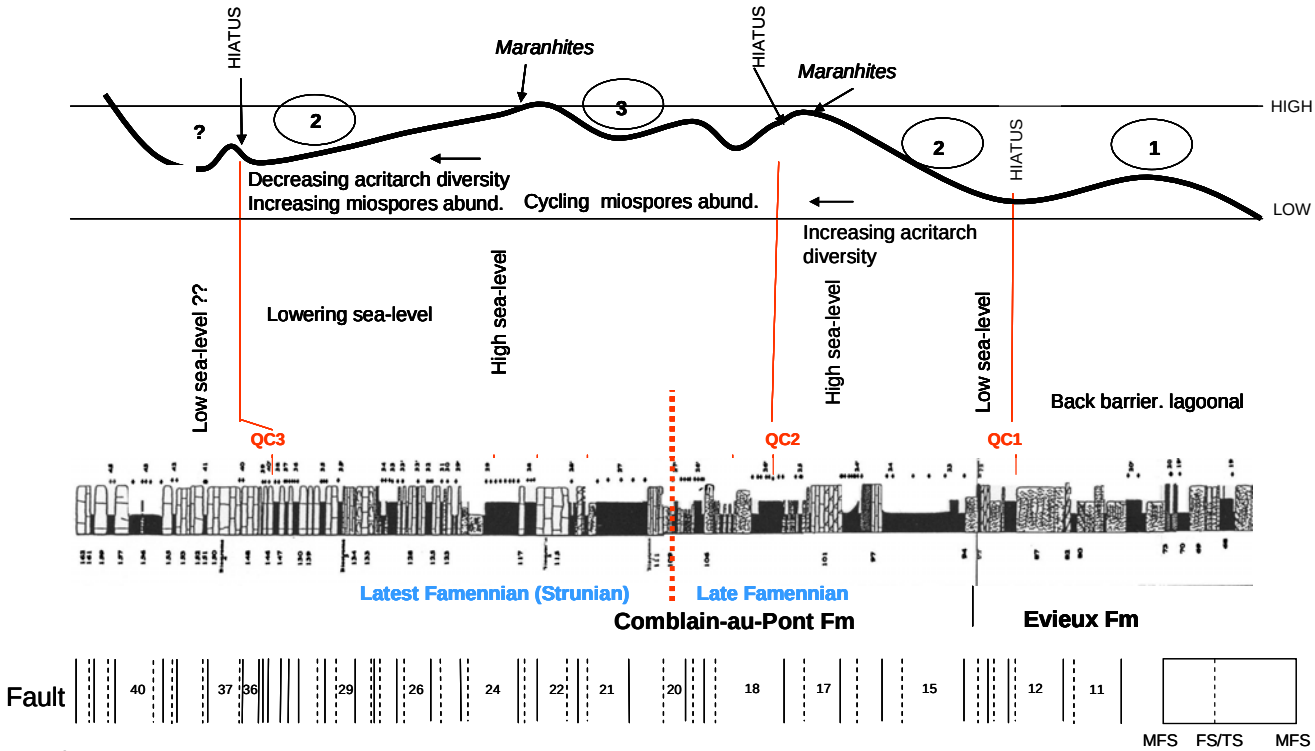

Fig. 4

Fig. 4: suggested bathymetry in the Chanxhe section. Facies 1 corresponds to a low sea-level,facies 2 to the Epinette transgression. Strunian starts in a high sea-level facies (facies 3) andthen returns to a low sea-level (facies 2). Shallow water Ostracod species (Casier et al. 2005)increase in quantity and diversity from bed 123 to bed 152 across the QC3 limit. At the base of the figure are metric to plurimetric sequences: MFS = maximum flooding surface, FS/TS = Flooding or transgressive surface.

0
5
1
1
2
2

The acritarch species number (ranging from 0 to 20 on fig. 3) has a maximum below the QC2limit but slowly decreases in the Strunian part of the section. The Prasinophytes show more than 50% to 100% of the total acritarch assemblage. They mostly belong (Tyson 1995) to small *Leiosphaeridia*, small and large *Gorgonisphaeridium*, *Synsphaeridium, Cymatiosphaera* and *Pterospermella*. *Maranhites* occurs significantly (2 %) above the Strunian base.
Suggesting that the highest sea-level is reached in that part of the section (Streel et al. 2000b). Other acritarchs are *Micrhystridium, Solisphaeridium, Stellinium* and *Verhyachium.* The Prasinophytes are characteristic of both lagoonal and offshore facies (Montenari & Leppig 2003) but with the increasing miospore abundance observed in the higher part (beds 133 to 147) of the section immediately below the QC3 limit the latter environment (Woods 1955 in Tyson 1995) is exclude. Shallowing trend is corroborated by the increase in quantity and diversity from bed 123 to bed 152 of shallow water Ostracod species belonging to the genera *Platycopina* and *Paraparchiticopina* (Casier et al. 2005).

The Prasinophytes have also affinity with cold water and dysoxic-anoxic facies (Tyson 1995, p. 301). This is in line with the general cooling and glaciation on Western Gondwana in the LE and LN miospore Zones (Streel et al. 2000a).

Metric to plurimetric sequences can be defined as the smallest cycles of variations of the depositional conditions, related to minor sea-level cyclic fluctuations developed within shallow water and shallowing upward conditions. Each sequence is limited by two maximum flooding surface (MFS). Flooding or transgressive surface (FS/TS) separates the progradation part (below) from the retrogradation part (above) of the sequence. When considering (Fig. 4) the characteristics of the sequences (11 to 42), one may note that most of them (11 to 27) do show a typical distortion pattern, the “rise period” (Above FS/TS) being generally reduced in importance or thickness. Indeed thickness of sequences are plurimetric up to 27 and metric or less higher. This is partly due to synsedimentary tectonics i.e. contemporaneously listric fault activity that affected in particular the tilted block which include the Chanxhe section (Maziane et al 2002). The tectonic activity is also materialized by the occurrence of three ball-and-pillow levels in the upper part of the Comblain-au-Pont Formation.

Taking into account the sedimentology, the sequential pattern as well as the palynomorph distribution, one can attribute the basal part of the Comblain-au Pont Formation in the Chanxhe section to a general transgressive trend (global TST) which regroups the sequences 11 to 21, up to just above the chronostratigraphic boundary marking the base of the Strunian, The remaining upper part of the formation (22 to 42) better fits with a global highstand (HST) developed as a typical aggradation during the building of the corresponding sequence sets that incorporated cyclically only fine-grained siliciclastics and limestones with several biostromes.

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COMMENT ON PROPOSED UPPERMOST FAMENNIAN "SUBSTAGE"

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Recognition of an Uppermost Famennian "substage" at the base of the Upper *expansa* Zone has no scientific utility and should not be the subject of a vote. This conodont zone is recognized on the basis of the first occurrence of *Bispathodus ultimus*, an easily identified (ZIEGLER & SANDBERG, 1984) but rarely occurring species. This species occurs in a phylogenetic sequence above its ancestor *Bispathodus costatus* at Oberrödinghausen (Hönnetal Railroad Cut), Germany. It ranges as high as the Middle *praesulcata* Zone at the same locality and in the Trolp Quarry, Austria. The species has not been recognized in North America or in Australia. As reported by SANDBERG (*in* CASIER et al., 2004), *Bispathodus ultimus* does occur in Belgium in Banc 146 (CONIL, 1971), 3.6-3.8 m below the top of the Etroeungt Formation at the Anseremme railway bridge section in the Dinant Basin. According to MAMET & PRÉAT (*in* CASIER et al., 2004), the Etroeungt Formation was deposited in an open-marine environment near or within the storm wave base. For comparison with a second faunal list presented herein, this very different fauna from my sample 71-BEL-11 is listed below:

Bispathodus ultimus
Bi. aculeatus aculeatus
Bi. stabilis
Branmehla fissilis
Br. praelonga
Mehlina strigosa
Pelekysgnathus inclinatus
Polygnathus delicatulus
Pol. cf. *Pol. inornatus*
Pseudopolygnathus graulichi
Ps. cf. *Ps. dentilineatus*
Apatognathus varians
Delotaxis sp.

At the Anseremme section, the Etroeungt Formation overlies the shallow-marine Epinette Formation, which in turn overlies the peritidal to nonmarine Condroz Sandstone. Within the Epinette Formation, Banc 28 (CONIL, 1971) contains the lowest occurrence of the calcareous foraminiferan *Quasiendothyra kobeitusana*, which is generally considered to mark the base of the Strunian. This level thus equates to the proposed Uppermost Famennian "substage". However, Banc 28 contains an important conodont fauna, which I collected in 1971 as sample 71-BEL-9 from a limestone lens in shale, 0.4 m above the base of the Epinette. Unlike my sample from Banc 146, I have not previously published a listing of the conodont fauna from this bed but will present it here. Significantly, this shallow-water fauna does not represent the Upper *expansa* Zone, but rather the **Middle *expansa* Zone**. The following faunal list of sample 71-BEL-9 is based on taxonomic revisions to the genera *Bispathodus* and *Pandorinellina* contained in ZIEGLER, SANDBERG, and AUSTIN (1974) and ZIEGLER and SANDBERG (1984):

Bispathodus aculeatus aculeatus
Bi. spinulicostatus
"Icriodus" raymondi
Pandorinellina plumula plumula
Pand. plumula nodosa
Pand. plumula tr. *Clydagnathus*
Polygnathus communis
Pseudopolygnathus controversus tr. *Ps. graulichi*

Apatognathus sp.
Delotaxis sp.

Conodont evidence thus unequivocally demonstrates that the Strunian Stage in Belgium begins at least with the Middle *expansa* Zone. Supporting this older age, the Devonian sea-level curve (JOHNSON, KLAPPER, and SANDBERG, 1985; JOHNSON and SANDBERG, 1989) showed that the Cycle IIf eustatic rise began with the Lower *expansa* Zone and lasted through the Upper *expansa* Zone and succeeding Lower *praesulcata* Zone. The later reference also mentioned that the IIf transgression, well dated in North America, "also resulted in the return to the North American and European cratons of large clisiophyllid and caninoid corals (the so-called Etroeungt fauna)". These Etroeungt corals are widely distributed within the Middle *expansa* Zone in Utah and Nevada (SANDBERG, POOLE, and JOHNSON, 1989).

Because the IIf transgression began with the Lower *expansa* Zone, it is even possible that the proposed Uppermost Famennian "substage" begins with the Lower *expansa* Zone. This is the same level that was proposed for the highest of three subdivisions of the Famennian Stage in two previous SDS submissions (ZIEGLER and SANDBERG, 1997; SANDBERG and ZIEGLER, 1998). Supporting this older position is the abrupt, widespread appearance of large to huge *Gastrodetoechia* and *Paurorhyncha* rhynchonellid brachiopods throughout the Western United States. At one locality in Utah the ammonoid *Cyrtoclymenia* has been reported from this zone (PETERSEN and STOKES, 1983). It should be noted that conodont sample 71-BEL-9 occurs 40 cm above the base of the Epinette Formation and I am unaware of any report of a lower collection from the very base. Even if the base of the Epinette is only as old as the Middle *expansa* Zone, it is possible that the IIf transgression took some time to reach the cratonic interior, where the Condroz Sandstone was being deposited. Thus, very little time difference exists between the proposed Upper Famennian "substage" at the base of the Lower *expansa* Zone and the Uppermost Famennian "substage" at the base of the Middle *expansa* Zone. They probably represent the same eustatic event.

In conclusion, my only two conodont samples that can be positively assigned zonally are sample 71-BEL-9, representing the Middle *expansa* Zone, from 40 cm above the base of the Epinette Formation and sample 71-BEL-11, representing the Upper *expansa* Zone, from 3.8 m below the top of the Etroeungt Formation. Two other samples collected from the ~40 m interval separating them yielded only sparse, zonally unassignable faunas.

This discussion provides further support for the argument that conodont zones rather than informal "substages" should be used for subdivisions of the Devonian Stages, which are the lowest formal subdivisions recognized by the IUGS Commission on Stratigraphy.

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THE DEVONIAN/CARBONIFEROUS BOUNDARY STRATOTYPE SECTION (LA SERRE E´, MONTAGNE NOIRE) REVISITED

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The La Serre section trench E´ south of Cabrières (Montagne Noire) has been selected as the Devonian/Carboniferous Global Boundary Stratotype Section and Point (GSSP). However, this section cannot be regarded as an ideal GSSP. The boundary was fixed between Beds 88/89 within an oolitic sequence, thus conodonts and other fossil groups are reworked. Also, the stratotype lacks ammonoids and palynomorphs just at the boundary, and the high variability of siphonodellids and transitional morphotypes makes precise determinations difficult. However, this section is the only one that was thought to show the evolutionary lineage of *Siphonodella praesulcata* to *Siphonodella sulcata* when the boundary was decided.
The succession was re-sampled in detail. Based on the new conodont records presented herein, a new D/C boundary position and a revised zonation is proposed. The bases of the Upper *praesulcata*, the *sulcata* and *duplicata* Zones were fixed at older stratigrapical levels than previously proposed (Flajs & Feist 1988). The base of the *sulcata* Zone corresponds to the base of Bed 85 due to the first occurrence of *S. sulcata*. Therefore, the D/C boundary is placed between Beds 84 and 85, which is the basal part of a regressive interval (basal Upper Calcoolite Unit).
Conodont specimens from Bed 85 were previously determined and tentatively assigned to *S. sulcata* (Ziegler & Sandberg 1996), which is in accordance with our new results. However, if the first occurrence of *S. sulcata* is in Bed 85, then "…the whole sequence containing the supposed *S. praesulcata-S. sulcata* lineage is an artefact created by reworked sediments derived from different source areas…" (Ziegler & Sandberg 1996, p. 178-179). Thus, the revised position of the D/C boundary at La Serre E´ presented herein requires a re-positioning of the GSSP level in the stratotype section, or the search for a new D/C boundary stratotype.

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NEW REPORTS

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The *subterminus* conodont Fauna (Bunker and Klapper 1984)

Introduction

A direct positioning of the late Givetian-earliest Frasnian *hermanni, disparilis* and lower *falsiovalis* conodont zones, established in pelagic successions, in shallower-water marine successions is almost impossible.*Skeletognathus norrisi,* an ubiquitous species, can be helpful for recognizing the lowest part of the *falsiovalis* Zone in shallower-marine environments. However, for shallower-marine environments there is mostly a need for an alternative conodont zonation for the late Givetian-earliest Frasnian.
In North America the *Pandorinellina insita* Fauna is considered as a shallow-water equivalent for the lowest part of the *falsiovalis* Zone and the *Icriodus subterminus* Fauna as a shallow-water equivalent of the *disparilis* Zone and may be also of the *hermanni* Zone (Rogers 1998).
Until now the *subterminus* Fauna has been only well documented from the central and western North American Interior Bassins. Our purpose is to document the *subterminus* Fauna outside North America and to define more precisely its lower boundary and subdivisions in relation to the pelagic zonation. Moreover *Icriodus subterminus* as used at present is a long ranging species: *hermanni*? and *disparilis* to Lower *rhenana* Zones. Therefore a revision of *Icriodus subterminus* and other accompanying conodont taxa may improve the stratigraphic use of the *subterminus* Fauna.
During 2006 we recognized *Icriodus subterminus* and closely related forms in published and new collections from Europe and southern Morroco, more precisely in the Boulonnais area (NE France), Ardenne area (Belgium and NE France), the Radom-Lublin area (SE Poland, the Holy Cross Mountains (S Poland) and the N Tafilalt and Mader in Morocco. Our study is also based on *Icriodus subterminus* Fauna comparison material from Iowa, Manitoba and NE Alberta by courtesy of G. Klapper and T.T. Uyeno.

Main results

1- Within *Icriodus subterminus* we recognized four morphotypes. Two short, stout morphotypes may have a more restricted stratigraphic range. In one of these two morphotypes the denticles of the posterior extension of the middle row increase abruptly in height and in the other one the height increases progressively. Two more elongated morphotypes may not appear at the same level and range higher in the Frasnian. The two more elongated morphotypes can also be separated in the same way as the two short, stout morphotypes.
2- In the *subterminus* material from Canada Uyeno (1981, 1982, 1983) recognized an *Icriodus* cf. *Icriodus subterminus* including specimens that can be assigned to *Icriodus lilliputensis* (described from the Ardenne area) and to *Icriodus excavatus* (described from Europe and Iran). The other specimens are assigned here to *Icriodus* aff.*Icriodus subterminus.For* the moment it is not clear whether or not *Icriodus* aff.*Icriodus subterminus* has the same range as the different *Icriodus subterminus* morphotypes.
3- Co-occurring *Icriodus* taxa including *I.brevis,I.excavatus, I. lilliputensis, I. difficilis,I. expansus, I.* n.sp.A used in a more precise way and considering their first and last occurrence may be helpful to precise subdivisions of the *subterminus* Fauna.
4- The origin of *Icriodus subterminus* is not yet clear. At present we consider *Icriodus lilliputensis* as closely related to the short, stout morhotypes of *Icriodus subterminus*, based on the succession with overlapping of the two taxa in an Ardenne section (Ny). Relations with *Icriodus excavatus* may be possible.
5- In Europe *Icriodus subterminus* appears at some localities below the *insita* Fauna but also within the *insita* Fauna.In the Morrocan Tafilalt *Icriodus subterminus* first occurs together with *Skeletognathus norrisi* in an hemipelagic facies. In the Mader *Icriodus* aff. *I. subterminus* occurs together with *Schmidtognathus wittekindti.In* the Radom-Lublin area *Icriodus* aff.*I. subterminus* occurs together with *Polygnathus timorensis* indicating that it is not younger than the *hermanni* Zone.
6- Migration of *Icriodus subterminus* between N America, Europe and N Afrika and also biofacies changes have to be considered in interpreting the local stratigraphic base of the *subterminus* Fauna. But this topic has to be further investigated.

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[Abstract of the 2nd International Palaeontological Congress, June 17-21, 2006, Beijing, China, p. 352]

Myths and facts concerning the Frasnian/Famennian boundary mass extinction

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Mass extinctions, Upper Kellwasser Event, Upper Devonian, sea level changes

One of the six biggest global mass extinctions occurred around the Frasnian/Famennian boundary and finally wiped out complete marine ecosystems, such as the widespread stromatoporoid-coral reefs and specific brachiopod-trilobite assemblages of the (sub)tropical shallow seas, or the tentaculitoid-dominated pelagic biota, with massive losses in ammonoids, conodonts, and deeper-water trilobites. Based on the black Upper Kellwasser Limestone (UKW) of Germany, which has hypoxic correlatives from the Canadian Rocky Mountains to western, central and eastern North America, North Africa, all European basin, to the Urals, Caucasus, Siberia and South China, the polyphase mass extinction episode is also known as the Upper Kellwasser Event.

In recent time a wealth of palaeontological, stratigraphical, sedimentological, geochemical and geophysical data has been published but these still leave more questions than answers (Racki 2005). There are widely different hypotheses concerning event causation and patterns. In this context it is disturbing that there is a range of allegations and hypothesis that are repeatedly quoted and discussed at length although not based on any relevant data or even contradicted by the known facts. The scientific recycling of such “myths” prevents progress in our understanding of one of the most severe crises in the evolution of earth biosphere.

Myth 1: The mass extinction mostly affected the (sub)tropical biota whilst the cold water marine faunas survived.
Fact: There are no described and unambiguous macrofauna assemblages from the fully marine Upper Devonian of subpolar South America/Africa and the last cold water Malvinokaffric faunas disappeared already in the Middle Devonian, caused by increasing regional warming.

Myth 2: The extinction event can be related to a glaciation episode.
Fact: Globally, especially in South America, there is no evidence for any ice sheets or glacial sedimentation prior to the latest Famennian (correlating with the regressive pulse of the Hangenberg Event). Isotopic data suggest very high global temperatures (hothouse climates) from the Upper Givetian to Upper Famennian, with a short-termed cooling during the sudden regressive phase ABOVE the black UKW beds and right at the F/F boundary.

Myth 3: The eutrophication causing the spread of UKW black shale/limestone was caused by tectonism, resulting in uplift, increased weathering and strong discharge of nutrients into the seas (Averbuch et al. Model).
Fact: A review of all global Upper Devonian fold belts gives no evidence of links between peaks of Eovariscan tectonism and the UKW beds; UKW facies developed strongest far away from areas of terrestrial clastic input and also in basins outside any known orogenic influence.

Myth 4: The mass extinction was triggered by the strong Upper Devonian increase in terrestrial vegetation, leading to enhanced weathering (Algeo et al. Model).
Fact: Major evolutionary innovations in land plants pre- and post-date the F/F boundary and were gradual. There are no known short-lived palynological events associated with the UKW beds that suggest any sudden change or flourishing of land vegetation. The rarity of Devonain coal and isotopic data suggest that land plant biomass did not become significant before the Carboniferous. The F/F boundary is difficult to find in terrestrial facies.

Myth 5: There is contradicting evidence concerning F/F boundary sea level changes.
Fact: All investigated sections are in accord with a minor pre-event regression, sudden eustatic rise of the main UKW phase, turn to a major regression and reworking event (with unconformities) at the F/F boundary, and a subsequent early Famennian transgression.

Comment by CM Maurice Streel
on the document submitted to
the IUGS Subcommission on Devonian Stratigraphy Meeting in Leicester, UK., 18 July 2006 and entitled
Comment on Proposed Uppermost Famennian "substages"
by TM Charles A. Sandberg
(Underlined texts below are extracted from Sandberg document)

1. "The Upper *expansa* Zone has no scientific utility....It is recognized on the basis of the first occurrence of *Bispathodus ultimus*, an easily identified (Ziegler & Sandberg, 1984) but rarely occurring species"

The Upper *expansa* Zone was identified in several regions in western and eastern Europe (Streel 2002, Streel et al. 2003, 2005) where it happens that it can be recognized by several taxa. This is also true in North America with *Pseudopolygnathus marburgensis trigonicus* and other species (Sandberg 1979, p. 97), even if *B. ultimus* is not yet known there.

2. "As reported by Sandberg (*in* Casier *et al.*, 2004), *Bispathodus ultimus* does occur in Belgium in Banc 146 (Conil, 1971), 3.6-3.8 m below the top of the Etroeungt Formation at the Anseremme railway bridge section in the Dinant Basin."

B. ultimus first occurs much below the top of the Etroeungt Fm in Anseremme parallel sections (Dreesen & Thorez, 1994) i.e. near the base of that Formation (sensu Mamet in Casier *et al.* 2004). The correlation between the "classic" section of the Anseremme railway bridge and the parallel sections was demonstrated by Streel *et al.* (2005), at the SDS Florence meeting in 2004. It is reproduced below as Fig. 1. The relation between *B.ultimus* and *Quasiendothyra kobeitusana kobeitusana* bases is also demonstrated in the Chanxhe section (Streel & Hartkopf-Fröder, 2005 and Streel et al. 2006b)

3. "Within the Epinette Formation, Banc 28 (Conil, 1971) contains the lowest occurrence of the calcareous foraminiferan *Quasiendothyra kobeitusana*, which is generally considered to mark the base of the Strunian."

Quasiendothyra kobeitusana in Conil 1971 occurs below (before) *Quasiendothyra kobeitusana kobeitusana sensu* Mamet. *Q. k. k. sensu* Mamet (see also Mamet & Préat, 2003) first occurs near the base of the Etroeungt Fm at the top of the Epinette Fm as demonstrated by a special comparative research in the Avesnelles Trench (Working Group on the DC Boundary, session on 17/05/79 in Washington DC, report).

4. "Conodont evidence thus unequivocally demonstrates that the Strunian Stage in Belgium begins at least with the Middle *expansa* Zone."

The Strunian begins with the Etroeungt Limestone, approximately with the Upper *expansa* Zone (i.e. within the LL *Retispora Zone*, at the quantitative change from *R. lepidophyta lepidophyta* to *R. lepidophyta minor)*, not with the "Middle *expansa*" Epinette transgression (which corresponds to the base of the *Retispora* zones).

5." ...the Cycle IIf eustatic rise began with the Lower *expansa* Zone and lasted..."

The Cycle IIf , at the base of the Lower *expansa* Zone, although poorly demonstrated in Belgium, should start much below, with the Beverire Event, i.e., of course, below the Fontin Event (see #7.), dated Middle *expansa* Zone (Streel et al., 2003, fig. 2)

6. " ...the IIf transgression...also resulted in the return to the North American and European cratons of large clisiophyllid and caninoid corals (the so-called Etroeungt fauna)"

The so-called Etroeungt fauna is not a defined biostratigraphic unit. It just means a transitional fauna between Devonian and Carboniferous faunas, the sort of rough estimate which have contributed to discredit the Strunian concept (Thorez, Dreesen & Streel 2006, Streel, Brice & Mistiaen 2006a**).**

7. "It should be noted that conodont sample 71-BEL-9 occurs 40 cm above the base of the Epinette Formation and I am anaware of any report of a lower collection from the very base."

The Fontin Event (See Streel 1999, p. 203), which is below the Epinette transgression, has been dated as Middle *expansa* (Dreesen *et al.*, 1993) in eastern Belgium.

8. "Thus, very little time difference exists between the proposed Upper Famennian "substage" at the base of the Lower *expansa* Zone and the Uppermost Famennian "substage" at the base of the Middle *expansa* Zone. They probably represent the same eustatic event"

This is wrong being based on incomplete analysis of the literature.

The chart below explains the Upper and Uppermost Famennian succession of conodont and miospore data and events within the *expansa* and *praesulcata* zones timespan (after Streel & Marshall 2006, tab. 1 and 2)

Sandberg *et al.* 2002	**Events in USA (Sandberg *et al.* 1989)**	**Conodont zones**	**Events in Western Europe**	**Miospore zones**
Event 18		Mid. *praesulcata*	Hangenberg Sst.	LN
	7th transgression	Mid. *praesulcata*	HBS transgression	LN base
Event 17?		Low./Mid. *praesulcata*	Drewer Sst.	LE
		Low. *praesulcata*	Etroeungt Lmst	LL-LE
		Upp. *expansa*	Etroeungt Lmst	LL-LE
	6th transgression	Mid *expansa*	Epinette transgression	LL base
	5th transgression	Mid *expansa*	Fontin (=?Dasberg) transgression	VCo-VH
Event 16	Eustatic rise IIf	Low *expansa*	?Beverire transgression	VCo

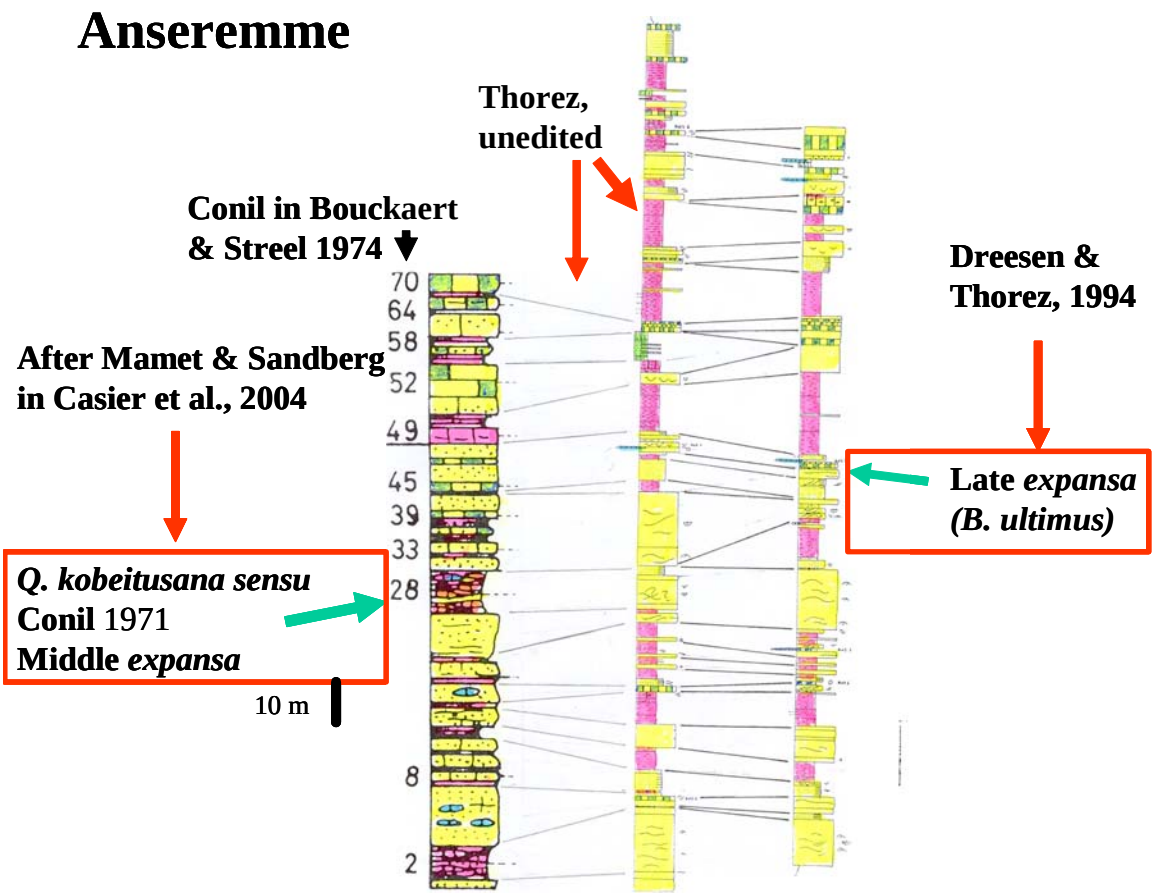

Fig. 1: presented at the IGC Florence in 2004.

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TM Sandberg has announced that he needs time to restudy Belgian conodonts before he can answer this new document. Details are to be expected at the Nevada Meeting.

Abstract presented during an international meeting "New insights into Palaeobotany" Liège, December 13-16, 2006, as a contribution to Muriel Fairon-Demaret retirement. The content largely relies on the two lectures given during the last Geological Society of America meeting at Philadelphia (USA), see Streel & Isaacson (2006) and Streel & Traverse (2006).

West Gondwanan and Euramerican climate impact on early Famennian to latest Viséan miospore assemblages

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Accurate Upper Devonian biostratigraphy is based on conodonts, marine microfossils. Dating non-marine or marine deposits which do not contain conodonts, often depends on miospores, which are produced in huge quantities by terrestrial plants and are abundantly dispersed in contemporaneous marine sediments. Most of the correlation between conodont and miospore stratigraphies has been established in Western Europe, notably in the Ardennes-Rhine area. Because the same Frasnian and Famennian miospore zones (the *Cymbosporites* Realm in Streel & Marshall 2006) occur in both Southern Euramerica and Western Gondwana (implying close proximity of these continents) they allow transfer of Southern Euramerica conodont stratigraphy to Western Gondwana. When reconciling the Famennian conodont and miospore zones with the new, now widely accepted chronostratigraphy (Kaufmann 2006) and using the substage nomenclature proposed by Streel *et al.* 2000 and Streel 2005 (**Fig. 1**), three steps are recorded which might be climatically controlled (**1** to **3**). Climatic and / or tectonic control is also obvious during the Mississippian (**4**).

1) In Southern Euramerica, the Lower-Middle Famennian vegetation crisis (at least 5 Myr) corresponds to very poorly diversified miospore zones (Raymond & Metz 1995, Streel *et al*. 2000). This crisis seems to extend stratigraphically to the Upper Famennian in cold temperate to subpolar Western Gondwana and may be therefore climatically control.

2) The Upper Famennian miospore zones are based on a succession of species of *Grandispora* occurring in the same stratigraphic order in western and eastern Europe (Higgs *et al.* 2000). The bases of the Upper Famennian VCo and VH miospore Zones in USA (Richardson & Ahmed 1988) are poorly controlled by marine fossils which often occur as single specimens at long distance from rich miospore assemblages (Streel & Loboziak 1994). Correlation is then based on lithostratigraphy despite their diachronous character. Maybe, however, a belated arrival of VCo and VH characteristic miospores in the Upper Famennian of Belgium could have been controlled by the arid climate (Streel & Marshall 2006) if rain-bearing winds were deflected into Gondwana as proposed in the Tournaisian by Wright (1990). This alternative is called here the Upper Famennian correlation challenge (at least 5 Myr). Tectonic control of regional climates may be inferred in mapping the unconformities around the Old Red Continent.
During the Upper and Uppermost Famennian characteristic conodont taxa (Kaiser 2005) show shorter stratigraphic ranges and are more numerous than characteristic miospores. Both microfossils mark an obvious turnover near the Upper / Uppermost Famennian limit.

3) Glacial and interglacial cycles, during a period called here the quick changing climate Uppermost Famennian (less than 3 Myr), are quite evident after the sharp climate change occurring during the late Upper Famennian within the Middle *expansa* Zone and introducing a new, almost cosmopolitan vegetation belt characterized by the miospore *Retispora lepidophyta*. But the best documented part is obviously the Uppermost Famennian age, when glacial deposits containing the LE-LN Zones reached the sea-level in Western Gondwana. Based on miospore (and locally on acritarch) quantitative data, cycles are very obvious in arid equatorial (Greenland) as well as in tropical (Ardennes-Rhine) regions (Streel & Marshall 2006). They allow also very detailed correlation of the Hangenberg Crisis (Streel 1999, Kaiser *et al.* 2006), in the Middle to Upper *praesulcata* Zone, with new geochemical data from tropical (Western Europe) and subtropical (Southern France and Morocco) regions and detailed correlation with warm temperate subtropical Pocono Fm (Pennsylvania) and the glacial events in Western Gondwana (South America).

4) Late Middle to early Late Tournaisian rare glacial evidences in Western Gondwana might correspond to mountain glacier at proximity of the Eohercynian uplift of the Andean Range.
Upper Viséan (Holkerian-Asbian or late Meramecian) rocks in Western Gondwana have also some glacial evidences but might sometimes display a very Warm-Temperate Floral Belt (Alleman & Pfefferkorn 1988). This apparent paradox is explained by alternation of mean temperatures during 4 My as demonstrated by isotopic data in Southern Euramerica (Bruckschen & Veizer 1997) allowing alternation of glacial versus very warm climates in Western Gondwana.

In Western Gondwana **(Fig. 2),** cold and dry climates with rather poor vegetation (Holocene Barren Grounds climate type) seem to alternate with less cold but wetter climates with glacier extensions and richer vegetation.

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Legend of Fig. 1
Correlation of conodont and miospore stratigraphies
Relation between chronostratigraphy and conodont stratigraphy reproduced from Kaufmann 2006 (* in Conodont Zonation column for *trachytera* Zone)
Miospore correlation between eastern USA and western Europe mainly based on Richardson & Ahmed 1988. Miospore / conodont correlation in eastern USA based on Richardson & Ahmed 1988 and Streel & Loboziak 1994. Lithologic correlation after Kirchgasser 2000.
The type Belgian lithostratigraphic data (Thorez *et al*. 2006) suggest that, in Kaufmann 2006, the Uppermost *marginifera* conodont Zone (Um) duration is probably too long and the Middle *expansa* conodont Zone (unlabelled), probably too short, the last-one displaying 3 miospore Zones (VCo, VH, LL).

Legend of Fig. 2
Ages of miospore zones recorded in Western Gondwana
After Melo & Loboziak (2003).

ABBILDUNG 2

INTERNATIONAL SUBCOMMISSION ON DEVONIAN STRATIGRAPHY (SDS)

SDS ACTIVITIES 2000 - 2005
REPORT FOR THE IUGS REVIEW COMMITTEE OF ICS
(November 2005)

R. Thomas Becker, WWU Münster, Germany
SDS Chairman

1. SDS Membership

SDS has been one of the most active Subcommissions of ICS since it formed in 1973, which is mostly based on a highly successful integration of all leading specialists of Devonian stratigraphy, regardless of their specialisation or their origin. SDS currently comprises three **officers** (chairman, vice-chairman, secretary/second vice chairman), 18 **Titular Members**, and ca. 80 **Corresponding Members**, covering all continents and all stratigraphic methods. In addition, there are national Subcommissions on Devonian Stratigraphy, e.g., in Germany and Russia, and unofficial regional groups, such as the North American "Friends of the Devonian", that communicate SDS activities and decisions to further Devonian stratigraphers. SDS is the only permanent international organisation that promotes progress in the development of precise global Devonian time scales and that acts as a forum for all Devonian stratigraphers and for those whose interests lie in the application of precise stratigraphy to diverse geoscientific fields, from palaeontology and Palaeozoic global changes (events) to sedimentology, petroleum geology, geochemistry, geochronology, plate tectonics, and synsedimentary tectonics. The latter aspect is strongly underlined by past and current successful co-operations between SDS and various IGCP Projects (e.g., IGCPs 216, 293, 421, and, currently, 499).

The current **voting membership** consist of:

Chairman R. T. Becker (Germany; ammonoids, conodonts)
Vice-Chairman A. El Hassani (Morocco, general, event and magnetostratigraphy)
Secretary J. E. Marshall (Great Britain, palynology)
TM A. Blieck (microvertebrates)
TM C. E. Brett (USA, sequence and event stratigraphy)
TM Chen Xiuqin (China, Nanjing, brachiopods)
TM R. Crick (USA, nautiloids, magnetostratigraphy)
TM J. Hladil (Czechia, stromatoporoids, tabulate corals, general stratigraphy)
TM Ma Xueping (China, Beijing, brachiopods)
TM R. Mawson (Australia, conodonts)
TM J. Over (USA, conodonts)
TM M. C. Perri (Italy, conodonts)
TM G. Racki (Poland, brachiopods, event and chemostratigraphy)
TM E. Schindler (Germany, tentaculites, event stratigraphy)
TM V. Tsyganko (Russia, western part, corals)
TM T. Uyeno (Canada, conodonts)
TM J. I. Valenzuela Rios (Spain, conodonts)
TM K. Weddige (Germany, conodonts)
TM G. Young (Australia, vertebrates, general stratigraphy)
TM Zhu Min (China, Beijing, vertebrates)

A nomination for a future representative for the eastern part of Russia (Sibiria) has been made. None of our Corresponding Members from South America has so far agreed to become TM since all lack support or funding by their home institutes. Devonian sediments are rather restricted in the main part of Africa; therefore there are only few Devonian stratigraphers from this continent (South Africa is represented by a CM). Some of the TMs also act as elected leaders of special working groups.

2. SDS tasks 2000-2005 and beyond

SDS was the first Subcommission to complete in 1998 the formal definition of chronostratigraphic subdivisions (three series and seven stages) by approved GSSPs (see publication list). The Devonian-Carboniferous boundary was formally defined by an International Working Group and approved by ICS in 1991 (Paproth et al., 1991). Already in parallel with the search for chronostratigraphic definition, SDS had begun to follow a wide range of other tasks of equal importance for the wider community of geoscientists.

2.1. Definition of formal substages

From several reasons it became necessary that some of the defined stages, the Emsian, Givetian, Frasnian, and Famennian, need to be formally subdivided into internationally accepted substages:

- Some of the stages had a much longer duration than others (e.g., the Emsian, Frasnian, and Famennian) and, especially, than stages in other systems.
- Stage subdivisions are frequently in use in many publications on different topics, but without any common meaning and without allowing a meaningful correlation or integration of data.
- Several major biotic crises or global sedimentary perturbations (e.g., black shale events), which provide natural subdivisions, occurred within stages (e.g, within the Emsian, Givetian, Frasnian, and Famennian) and are widely lumped by non-specialists and in crude statistical analysis of data resolved only at the stage level (e.g., in misleading biodiversity studies).
- There are classical and widely known subdivisions of stages in key regions (e.g., Emsian of Czechia, Givetian of Belgium and Germany, Frasnian of Belgium and North America, Famennian of Belgium and Germany).
- Biostratigraphy and other stratigraphic methods easily allow subdivisions that can be recognized globally – hence SDS feels committed to supply a most precise global time scale.

As agreed with ICS, substages will be formally defined by an index fossil but not by a GSSP. Instead, regional reference sections that allow global correlation will be designated and compiled. No old terms will be revived and no new chronostratigraphic names will be introduced. Instead, depending on the number of substages, the terms Lower, Middle and Upper, and Uppermost will be employed.

Emsian

Following its classical subdivision in Germany or in Czechia, two substages will be recognized. The search for the most suitable index fossil has not yet been completed but the future level has been decided to enter close to the global and transgressive Daleje Event, which was named after the classical Czech Dalejan stage.

Givetian

Re-definition of the Middle/Upper Devonian series boundary in 1987 resulted in the fact that significant parts of the classical German Upper Devonian fell into the Givetian, with the 2nd order global biotic crises named as Taghanic Event lying in the upper third of the current Givetian. Consequently, the stage will be divided into three substages whose formal definition has been widely agreed and formal voting is currently under way.

Frasnian

Subdivision into three substages has been unanimously accepted and formal voting on index fossils is currently under way. The substage boundaries coincide with major eustatic changes that allow non-biostratigraphic recognition.

Famennian

In 2003, a majority of voting members favoured a subdivision of this longest of all Devonian stages (ca. 15 ma duration) into four substages. This allows recognition of a future Uppermost Famennian as a rough equivalent of the classical Belgian Strunian stage, which had, in contrast to Belgian geological tradition, been subsumed in the Famennian. Voting on the Uppermost Famennian is under way but the two other substage levels are still under discussion. It has been proposed to place substage boundary levels close to or at major eustatic events.

2.2. Global recognition of chronostratigraphic units

All Devonian GSSPs were defined in subtropical/tropical pelagic outer shelf facies, which allowed easy global correlation based on kosmopolitan faunas and significant short-termed eustatic pulses. Correlation of GSSP levels into huge near-shore, neritic, terrestrial and boreal Devonian areas has been accomplished in a few cases but is still at an early stage elsewhere. Neritic-pelagic and marine-non-marine correlations have been topics of all recent SDS Business Meetings and of many excursions (see SDS Newsletters). Since 2004, the close partnership between SDS and IGCP 499 on "Devonian land-sea interaction: evolution of ecosystems and climate" emphasizes this approach. The approval of GSSPs is only the first step towards a standardized stratigraphy – exploring, increasing and documenting the correlative potential of GSSP (regional GSSP application) is of equal importance.

A huge amount of geological/stratigraphical literature employs old and regional chronostratigraphic nomenclatures that are not understandable and usable any more if no correlation between the new and global stratigraphic system and traditional, regional subdivisions is achieved. During its regional meetings and based on work by national Subcommissions, this task has been tackled in specific regions (e.g, Belgium, Germany, North America, Russia) and is continuing.

2.3. Modern, non-biostratigraphic methods

Stratigraphy is increasingly using new non-biostratigraphic methods of correlation, with important application in basin analysis and exploration. These include sequence stratigraphy, magnetostratigraphy (especially the use of magnetic susceptibility in mostly re-magnetized basins and fold belts), chemostratigraphy, stable isotope stratigraphy, cyclostratigraphy, and quantitative stratigraphy (especially graphic correlation techniques). SDS has devoted in the past special symposia, parts of their excursions and of Business Meetings (see list of Meetings and SDS Newsletters) to progress in these fields and will continue to do so.

2.4. Integration of Chronostratigraphy and Geochronology

In the past there has been a significant lack of bio- and chronostratigraphically strictly constrained absolute ages for the Devonian. SDS has coordinated and stimulated the geochronological investigation of well-dated volcanic rocks that has lead to a much approved absolute time scale in recent years. Work by the groups around R. D. Tucker (USA), and especially by B. Kaufmann and E. Trapp (conducted in Münster, Germany), has to be emphasized.

2.5. Communication of Devonian stratigraphic progress

Advances in stratigraphy are of little significance if they are not widely communicated to the global scientific community. Results are not only reported regularly to ICS, but also in the annual SDS Newsletter (edited by TM Rex Crick, freely available on the internet), in a range of SDS publications, including complete GSSP reviews (see appendix), and via the SDS homepage at Arlington University/Texas (http://sds.edu.edu/).

2.6. Devonian global environmental change

The Devonian was a time of repeated global biotic crisis of different magnitudes, including two 1st mass extinctions at the Frasnian-Famennian boundary (Upper Kellwasser Event) and in the topmost Famennian (Hangenberg Events). SDS has focussed within its symposia on sudden extinctions, anoxic, climatic and eustatic events, building up a detailed event stratigraphy that enables non-biostratigraphic correlations.

2.7. Current and future SDS tasks

Chronostratigraphic revisions

Subsequent research since GSSP decisions, unfortunately, showed significant problems in the case of the base of the Emsian and in the case of the Devonian/Carboniferous boundary. The Emsian GSSP was defined when the understanding of defining conodont lineages was at a rather early stage (a new species was used for definition). Subsequent work in regions far apart from the Central Asian GSSP, also based on correlation with other critical faunal groups (brachiopods, graptolites etc.), proved that the GSSP level lies well within the Pragian of the classical Czech definition and much below the base of the traditional Emsian of German understanding. Consequently, more than a third of the classical Pragian has been cut off and has been re-assigned to the Emsian. There is already wide support for a correction within the Zinzilban (Uzbekistan) GSSP section, avoiding the search for a new type section.

Recent resampling of conodonts at the D/C boundary stratotype at La Serre, southern France, suggests that the GSSP level lies slightly higher than originally thought, which would place a globally distributed level with very typical and unequivocal Carboniferous faunas into the Devonian. As in the case of the Emsian, and in agreement with the Carboniferous Subcommission, a correction of the precise GSSP level within the approved GSSP section (shift of a few beds) is currently envisaged but further re-sampling is currently proceeding.
Both examples reflect a general and typical problem of GSSPs and of all Subcommissions. Subsequent research will probably require minor adjustments in many cases and with advancing stratigraphical methods and precision. Therefore, it is important that Subcommissions continuously monitor the success and practical use of approved GSSPs. It seems desirable to review all GSSPs after longer periods, with revisions, as current practise, not to take place before ten years after original approval.

Continuation of current tasks
Tasks outlined under 2.3. to 2.6. are far from being resolved and will be tackled by future special symposia. As an example, there are current studies aiming at the improvement of the global sea-level curve, at the integration of regional studies of cyclic sedimentation, and of developing quantitative time-scales. The role of SDS is to use its organisational power and its assembled multidisciplinary expertise to direct and facilitate progress of stratigraphical research. As in the past, an international and officially recognized organisational body is essential in order to obtain funding from national research organisations, to support scientists from less developed countries, and to gain access to remote and poorly studied but important Devonian basins. SDS has been very successful in opening Devonian areas of military controlled regions of North Africa, Iran, and remote parts of South America, Australia, Canada, Russia and China to the wider scientific community. Future meetings and excursions are planned to investigate the Devonian of further insufficiently known and rather inaccessible regions.

3. SDS Meetings 2000-2005 and beyond

SDS holds annual and formal Business Meetings that usually take place in association with special international symposia and excursions to important Devonian outcrop areas. SDS has always held meetings in conjunction with IGCs (e.g., Washington, Beijing, Rio de Janeiro, Firenze) and regularly joint forces with other organisation that have a focus on Devonian research, e.g., ECOS/ICOS (international conodont symposia) or specific IGCPs. In addition, SDS supports further international congresses with an emphasis on the Devonian, where smaller or specialized groups of its membership convene. The following meetings have officially been co-organized by SDS in 2000-2005 or are currently planned.

2000
August: SDS Business Meeting and Symposium on "**Devonian Palaeogeography and Palaeoclimatology of Western Gondwana**", **Rio de Janeiro**, Brazil, in the frame of the 31st IGC.

2001
May: 15th International Senckenberg Conference, joint SDS and IGCP 421 symposium on "**Mid-Palaeozoic Bio- and Geodynamics – The North Gondwana – Laurussia Interaction**", **Frankfurt** a M., SDS Business Meeting, pre-conference **field trips** to the Devonian of Couvin-Phillipevillearea, **Ardenne**, and of the Rhein-Mosel area and Lahn/Dill Synclines, **Rhenish Massif**; post-conference field trips to the Devonian of the **Thüringer Schiefergebirge**, SE Germany, and to the Barrandian area, **Bohemia**.

2002
June: ECOS VIII, **8th International Conodont Symposium, Toulouse**, SDS Business Meeting, pre-conference **field trip** to the **Cantabrian Mountains**, northern Spain, post-conference **field trips** to "**The Palaeozoic of the Montagne Noire, Southern France**", led by TM R. Feist, and to the **Pyrenees.**
July: International Symposium "**Geology of the Devonian System**", **Syktyvkar**, Komi Republic, northern Russia, **field trip** to the **Timan**, northern Russia.

2003

November: Joint Meeting SDS and "Friends of the Devonian", in conjunction with Session 157 of GSA Meeting, "Geoscience Horizons: **Seattle** 2003" on "**Understanding Late Devonian and Permian-Triassic Biotic and Climatic Events: Towards an Integrated Approach**"

2004
March: "**Devonian neritic-pelagic correlation and events**", **Rabat**, with SDS Business Meeting and 8 days field **excursion** to the **Dra Valley**, SW **Morocco** (jointly organized with the Institute Scientifique, Rabat, and with IGCP 499)
August: Business Meeting and Symposium G22.03 "**High-resolution stratigraphy for the subdivision of Devonian stages**", International Geological Congress, **Firenze**, Italy.

2005
August: SDS Business Meeting, joint symposium with IGCP 499 on "**Devonian terrestrial and marine environments: from continent to shelf**", **Novosibirsk**, Siberia, Russia, and **field trip** to the "**Devonian of the Salair and Altai Mountains**".
August: **6th Baltic Stratigraphic Conference**, **St. Petersburg**, Russia, **field trip** to the "**Devonian of Leningrad and Pskov districts**" (organized by CM A. Ivanov).

2006
June: ICOS 5, International Conodont Symposium, **Leicester**, SDS Business Meeting and symposium on "**Devonian conodont biostratigraphy**", pre-conference SDS **field trip** "**The Old Red Sandstone of Scotland**" (organized by Secretary J. E. Marshall).
July: 2nd International Palaeontological Congress, **Beijing**, China, joint symposium with IGCP 499 on "**Devonian land-sea interaction: evolution of ecosystems and climate**", **field excursions** to the Devonian of **Guangxi** and to the Devonian/Carboniferous of **Xinjiang**.

2007
September: SDS Business Meeting and international symposium, **Eureka**, Nevada, **field trip** to the Devonian of **Nevada**.

2008
SDS symposium in conjunction with the **IGC** in **Oslo**, Norway.

4. SDS Publications (see appendix)

As mentioned above, SDS publishes the annual SDS Newsletter, which commenced in 1985, and with issue 21 (and older newsletters) currently being available on the SDS homepage. SDS has published a wide range of individual papers, e.g. the formal GSSP descriptions in *Episodes*, as well as monographs on Devonian stratigraphy resulting from many SDS symposia or from SDS field trips. The following publications are currently in preparation:

- "Devonian events and correlations" (Becker, R. T. & Kirchgasser, W. T., Eds.), Geological Society, Special Publication, proceedings of the Rabat 2004 symposium, published in the frame of the IUGS-Geological Society co-operation.
- Devonian substage subdivisions, Geological Quarterly.
- Proceedings of the 2005 Novosibirsk Meeting, Courier Forschungsinstitut Senckenberg series.
- Proceedings of the GSA 2004 special symposium on Devonian sequences and cycles, Palaeogeography, Palaeoclimatology, Palaeoecology.
- Proceedings of the Seattle 2003 symposium

5. SDS and ICS

The SDS Chairman is a Voting Member of ICS and, in this function, the present and past chairmen have taken part actively and regularly in the review and voting on GSSP proposals of other Subcommissions, in ICS meetings at IGCs and in workshops between those (Urbino 2002, Leuven 2005), and have contributed to

the preparation of the recent publication on the Geological Time Scale. On the other hand, ICS news are permanently been communicated to the Subcommission membership, either by email, at Business Meetings or via the SDS Newsletter. In this way, SDS acts as a multiplying factor of ICS. Beyond the GSSP presentations, SDS members have contributed several Devonian stratigraphic publications to the official journal of IUGS, *Episodes*.

6. Comments and Conclusions

A rigid, reliable, most precise and strictly defined time scale is one of the essential pre-conditions for the interdisciplinary communication of all geoscientists and does not stop with the first definition of GSSPs. The main work, with emphasis on CORRELATION, lies ahead of this initial step. An international, interdisciplinary, non-profit, and widely recognized and respected stratigraphical organisation is essential for the precise reconstruction of earth history, life and planetary evolution, and for the successful exploration of resources. Regular communication between scientists working in different episodes of earth history needs to be ensured and facilitated. This is a major and continuing task for ICS. Serious restrictions in funding and personal resources in many countries, especially the lack of funding for scientists from developing countries, require that the current low financial input into ICS should not be further reduced and that the authority of ICS and of its subcommissions should not be questioned. Many projects and international symposia have only become possible because of their strict integration with ICS and its parts, which convinced national research authorities to support and fund them. The future of ICS should both include progress in the various fields summarized above, and in the multiple communication of reached progress to all geoscientists, and further on to the greater public that is involved with and interested in geosciences.

7. Appendix: SDS Publication list

Formal GSSP Publications

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CHLUPAC, I. & KUKAL, Z. (1977). The boundary stratotype at Klonk. – In: MARTINSSON, A. (Ed.), The Silurian-Devonian boundary, IUGS, Series A, **5**: 96-109.

CHLUPAC, I. & OLIVER, W. A. (1989). Decision on the Lochkovian-Pragian boundary stratotype (Lower Devonian). – Episodes, **12**: 109-113.

HOUSE, M. R., FEIST, R. & KORN, D. (2000). The Middle/Upper Devonian boundary GSSP at Puech de la Suque, Southern France. - Courier Forschungsinstitut Senckenberg, **225**: 49-58.

HOUSE, M. R., BECKER, R. T., FEIST, R., FLAJS, G., GIRARD, C. & KLAPPER, G. (2000). Courier Forschungsinstitut Senckenberg, **225**: 59-75.

KLAPPER, G., FEIST, R. & HOUSE, M. R. (1987). Decision on the boundary stratotype for the Middle/Upper Devonian series boundary. – Episodes, **10**: 97-101.

KLAPPER, G., FEIST, R., BECKER, R. T. & HOUSE, M. R. (1993). Definition of the Frasnian/Famennian Stage boundary. – Episodes, **16** (4): 433-441.

OLIVER, W. A. & CHLUPAC, I. (1991). Defining the Devonian: 1979-89. – Lethaia, **24**: 119-122.

WALLISER, O. H. (2000). The Eifelian-Givetian Stage Boundary. - Courier Forschungsinstitut Senckenberg, **225**: 37-47.

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YOLKIN, E. A., KIM, A. I., WEDDIGE, K., TALENT, J. A. & HOUSE, M. R. (1998). Definition of the Pragian/Emsian stage boundary. – Episodes, **20**: 235-240.

YOLKIN, E. A., KIM, A. I., WEDDIGE, K., TALENT, J. A. & HOUSE, M. R. (2000). The basal Emsian GSSP in Zinzil´ban Gorge, Uzbekistan. - Courier Forschungsinstitut Senckenberg, **225**: 17-25.

ZIEGLER, W. (2000). The Lower Eifelian Boundary. - Courier Forschungsinstitut Senckenberg, **225**: 27-36.

ZIEGLER, W. & KLAPPER, G. (1982). Devonian Series Boundaries: Decisions of the IUGS Subcommission. – Episodes, **4**: 18-21.

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BULTYNCK, P. (2000, Ed.). Subcommission on Devonian Stratigraphy. Fossil groups important for boundary definition. – Courier Forschungsinstitut Senckenberg, **220**, 205 pp.

BULTYNCK, P. (2000, Ed.). Subcommission on Devonian Stratigraphy. Recognition of Devonian series and stage boundaries in geological areas. – Courier Forschungsinstitut Senckenberg, **225**, 347 pp.

CHLUPAC, I. (1995). Evaluation of Some Devonian Standard Boundaries. – Noca Acta Leopoldina, NF, **71** (291): 41-52.

HOUSE, M. R. (1988). International definition of Devonian System boundaries. – Proceedings of the Ussher Society, **7**: 41-46.

HOUSE, M. R. & GRADSTEIN, F. M. (2004). The Devonian Period. – In: GRADSTEIN, F. M., OGG., J. G. & SMITH, A. G., A Geologic Time Scale 2004, 202-221, Cambridge University Press.

HOUSE, M. R. & ZIEGLER, W. (1997, Eds.). On sea-level fluctuations in the Devonian. – Courier Forschungsinstitut Senckenberg, **199**, 146 pp.

KÖNIGSHOF. P. & SCHINDLER, E. (2003, Eds.). Mid-Palaeozoic Bio- and Geodynamics. The North Gondwana – Laurussia Interaction. Joint Meeting IGCP 421 and Subcommission on Devonian Stratigraphy, Proceedings of the 15th International Senckenberg Conference, Frankfurt am Main, May 11-21, 2001. – Courier Forschungsinstitut Senckenberg, **242**: 348 pp.

ZIEGLER, W. & WERNER, R. (1982, Eds.). On Devonian Stratigraphy and Palaeontology of the Ardenno-Rhenish Mountains and related Devonian Matters. – Courier Forschungsinstitut Senckenberg, **55**, 508 pp.

ZIEGLER, W. & WERNER, R. (1985, Eds.). Devonian Series Boundaries – Results of world-wide studies. – Courier Forschungsinstitut Senckenberg, **75**, 416 pp.

SDS Regional Guidebooks

BRETT, C. E. & VER STRAETEN, C. A. (1997, Eds.). Devonian Cyclicity and Sequence Stratigraphy in New York State, Field Trip Guidebook, July 22-27, 1997. – 369 pp.

CHLUPAC, I., HLADIL, J. & LUKES, P. (1986, Eds.). Barrandian – Moravian Karst 1986. Subcommision on Devonian Stratigraphy of the International Commission on Stratigraphy, Field Conference, Excursion Guidebook. – 62 pp.

EL HASSANI, A. (2004, Ed.). Devonian neritic-pelagic correlation and events in the Dra Valley (Western Anti-Atlas, Morocco), International Meeting on Stratigraphy, Rabat, March 1-10, 2004. – Documents de l´Institut Scientifique, **19**, 100 pp.

EL HASSANI, A. & TAHIRI, A. (2000, Eds.). Moroccan Meeting of the Subcommission on Devonian Stratigraphy (SDS) – IGCP 421, April 24th – May 1st 1999, Excursion Guidebook. – Notes et Mémoires du Service Géologique, **399**, 128 pp.

FEIST, R. (1983, Ed.). Montagne Noire, September 1983, Guidebook of the Field Meeting. – International Union of Geological Sciences, Subcommission on Devonian Stratigraphy, 63 pp.

FEIST, R. (1990, Ed.). The Frasnian – Famennian boundary and adjacent strata of the eastern Montagne Noire, France. International Union of Geological Sciences, Subcommission on Devonian Stratigraphy, Guide Book of the Field Meeting, Montagne Noire 1990. – 69 pp.

GARCIA-ALCALDE, J. L., ARBIZU, M. A., GARCÍA-LÓPEZ, S. & MÉNDEZ-BEDIA, I. (1979, Eds.). Meeting of the International Subcommission on Devonian Stratigraphy, Guidebook of the fieldtrip. – Servicio de Publicaciones de la Universidad de Oviedo.

JANSEN, U., KÖNIGSHOF, P., PLODOWSKI, G. & SCHINDLER, E. (2001, Eds.). 15th International Senckenberg Conference, "Mid-Palaeozoic Bio- and Geodynamics – The North Gondwana – Laurussia Interaction", Field trips guidebook. – Joint Meeting IGCP 421 and SDS, 151 pp.

OLIVER, W. A. & KLAPPER, G. (1981, Eds.). Devonian Biostratigraphy of New York, Part 1 and 2, International Union of Geological Sciences, Subcommission on Devonian Stratigraphy.

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YOLKIN, E. A., BAKHAREV, N. K., IZOKH, N. G., GRATSIANOVA, R. T., KIPRIYANOVA, T. P. & OBUT, O. (2005). Devonian sequences of Salair, Rudny & Gorny Altai. - International Conference "Devonian Terrestrial and marine environments: from continent to shelf" (IGCP 499 Project / SDS joint field meeting), Novosibirsk, Russia, July 25 – August 9, 2005, 79 pp.

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EL HASSANI, A. (2004, Ed.). Devonian neritic-pelagic correlation and events. International Meeting on Stratigraphy, Rabat, Moroco, March 1-10, 2004, IUGS Subcommission on Devonian Stratigraphy and Institut Sciemntifique, University Mohammed V – Agdal, Rabat, Morocco. – 87 pp.

FEIST, R., TALENT, J. & ORTH, B. (1999, Eds.). Abstract Book, Errachidia Meeting SDS – IGCP 421, April 23rd – May 1st 1999. – 48 pp.

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JANSEN, U., KÖNIGSHOF, P., PLODOWSKI, G. & SCHINDLER, E. (2001, Eds.). 15th International Senckenberg Conference, "Mid-Palaeozoic Bio- and Geodynamics – The North Gondwana – Laurussia Interaction", Abstracts. – Joint Meeting IGCP 421 and SDS, 106 pp.

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PAPROTH, E. & STREEL, M. (1982, Eds.). Devonian – Carboniferous transitional beds of the northern "Rheinisches Schiefergebirge", Guidebook. – International Union of Geological Sciences, Commission on Stratigraphy, Working Group on the Devonian/Carboniferous Boundary, 63 S.

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The IGCP Project 499: "Devonian land-sea interaction: evolution of ecosystems and climate" (DEVEC) – what has happened, what's coming up

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IGCP Project 499 is on the run since its opening meeting in Morocco (March 2004) and can be considered as very productive and successful. Besides the given information below we recommend further reading at our homepage: http://www.senckenberg.de/igcp-499. Lists of publications and participants are there available.

As mentioned above, the inauguration meeting took place from March 1 to 10, 2004 in Rabat and in the Dra Valley of the Anti-Atlas (Morocco) under the splendid organisation of TM Ahmed EL HASSANI and his fabulous team. The meeting was entitled "Devonian neritic–pelagic correlation and events". 24 oral presentations on Devonian matters including e.g., biostratigraphy, palaeontology, eventstratigraphy, and chemostratigryphy were given during the first two days of the meeting at the 'Institut Scientifique de l'Université Mohammed V, Agdal' in Rabat. Additionally, 20 posters have been presented touching similar topics. 50 participants from various countries attended this part of the meeting. After the technical sessions an extended fieldtrip to the marvellous Devonian geology of the Dra Valley in the Anti-Atlas was attended by 30 participants. The trip was guided by two German groups, i.e., Thomas BECKER and his crew from Münster University, and the Senckenberg group from Frankfurt (Gerhard PLODOWSKI and collaborators). The main focus of the trip was set on Lower to Middle Devonian siliciclastics, but minor parts of some sections even reached into the Upper Devonian. A very high grade of biostratigraphic resolution could be demonstrated using a number of taxa (e.g., brachiopods, goniatites, conodonts, tentaculitids, trilobites, ostracods). Other taxa, such as corals and crinoids, have been investigated by attending specialists. Aspects of cyclic stratigraphy and detailed sedimentology and facies analyses have been intensely discussed.
Ahmed EL HASSANI has put together a volume summarizing the abstracts of the oral presentations and posters on 87 pages (entitled: "Devonian neritic–pelagic correlation and events"). The 10 contributions to the sections of the fieldtrip (+ intruductionary remarks and an overview article) that had been prepared as a pre-print guidebook for the trip have been published later as a separate volume [EL HASSANI, A. (ed.): "Devonian neritic–pelagic correlation and events in the Dra Valley". – Documents de l'Institut Scientifique, **19**: 100 pp.]. The articles of the volume are available as PDF files via website: www.israbat.ac.ma/PublicationsIS/Doc19_04/sommaireWeb.htm).

During the technical part of the meeting the IGCP Project 499 (then just accepted) was introduced for the first time to the scientists working in the Devonian. Additionally, a brief overview about other IGCP projects that had started about the same time and showing some relations to IGCP 499 was also given (e.g., IGCP projects 491, 497, and 503).

The first North American meeting of IGCP-499 was a symposium entitled "Correlation of Devonian Marine and Terrestrial Strata" chaired by TM D. Jeffrey OVER (Geneseo). It was embedded in the "North American Paleontological Convention" (NAPC) that took place in Halifax, Nova Scotia from June 19 to 26, 2005. Besides presentations of the symposium several other talks at the meeting were on Devonian floras and

faunas. An overview of IGCP-499 was given by OVER et al. The most important aspect of the meeting was the communication between different workers and the development of interdisciplinary projects, especially involving palynologists and macroplant specialists. Abstracts were published in association with the University of California at Berkeley, Museum of Paleobiology in PaleoBios, **25** (supplement to number 2), June 2005.
More information can be obtained from website: http://meguma.earthsciences.dal.ca/napc/napc.htm.

In the tradition of successful joint meetings and field trips of Devonian IGCP projects and the international Subcommission on Devonian Stratigraphy (SDS) a wonderful meeting was held at the Institute of Petroleum Geology, United Institute of Geology and Mineralogy of the Russian Academy of Sciences, Siberian Branch in Novosibirsk from July 25 to August 9, 2005. The meeting which included a splendid field trip to the South of Siberia (July 26 – August 6, 2005) and well-organised technical sessions (August 7 – 8, 2005) was run by a great team from Novosibirsk under the guidance of E.A. YOLKIN, A.V. KANYGIN, N.K. BAKHAREV, N.G. IZOKH and O.T. OBUT (and a fantastic team helping to arrange the sessions and the field trip in a perfect way!). It was entitled "Devonian Terrestrial and Marine Environments: From Continent to Shelf" (DECONS). About 75 scientists (among them 32 colleagues from foreign countries) presented 35 oral lectures and 44 posters. Business meetings of IGCP 499 and SDS were held on the afternoon of August 8, 2005. The field trip lead the participants to various Devonian outcrops in the Salair, Rudny Altai, and Gorny Altai regions yielding a great variety of rocks in different facies settings (from nearshore/terrestrial to open marine conditions) and from the Lower to the Upper Devonian. Four field camps had to be set up by the perfectly working team. A big "THANK YOU" for arranging these unforgettable days! Two volumes including the abstracts and the field guides have been put together by our Siberian colleagues:
YOLKIN, E.A., BAKHAREV, N.K., IZOKH, N.G., GRATSIANOVA, R.T., KIPRIYANOVA, T.P. & OBUT, O.T. (2005): Devonian terrestrial and marine environments: From continent to shelf, Joint Conference IGCP 499/SDS, Devonian sequences of Salair, Rudny & Gorny Altai: Field excursion guidebook. – 82 pp.; Novosibirsk.
YOLKIN, E.A., IZOKH, N.G., OBUT, O.T. & KIPRIANOVA, T.P. [eds]: Devonian terrestrial and marine environments: From continent to shelf, Joint Conference IGCP 499/SDS, Contributions. – 156 pp.; Novosibirsk.
More information can be found on website: http://petrol.uiggm.nsc.ru/DECONS.

IGCP 499 has been included the "6th Baltic Stratigraphic Conference" held at St. Petersburg (Russia) from August 22 to 26, 2005. The conference that was coordinated by Zivile ZIGAITE in the framework of IGCP 491 that is focused on mid-Palaeozoic vertebrates (coordinated by TM Min ZHU and Gavin YOUNG). IGCP 499 was represented by Jurga LAZAUSKIENE who also organised a business meeting. For more information see website: http://www.vsegei.com/vi_baltic_conference.html.

From September 26 to October 3, 2005 an IGCP 499 Workshop was held in Turkey entitled „Depositional Environments of the Gondwanan and Laurasian Devonian". The Devonian of Turkey is of special interest, because it comprises Laurasian and Gondwanan components on different tectonic blocks. Therefore, an active group of Devonian researchers was assembled in Turkey by IGCP 499 co-leader M. N. YALCIN (Department of Geology, University of Istanbul) and A. NAZIK (Cukurova University, Department of Geology, Adana). The technical sessions took place at Istanbul University. The workshop was attended by about 50 colleagues, mainly from Turkey, but also from Bulgaria, Germany, Lithuania, Morocco, and the USA. There have been about 20 oral contributions and several posters covering major aspects of the subject with special focus on the Devonian of Turkey and adjacent areas. The highly successful meeting was held in the historic main building of Istanbul University which is situated in the heart of the city and overlooking a unique panorama of the Golden Horn. An IGCP 499 business meeting was held at the end of the technical sessions (Sept. 26). There were two fieldtrips offered in conjunction with the meeting. The first (Sept. 28) led a number of the participants to outcrops covering an almost complete and representative fossiliferous section of Ordovician to Lower Carboniferous sedimentary rocks in the eastern surroundings of Istanbul. The second fieldtrip was devoted to two major sections in the Taurus Mountains of Southern Turkey (Sept. 30 – Oct. 3). It was attended by only few foreign participants and could therefore be combined with intense cooperative fieldwork on the respective sections by Turkish and German colleagues. Following the transfer to Kayseri as the starting point, the next two days were devoted to the Degirmentas Section between

Degirmentas and Halevikdere villages in the NNE of the Tufanbeyli District. The more or less continuous section starts with Cambrian strata including major carbonates and ends in the Carboniferous, in between covering an almost complete Devonian succession which was studied in some detail. The next day gave an interesting opportunity to experience some historic places of great importance N of Adana. The subject of the last two days of the fieldtrip was the Civikle Section which is covering most of the Devonian including the Devonian/Carboniferous Boundary. The official part of the field trip was followed by extended fieldwork in the framework of a bilateral Turkish-German cooperation project. Summing up, the workshop and accompanying fieldtrips can be regarded as highly successful. They offered a unique chance to get an insight into the Devonian of Turkey which is covering two major palaeogeographic "complexes" in a nearby setting. The Turkish colleagues have to be thanked for organizing and hosting a great workshop. They not only offered a fascinating Devonian, but also a wonderful landscape, culture and hospitality. The participants of the meeting were provided with a booklet not only comprising the abstracts of talks and poster presentations, but also an introduction to the Devonian of Turkey and to the details of the areas covered by the fieldtrips ("Depositional environments of the Gondwanan and Laurasian Devonian, International workshop of IGCP Project 499, Abstracts and field trip guide books: 77 pp.; Istanbul). Further information see website: http://www.istanbul.edu.tr/devec_tr/.

At the 2nd International Palaeontological Congress (IPC) in Beijing, China from June 17 to 21, 2006 a session on "Devonian land-sea interaction: Evolution of ecosystems and climate" was held (Session T7 on June 17, 2006). 21 talks and posters have been presented. More than 30 colleagues from Australia, Canada, China, European countries and the USA were following the call to participate. Far more talks were offered than could be accommodated in the single-session programme. Finally 15 talks on a wide range of topics (e.g. on carbon isotope stratigraphy, climate fluctuations, sedimentology and microfacies, palaeoecology and mass extinction events) were presented. The abstracts of these contributions are published in the IPC abstract volume (Qun YANG et al. (eds.): Ancient life and modern approaches – Abstracts of the Second International Palaeontological Congress. University of Science and Technology of China Press; 553 pp.). The IGCP 499 session was highly successful. It brought together people from a wide range of countries and experience in various disciplines. The organisation of an International Conference would not have been possible without the support and help of numerous people and institutions. The Chinese colleagues and their students have to be thanked for organizing and hosting an interesting conference. The topical session was partly supported by the German Science Foundation (DFG).

Embedded in the meeting of the "Commission International de Microflore du Paléozoique" (CIMP) that took place from September 2 to 6, 2006 in Praha, Czech Republic, an IGCP 499 symposium was held on "Palaeozoic palynology". As some of the palynological topics of the meeting appeared to be very important for recognition of marine – non marine sequences and for correlation between different very shallow water areas, IGCP 499 organized the special session in conjunction with CIMP. More than 40 participants from 7 countries attended the session held on September 4, 2006: 6 talks were given and 4 posters were presented, but not all contributions related to IGCP 499 topics could be grouped in this session.

There were several other activities going on during which IGCP 499 has been presented:

The first presentation of IGCP 499 to the public was within a press campaign of the German IGCP National Committee together with additional information on other IGCP projects lead or co-lead by German colleagues. The presentation took place at the Senckenberg Museum in Frankfurt on April 28, 2004. The first business meeting of IGCP 499 was held at the University of Göttingen (Germany) on October 6, 2004 and was attended by about 40 colleagues from 9 countries. It was embedded in the annual meeting of the German Paläontologische Gesellschaft which included a special session on Devonian topics. A substantial number of regional coordinators from different countries contributed to the meeting. Besides a general overview by the project leaders, colleagues from Belgium (P. Bultynck), China (X. Chen), Germany (Frankfurt group), Iran (M. Yazdi), Poland (G. Racki), Russia (N. Izokh), Spain (J. Valenzuela-Rios), Turkey (N. Yalcin) and the United States (C. Brett) reported about regional plans and initiatives. It was agreed that future IGCP 499 meetings will preferably be held in conjunction with the international Subcommission on Devonian Stratigraphy (SDS) as it was the case in the successful initial meeting in Rabat (Morocco) in March 2004.

IGCP 499 has also been presented during the following meetings:

11th International Palynological Congress in Granada (Spain), July 4 – 9, 2004,
32nd International Geological Congress in Firenze (Italy), August 20 – 28, 2004,
International Symposium on "Early Palaeogeography and Palaeoclimate" in Erlangen (Germany), September 1 – 3, 2004 (first meeting of IGCP Project 503 "Ordovician Palaeogeography and Palaeoclimate" lead by T. SERVAIS, A. MUNNECKE, D.A.T. HARPER, J. LI, A.W. OWEN and P.M. SHEEHAN),
Annual meeting of the Geological Society of America in Denver (USA), November 7–10, 2004.

Planned meetings

IGCP 499 field meeting in San Juan, Argentina, May 2007
Thanks to the invitation of some colleagues from Argentina the Precordillera has been chosen as the site for the first field meeting in 2007. The meeting will take place from May 13 to 23, 2007 including oral and poster sessions in San Juan. A seven day post-meeting field trip will be offered to show Devonian sections in the Eastern and Central Precordillera as well as sections in the Mendoza Province. The scientific sessions and the field trip will be organized by a team of the Universidad Nacional de San Juan. Further information can be obtained at http://www.fcefn.unsj-cuim.edu.ar/Institutos/geologia/Ingeo/index.html.

Joint meeting of SDS and IGCP 499 in Nevada (U.S.A.), September 7 to 18, 2007
The 2007 business meeting of the Subcommission on Devonian Stratigraphy (SDS) and the business meeting of IGCP 499 will be held in Eureka, Nevada (U.S.A.). A seven day pre-meeting field trip is scheduled to depart from Las Vegas and end in Eureka prior to the meeting. The main topics will be:

(a) Rapid Global Change in the Devonian,
(b) Devonian land-sea interactions and
(c) other proposals that are to be announced.

There will be three days for the presentation of oral lectures and posters. Any questions can be directed to the coordinator of the meeting, TM Jeff Over (over@geneseo.edu). There is also a link to the conference website: http://www.geneseo.edu/CMS/display.php?dpt=frasnian.

Final meeting of IGCP 499 in conjuction with IGCP 497 in Frankfurt (Germany) in fall, 2008
The final meeting will be held at the Forschungsinstitut und Naturmuseum Senckenberg in Frankfurt (Germany) with field trips to mid-European Devonian sections.

Working Groups / Regional Groups

In order to channel the work within IGCP Project 499 which covers a wide range of scientific disciplines different working groups were establish with the aim to provide a better coordination with respect to forthcoming activities (e.g. field meetings, workshops). These working groups should either cover palaeoenvironmental settings or individual disciplines. However, in spite of such a technical subdivision, the goal is to encourage interrelated activities. Consequently, establishing new working groups is welcome at any time but should be announced to the project leaders! All participants may lead such groups or propose them.

Terrestrial realm (coordinator: Volker WILDE, Frankfurt)
Focus will be set on terrestrial settings (e.g., palaeosoils) as well as on the immediate transitional settings, such as coasts, lagoons, estuaries, etc.

Major working fields/disciplines are: Palaeontology (palaeobotany, palynology, palaeozoology), palaeopedology, terrestrial sedimentology.

Transitional/shallow marine realm (coordinator: Eberhard SCHINDLER, Frankfurt)
As already indicated by the heading, there is no sharp discrimination possible to either the landward or the open marine side. All aspects of research on the processes and/or correlation of the rocks belonging to similar or different facies have to be considered.
Major working fields/disciplines are: Palaeontology (palynology, palaeozoology, palaeoichnology), sedimentology/facies analysis, stratigraphy/correlation.

Outer shelf/open marine realm (coordinator: Peter KÖNIGSHOF, Frankfurt)
Similar to the preceding paragraph, there is a wide transitional zone to the shallow marine side. The main topics within this setting are very similar to the previously mentioned items. Reefs surely play a special role in this setting.
Major working fields/disciplines are: Palaeontology (palaeozoology), sedimentology/facies analysis, stratigraphy/correlation, reefs, bioerosion.

Geochemistry
Geochemical studies are important for all areas of Devonian research and may be split into two "sub-units" for which two colleagues agreed to act as coordinators:
Ulrich MANN (Jülich) will take care of the **organic geochemistry**,
Michael JOACHIMSKI (Erlangen) will be responsible for coordinating the **inorganic geochemistry**.

As pointed out above, nobody of the participants should hesitate to set up another working group or promise to do so!

In addition to these thematic working groups a good number of colleagues have already agreed to act as regional coordinators for the IGCP 499 Project. The status of these working groups is very different. There may be formal working groups related to existing formal organisations (e.g., Spain, Russia). On the other hand, individual colleagues may act as personal coordinators who just agree to set up the group and take care of the results (e.g., providing lists of activities and publication etc.).

The following list shows the 'state of the art' with respect to regional working groups and their leaders (for contact, please, see list of participants on the IGCP 499 website):

Australia - J.A. Talent (Sydney)
Austria - H.-P. Schönlaub (Wien)
Baltic countries - J. Lazauskiene (Vilnius)
Belgium - P. Bultynck (Bruxelles)
Canada - P. Copper (Sudbury)
China - X. Chen, M. Zhu (Nanjing/Beijing)
Czech Republic - O. Fatka (Praha)
France - R. Feist (Montpellier)
Germany - P. Königshof, E. Schindler, V. Wilde (Frankfurt)
Iran - M. Yazdi (Isfahan)
Italy - C. Corradini (Cagliari)
Morocco - A. El Hassani (Rabat)
Poland - G. Racki (Sosnowiec)
Portugal - J.T. Oliveira, Z. Pereira (Amadora/S. Mamede)
Russia - E.A. Yolkin, N.G. Izokh (Novosibirsk)
Spain - J.I. Valenzuela-Rios, J. Liao (Valencia)
Turkey - N.M. Yalcin (Istanbul)
United Kingdom - J. Marshall (Southampton)
U.S.A. - C.E. Brett, P.E. Isaacson, J.R. Morrow, D.J. Over, C.A. Ver Straeten (Cincinnati/Moscow, Idaho/Greeley/Geneseo/Albany)

For the underlined countries a link has been set in the electronic version.

Finally, it should be stressed that perfect cooperation between IGCP 499 and SDS was, is, and will be an outstanding factor. As in the past, many fruitful discussions, interactions – and not at least publications – are to be expected in the future.

SDS PUBLICATIONS

New (2005/2006) important (or possibly not widely recognized) **Devonian publications:**

This section should become a regular part of our Newsletter and input from the membership would be highly welcomed. This section will summarize significant or voluminous recent publications as well as Devonian papers that were not published by SDS Members and which may not be available in normal libraries.

BALINSKI, A., OLEMPSKA, E. & RACKI, G. (Eds, 2006). Biotic aspects of the Early-Middle Frasnian eventful transition. – Acta Palaeontologica Polonica, **51** (4): 606-812 [see chairman´s message]

BARRICK, J. E. & LANE, H. R. (Eds, 2005). A Standing Ovation: Papers in Honour of Gilbert KLAPPER. – Bulletins of American Paleontology, **369**, 246 pp. [Dear Gil: SDS joins the standing ovations !!]

BASSE, M. (2005). Anmerkungen zu Eifel-Trilobiten. – Fossilien, **2005** (1): 16-21.

BASSE, M. (2006). Eifel-Trilobiten, IV. Proetida (3), Phacopida (3). – 304 pp., Edition Goldschneck, Wiebelsheim [a new voluminous trilobite monograph, featuring 64 plates].

CAPKINOGLU, S. (2005). Famennian conodonts from the Ayineburnu Formation of the Istanbul Zone (NW Turkey). – Geologica Carpathica, **56** (2): 113-122.

CAPKINOGLU, S. (2005). Upper Devonian (Upper Frasnian-Lower Famennian) conodont biostratigraphy of the Ayineburnu Formation (Istanbul Zone, NW Turkey). – Geologica Carpathica, **56** (3): 223-236.

COEN-AUBERT, M. (2005). Ruguex fasciculés et solitaires du Givetien supérieur dans le Tafilalt et le Ma´der (Maroc). – Bulletin de l´Institut royal des Sciences naturelles de Belgique, **75**: 67-85.

DZIK, J. (2006). The Famennian "Golden Age" of conodonts and ammonoids in the Polish part of the Variscan Sea. – Palaeontologica Polonica, **63**: 1-359.

ELKHOLY, H. & GAD, J. (2006). Die Wied-Gruppe (vormals Hunsrückschiefer): Eine neue lithostratigraphische Einheit am Nordrand der Moselmulde – Untersuchungen zu ihrer faziellen und stratigraphischen Einordnung. – Mainzer geowissenschaftliche Mitteilungen, **34**: 49-72.

FLICK, U., FLICK, H. & REQUADT, H. (2006). Die Trilobitenfauna im Nebengestein des meta-alkalibasaltischen Lagerganges vom Wasenbachtal – Abbild unterschiedlicher mariner Lebensräume an der Wende Unter-/Mitteldevon in der südwestlichen Lahnmulde (Rheinisches Schiefergebirge). – Mainzer geowissenschaftliche Mitteilungen, **34**: 21-48.

FRANKE, C. (Ed., 2006). Beiträge zur Paläontologie des Unterdevons Luxemburgs (1). – Ferrantia (Travaux scientifiques du Musée national d´histoire naturelle Luxembourg), **46**: 1-115 [includes papers on trilobites, biofacies and fauna of the Klerf Formation, and on eurypterids and other arthropod remains].

GAD, J. (2005). Miosporen aus dem Hunsrückschiefer des Westerwaldes (Rheinisches Schiefergebirge, Unterdevon) und die stratigraphische Stellung der Mayen-Formation. – Mainzer geowissenschaftliche Mitteilungen, **33**: 167-218.

GAD, J. (2006). Geochemische Untersuchungen der Wied-Gruppe (vormals „Hunsrückschiefer", Unterdevon, Moselmulde, Rheinisches Schiefergebirge) im Hinblick auf die Rekonstruktion der Paläoredoxbedingungen und der Fossillgerstätten. – Mainzer geowissenschaftliche Mitteilungen, **34**: 7-20.

GERRIENNE, P., MEYER-BERTHAUD, B. & FAIRON-DEMARET, M. (2005). The significance of *Runcaria* (Middle Devonian, Belgium) in the evolution of seed plants. – Carnets de Géologie, Memoir, **2005**/2: 15-19.

HEIDELBERGER, D. & KOCH, L. (2005). Gastropoda from the Givetian „Massenkalk" of Schwelm and Hohenlimburg (Sauerland, Rheinisches Schiefergebirge, Germany). – Geologica et Palaeontologica, Sonderband, **4**: 1-107.

KAUFMANN, B. (2006). Calibrating the Devonian Time Scale: A synthesis of U-Pb ID-TIMS ages and conodont stratigraphy. – Earth Science Reviews, **76**: 175-190.

KAUFMANN, B., TRAPP, E., MEZGER, K. & WEDDIGE, K. (2005). Two new Emsian (Early Devonian) U-Pb zircon ages from volcanic rocks of the Rhenish Massif (Germany): implications for the Devonian time scale. – Journal of the Geological Society, **162**: 363-372.

JIN, Shanyu, SHEN, Anjiang, CHEN, Ziliao, LU, Junming, WEI, Min, WANG, Yuanqing & XIE, Fei. (2005). Mixed Biostratigraphy of Devonian in Wenshan, Yunnan. – The 20th anniversary of the founding of Hangzhou Institute of Geology, CNPC (1984-2004), 195 pp., 40 pls., Petroleum Industry Press [includes a focus on conodonts and corals].

MAY, A. (2006). *Radiastrea* (Anthozoa, Rugosa) from the Emsian and Eifelian (Devonian) of Aviados, northern Spain. – Bulletin of Geosciences, **81** (3): 151-162.

MAY, A. (2006). Micheliniidae and Cleistoporidae (Anthozoa, Tabulata) from the Devonian of Spain. – Bulletin of Geosciences, **81** (3): 163-172.

MAY, A. (2006). Lower Devonian stromatoporoids from the northern Obejo-Valsequillo-Puebla de la Reina Domain (Badajoz and Córdoba Provinces, Southern Spain). – Revista Española de Paleontologia, **21** (1): 29-38.

MENNING, M. et al. (2006). Global time scale and regional stratigraphic reference scales of Central and West Europe, East Europe, Tethys, South China, and North America as used in the Devonian-Carboniferous-Permian Correlation Chart 2003 (DCP 2003). – Palaeogeography, Palaeoclimatology and Palaeoecology, **240**: 318-372.

NIKOLAEVA, S. V. & BOGOSLOVSKIY, B. I. (2005). Devonskie Ammonoidei. IV Klymenii (podotriad Clymeniina). – Trudy Paleontologicheskogo Institua, **287**: 1- 220, Rossiiskaia Akademia Nauk [the long outstanding fourth part of late BOGOSLOVSKIY´s Devonian ammonoid monograph].

OVER, D. J., MORROW, J. R. & WIGNALL, P. B. (Eds., 2005). Understanding Late Devonian and Permian-Triassic biotic and climatic events. – Developments in Palaeontology & Stratigraphy, **20**: 1-337, Elsevier.

PURNELL, M. A. & DONOGHUE, P. C. J. (2005). Conodont biology and phylogeny: interpreting the fossil record. – Special Papers in Palaeontology, **73** [includes an important paper by J. DZIK, using Upper Devonian conodonts as example]

RACHEBEUF, P., TA HOA, P., NGUYEN HUU, H., FEIST, M. & JANVIER, P. (2006). Brachiopods, crustaceans, vertebrates, and charophytes from the Devonian Ly Hoa, Nam Can and Dong Tho formations of Central Vietnam. – Geodiversitas, **28** (1): 5-36.

SCHÜLKE, I. & POPP, A. (2005). Microfacies development, sea-level change, and conodont stratigraphy of Famenniahn mid- to deep platform deposits of the Beringhauser Tunnel section (Rheinisches Schiefergebirge, Germany). – Facies, **50**: 647-664.

SCHRÖDER, S. (2005). Stratigraphie und Systematik rugoser Korallen aus dem Givetium und Unter-Frasnium des Rheinischen Schiefergebirges (Sauerland/Bergisches Land). – Zitteliana, **B25**: 39-116.

STADELMAIER, M., NOSE, M., MAY, A., SALERNO, C., SCHRÖDER, S. & LEINFELDER, R. R. (2005). Ästige tabulate Korallen-Gemeinschaften aus dem Mitteldevon der Sötenicher Mulde (Eifel): Faunenzusammensetzung und fazielles Umfeld. – Zitteliana, **B25**: 5-38.

WEYER, D. (2005). *Antilacca*, ein neues Rugosa-Genus aus dem mitteleuropäischen Unterdevon. – Abhandlungen und Berichte für Naturkunde, **28**: 5-21.

New SDS Publication, forthcoming in March 2007)
GEOLOGICAL SOCIETY OF LONDON, SPECIAL PUBLICATIONS:
No. 278
Devonian Events and Correlations

R. T. BECKER & W. T. KIRCHGASSER (eds.)

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Alexander J. BARTHOLOMEW & Carlton, E. BRETT p. 105-1312

6. **Recognising the Kacák Event in the Devonian terrestrial environment and its implications for understanding land-sea interactions**
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7. **Middle Givetian Brachiopod-Ammonoid Correlation in the Dra Valley (Anti-Atlas, Morocco) and Bergisch Gladbach-Paffrath Syncline (Rhenish Massif, Germany)**
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10. **The biostratigraphic and palaeogeographic framework of the earliest diversification of tetrapods (Late Devonian)**
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11. **Middle to Late Famennian successions at Ain Jemaa (Moroccan Meseta) – implications for regional correlation, event stratigraphy and synsedimentary tectonics of NW Gondwana**
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The volume can be purchased online under: http://www.geolsoc.org.uk/bookshop

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Geneseo

IUGS - Subcommission on Devonian Stratigraphy

Rapid Global Change
Eureka, Nevada

9 - 17 September 2007

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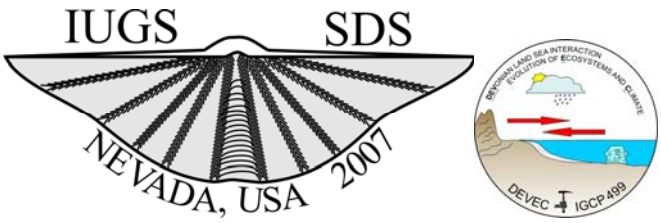

Over view

Devonian Global Change: compelling changes in the Devonian world, highlighting new findings in the terrestrial and marine biomes: fish, invertebrates, plants, terrestrial vertebrates, global warming, mass extinction, bolide strikes, and global correlation.

Topical Sessions:

Famennian substages

Johnson et al., 1985 sea level curve

Land-Sea Interactions

Registration - not yet active

Submit an abstract - not yet active

SDS: http://sds.uta.edu/

IGCP 499: http://www.senckenberg.de/root/index.php?page_id=1388

Day 1: - 9 Sept

Breakfast: Participants are on their own.

AM: Depart Las Vegas; drive north into Pahranagat Valley. En route one stop to view overall Devonian section (exact location TBA).

Lunch: Pick up pre-ordered sack lunches at R-Place, Ash Springs. Lunch stop at Horney's rest area, Hancock Summit.

PM: Middle-Upper Devonian transition, Simonson Fm, Fox Mtn. Fm, Guilmette Fm, and type section of Alamo Breccia, Hancock Summit west.

Night: JFDI Ranch, dinner at ranch dining hall. After dinner, introductory talk on Great Basin Devonian paleogeography (Morrow); other intro talks (Over, or?).

Day2: - 10 Sept

Breakfast: JFDI Ranch dining hall.

AM: Mt. Irish section, Guilmette Fm, Alamo Breccia, and unique post-impact, Frasnian coral-stromatoporoid reef ("Reso Reef").

Lunch: Pre-ordered sack lunches from JFDI Ranch. Possible lunch stop at Native American petroglyph site.

PM: Bactrian Mtn. section, Guilmette Fm, West Range Ls, and Pilot Shale; carbonate-platform F-F boundary section, Famennian Pilot basin.

Night: JFDI Ranch, dinner at ranch dining hall. After dinner, relax, or optional talks.

Day3: 11 Sept

Breakfast: JFDI Ranch dining hall.

AM: Silurian to Middle Devonian section, Ely Springs Dolomite, Sevy Dolomite, Oxyoke Ss, and Simonson Fm, northwest side Pahranagat Range location TBA).

Lunch: Pre-ordered lunch buffet, Little Al'e Inn, Rachel.

PM: Milk Spring area, S. Hot Creek Range, deep-water Alamo Breccia channel and Middle Devonian rocks. En route to Eureka, overview stop to d Railroad Valley oilfield (Devonian reservoir rocks).

Night: Best Western Eureka Inn. Dinner either at Opera House, or pre-ordered sandwiches (Pony Expresso Deli?), with dinner in local park (wine, b etc., provided).

Day 4: 12 Sept

Breakfast: Eureka Inn continental breakfast.

AM: Lower to Middle Devonian section, Lone Mtn.

Lunch: Pre-ordered sack lunches, Pony Expresso Deli?

PM: F-F boundary, distal Alamo Breccia channel, Devils Gate Ls, Devils Gate.

Night: Best Western Eureka Inn. Dinner at Opera House, with optional introductory talks?

Day 6: 13 Sept

Breakfast: Eureka Inn continental breakfast.

AM: Silurian to Lower Devonian rocks, Late Devonian tectonics, Roberts Mountains area (Stan Finney).

Lunch: Pre-ordered sack lunches, Pony Expresso Deli?

PM: Roberts Mountains, cont'd.

(Note-other option for this day includes Upper Devonian and Carboniferous rocks, northern Pancake Range)

Night: Best Western Eureka Inn. Dinner at Opera House, with optional introductory talks?

Day 7: 14 Sept

Breakfast: Eureka Inn continental breakfast.

AM: Middle Devonian fish quarry, Red Hill beds, and basal Devils Gate Ls, northern Simpson Park Range.

Lunch: Pre-ordered sack lunches or snacks only, Pony Expresso Deli?

PM: Mine tour, Carlin-Elko area

(click menu on left for site links and information)

Abstracts Due 1 May 2007

Meeting Registration Due: 1 May 2007

Late Registration add 20%

8 Sept – Arrive Las Vegas

9 Sept – field trip departs, spends night in Alamo

10 Sept – field trip in Alamo

11 Sept – field trip in Eureka

12 Sept – field trip in Eureka

13 Sept – field trip in Eureka: non-field trip conference participants arrive in Las Vegas

14 Sept – field trip in Eureka: non-field trip conference participants arrive in Eureka

15 Sept – conference begins, stay in Eureka

16 Sept – conference, stay in Eureka

17 Sept – conference, stay in Eureka

18 Sept – depart for Las Vegas, night in Las Vegas

Eureka is somewhat isolated, with no regular public transport, but the setting and atmosphere should compensate for the inconvenience. The closest bus stop is in Elko.

Las Vegas as staging point

Option – Charter Bus or Van from Las Vegas to Eureka on 14 September; return to Las Vegas on 18 September. Formal plans and cost will be in place by time of registration. Travel time (7:15) from Las Vega to Eureka; Reno to Eureka (5:15); Salt Lake City to Eureka (6:10).

Bus from Las Vegas to Elko is 16 hrs; Reno to Elko is 5:20, arriving at 12:20 PM; Salt Lake City to Elko is 4:30, arriving at 2:30 PM

Participants, especially for the field trip, are encouraged to travel early to ensure connections to Las Vegas.

Lodging in Eureka

Motels in Eureka - 2007

Best Western Eureka Inn
251 N. Main St.
Eureka NV. 89316
(775) 237- 5247
eurekainn@kandlservices.com
Rooms - 39 rooms
Suites - 3 suites
A block of rooms has been reserved for the conference. Most have double queen-sized beds, some are kings, at $80/night. Reservations must be made before 10 July 2007.
http://www.bestwesternnevada.com/hotels/best-western-eureka-inn/

Ruby Hill Motel
380 N. Main
Eureka NV. 89316
(775) 237- 5339
Rooms - 11 rooms
Single - $40.00
Double -$58.00

Sundown Lodge
60 N. Main St.
Eureka NV. 89316
(775) 237- 5334
Rooms - 27 rooms
Single - $37.60
Double - $48.25

ORGANIZERS

Field Trip

Jared Morrow
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San Diego, CA 92182-1020
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Technical Sessions

Jeffrey Over
Department of Geological Sciences
1 College Circle
SUNY-Geneseo
Geneseo, New York 14454 USA
over@geneseo.eduTravel to USA

Travel to the USA, with the exception of people from Canada and Bermuda, requires a machine-readable passport, and for some a tourist visa. Please see the link below for the list of countries that do not require a visa. If you require a visa, please contact Jeff Over or Jared Morrow for a letter in sufficient time for the proper documents to be prepared.

Rapid Global Change in the Devonian

SDS 2007 Annual Meeting, IGCP 499

Eureka, Nevada, 9 -17 September 2007

Information form

Please complete and return to:

SDS Nevada 2007 c/o D. Jeffrey Over
Department of Geological Sciences
1 College Circle – SUNY Geneseo
Geneseo, New York 14454 USA
over@geneseo.edu

conference web page - http://www.geneseo.edu/CMS/display.php?dpt=frasnian

Name: _____ E-Mail: _____

Institution: _____

Address: _____

City: _____ State/Province: _____

Country: _____ Postal Code: _____

Telephone: _____ Fax: _____

Please indicate participation in conference:

possibly probably almost certainly

I will present:

oral paper poster

Pre-conference field trip:

possibly probably almost certainly

Need transport from Las Vegas to Eureka on 14 September and return on 18 September

yes no

Official invitation needed: yes no

Tentative schedule:

8 Sept – Arrive Las Vegas, NV

9 Sept – field trip departs, spends night in Alamo, NV

10 Sept – field trip, night in Alamo, NV

11 Sept – field trip, night in Eureka

12 Sept – field trip, night in Eureka

13 Sept – field trip, night in Eureka: *non-field trip conference participants arrive in Las Vegas, NV*

14 Sept – field trip, night in Eureka: *non-field trip conference participants arrive in Eureka, NV*

15 Sept – conference begins, stay in Eureka

16 Sept – conference, stay in Eureka

17 Sept – conference, stay in Eureka

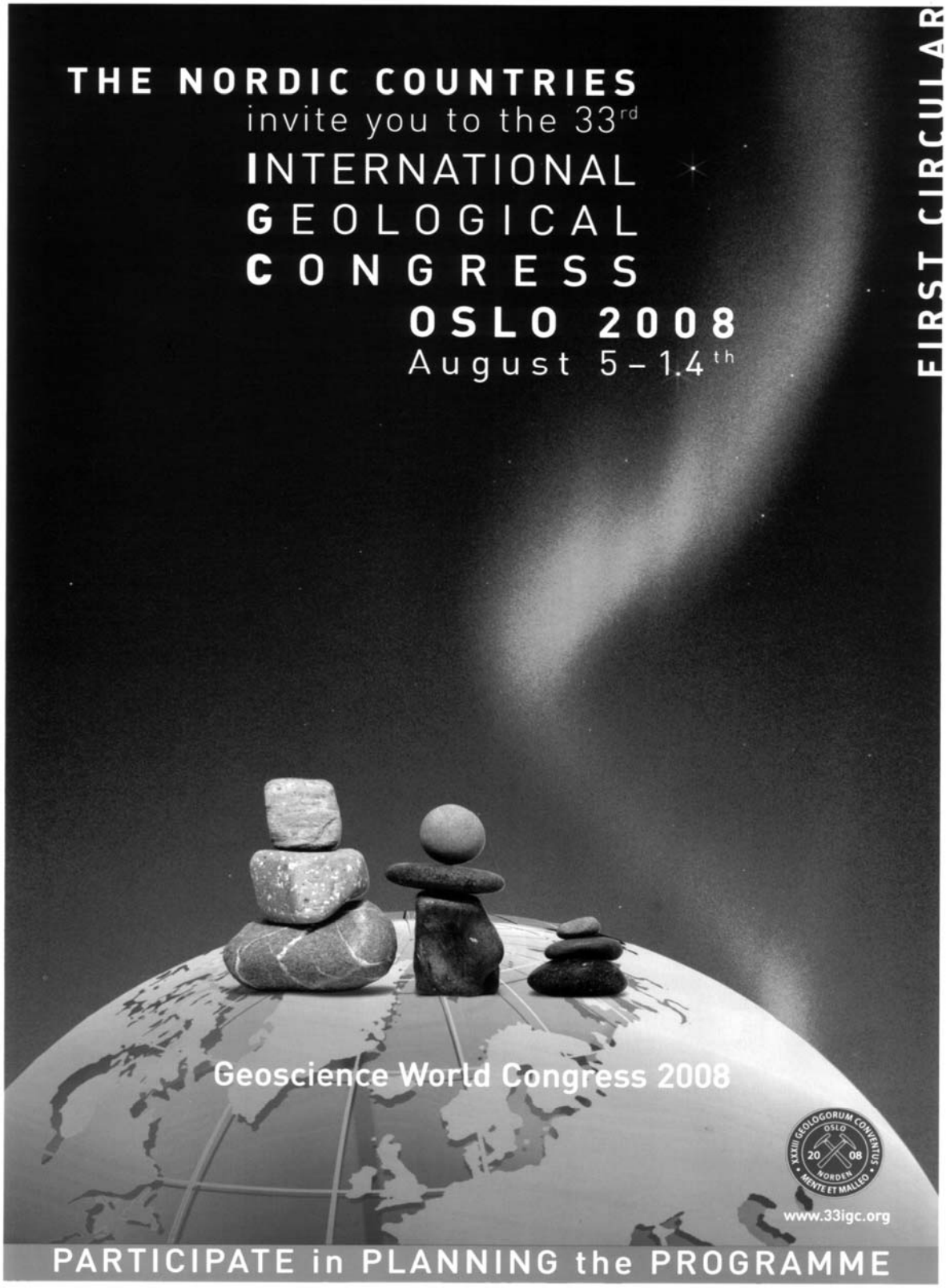
18 Sept – depart for Las Vegas, night in Las Vegas

Abstracts Due: 1 May 2007 Meeting Registration Due: 1 May 2007

2008 FIELD MEETING IN THE KITAB RESERVE, UZBEKISTAN

As decided during the SDS Business Meeting in Novosibirsk, SDS plans to re-visit the Emsian GSSP and fine Lower/Middle Devonian succession of the Kitab Reserve (Uzbekistan) at the end of August/early in September, 2008. The invitation by CM Alyosha Kim and his colleagues has recently been confirmed and the field meeting will be organized jointly by the Uzbekistan and Novosibirsk Devonian teams, including our CM Olga Obut as translator. There will be a sufficient time that allows SDS Members to attend both the Oslo IGC and the field meeting. The whole trip, which will allow a re-examination of the basal Emsian and of potential intra-Emsian substage levels, is planned to last ca. 10 days. More details will be provided at the Nevada Meeting.

SDS MEETINGS II



MEMBERSHIP NEWS

RECENT PUBLICATIONS OF CM I. BARDASHEV AND CO-AUTHORS

1. BARDASHEV, I.A.**.,** BARDASHEVA N.P.(2003a). Chumkartau type of Devonian-Carboniferous of Turkestan-Zeravshan zone. - Dokl. AN Resp. Tajikistan, **XLVI** (7-8): 5-14. (in Russian).
2. BARDASHEV, I.A.**.,** BARDASHEVA, N.P. (2003b). Demnora type of Devonian-Lower Carboniferous of Turkestan-Zeravshan zone. - Dokl. AN Resp. Tajikistan, **XLVI** (7-8): 15-23. (in Russian).
3. BARDASHEVA, N.P., BARDASHEV, I.A., WEDDIGE, K., ZIEGLER, W. (2004). Stratigraphy and conodonts of Lower Carboniferous of the Shishkat section (Southern Tien-Shan, Tajikistan). – Senckenbergiana lethaea, **84** (1/2), 225-301, 5 text-figs, 22 tabs, 15pls.
4. BARDASHEV, I.A. (2004a). The Arjanak-Varzob type of sections in Devonian of the Southhissar structure-faciale zone of the Central Tajikistan. - Proceedings of the Institut of Geology, **3**, 18-26, Donish, Dushanbe. (in Russian)
5. BARDASHEV, I.A. (2004b). Stratigraphy of Devonian and adjacent deposits of the Kalaihumb-Sauksai structure-faciale zone of the Northern Pamir. - Proceedings of the Institut of Geology, **3**, 26-34, Donish, Dushanbe. (in Russian)
6. BARDASHEV, I.A**.,** BARDASHEVA, N.P. (2004a). The Urmetan type of sections in the Devonian- Carboniferous carbonate deposits of the Turkestan-Zeravshan structure-faciale zone. - Proceedings of the Institut of Geology, **3**, 35-44, Donish, Dushanbe. (in Russian)
7. BARDASHEV, I.A**.,** BARDASHEVA N.P. (2004b). The Porut type of sections in the Devonian-Carboniferous carbonate deposits of the Turkestan-Zeravshan structure-faciale zone. - Proceedings of the Institut of Geology, **3**, 45-52, Donish, Dushanbe. (in Russian
8. ALEKSEEV, A.S., ARISTOV, V.A.,BARDASHEV, I.A. et al. 2004. Willi Ziegler- Paleontol. Zh., **1**: 107-108. (in Russian)
9. BARDASHEV I. A. (2005): The Mogoltau type of sections in the Devonian of the Beltau-Kurama structure-faciale zone. – Proceedings of the Institut of Geology, **4**: 3-12, 1 tabl. Donish, Dushanbe. (in Russian)
10. BARDASHEV I.A.., BARDASHEVA N.P. (2005): The Kalkanata type of sections in the Devonian-Carboniferous carbonate deposits of the Beltau-Kurama structure-faciale zone. – Proceedings of the Institut of Geology, **4**: 13-22, 1 tabl. Donish, Dushanbe. (in Russian)
11. BARDASHEV, I. A., BARDASHEVA, N.P., WEDDIGE, K., ZIEGLER,W. (2005): Stratigraphy and facies of the Middle Paleozoic of parts of southern Tien-Shan in Tajikistan and Uzbekistan.
12. BARDASHEV, I. A., BARDASHEVA, N. P. (2006): Kurganak type of Devonian-Carboniferous of Turkestan-Alai zone. – Dokl. AN Resp. Tajikistan. **XLIX** (2), pp. 167-171. (in Russian)
13. BARDASHEV, I. A. (2006): Karamas type of Devonian of Turkestan-Alai zone. – Dokl. AN Resp. Tajikistan. **XLIX** (3), pp. 261-266. (in Russian)
14. DRONOV, V.I., MELNIKOVA, G.K., SALIBAEV, G.H., BARDASHEV I.A. at al. (2006). Stratigraphic dictionary of the Pamirs. – Technische Universitat, Bergakademie Freiberg, 252 p., 16 text-figs.
15. BARDASHEV I.A. **(**2006a). Annotations to the Devonian Corelation Table, B253-262 di-ds 06, R 670-705 di-ds 06: Devonian bio- and lithostratigraphy of Tajikistan. – References. - Senckenbergiana lethaea, **86** (1), , P. 109-111, 1 text-fig.
16. BARDASHEV, I.A (2006b). Devonian Corelation Table, B253-262 di-ds 06, R 670-705 di-ds 06: Devonian bio- and lithostratigraphy of Tajikistan. – In: WEDDIGE, K. (Ed.). Devonian Corelation Table. - Senckenbergiana lethaea, **86** (1), , P. 117-120, 125-131, 135-141, 145-150, 20 tab. columns.
17. BARDASHEV I.A., BARDASHEVA N.P., WEDDIGE, K., ZIEGLER, W. (2006). The stratigraphy of the Shishkat reference section (Central Tajikistan, Tien Shan). - Senckenbergiana lethaea, **86** (2), pp. 289-319, 10 text-figs, 3 pls.

TM R. T. BECKER AND THE DEVONIAN GROUP AT MÜNSTER

In 2005 and 2006 research continued in Morocco, southern France and Germany and involved a range of students (mapping, Diploma and Ph. D. projects), amateur friends, cooperating specialists, and my wife Sarah. Very rich new ammonoid faunas, including important material from the Givetian, Frasnian and from around the Devonian/Carboniferous boundary, were collected in the Tafilalt and Maider. There are also important new collections from the latest Frasnian, Lower Famennian, latest Devonian (Wocklumian of the Ben Slimane area)) and Middle Tournaisian (from S of Rabat) of the Moroccan Meseta. The German Riescheid section surprisingly yielded a few pyritized clymenids that are among the westernmost specimens in the Rhenish Massif. Ian TROTH (Southampton) sent an important new goniatite from Bolivia that has

tornoceratid sutures but it may belong to an early Eifelian homoemorphic group (relative of *Mimotornoceras*) that also occurs in North Africa. But there is still a discrepancy with the supposed Emsian spores that occur in the same section. A joint manuscript with Royal MAPES (Athens, Ohio) on important latest Famennian (upper Wocklumian) ammonoids from Oklahoma has just been submitted to Acta Geologica Polonica. The Australian (Canning Basin) manuscript that was erroneously turned into a SDS report at the end of the last Newsletter is still in print with the GSWA at Perth. I have tried to give the Emsian substage discussion a little push by a document (BECKER 2006b, see this Newsletter) submitted to the Leicester meeting but I am not sure whether this will have any effect.

TM MA Xueping stayed as a guest researcher in Münster for one year and his time here was used to finish a paper on Lower/Middle Frasnian brachiopod stratigraphy of South China (MA et al. 2006). Xueping also identified Canning Basin brachiopods that co-occur in mixed neritic-pelagic faunas from the Lower Frasnian (Siphon Spring area) and in the Famennian Piker Hills Formation. Joint brachiopod-ammonoid papers are planned. He was also provided by Volker EBBIGHAUSEN (Odenthal) with nicely preserved new material from the Bergisch Gladbach area (near Cologne), which resulted in a first joint manuscript on *Desquamatia*. Xueping brought also Frasnian goniatites from Hunan that need to be described.

Much time was needed to edit the "House Volume" that will include a co-authered study (EBBIGHAUSEN et al. 2007) on joint brachiopod-ammonoid occurrences in the Dra Valley and in the Bergisch Gladbach area. We greatly appreciated that SDS Members gave us their *Uncites* and stringocephalid specimens that were collected during our 2004 Dra Valley excursion. Another contribution deals with the very condensed and incomplete Famennian successions of the Moroccan Meseta (KAISER et al. 2007). This is a first step to provide new and precise biostratigraphical data for the area in order to reconstruct in detail the complex facies history and Eovariscan tectonics of the Meseta. This work will continue and involve both Sarah and our friend Vice-Chairman Ahmed EL HASSANI. The Dra Valley field meeting stimulated more research. Gary WEBSTER (Pullman, Washington) has started to write a joint manuscript on the Frasnian crinoids collected at Oued Mzerreb. This will follow the first description of Moroccan Upper Devonian crinoids published in 2005 (WEBSTER et al. 2005). After the field meeting my mapping students discovered two nice successions through the Eifelian S of Torkoz. These were first sampled by Sarah and myself early in 2005 but we will join the large American (TM BRETT and collaborators)-Senckenberg-Rabat (Vice-Chairman EL HASSANI and collaborators) group that will investigate trilobite-bearing units of the Assa-Torkoz area this March. We hope that Middle Devonian results of the western Dra Valley can be put in the planned volume of Carlton.

During our magnificent field trip in 2005 through southern Siberia beautiful new pharciceratid material was collected in the Rudnyi Altai. It shall be published jointly with CM Kolya BAKHAREV from Novosibirsk. The large amount of other project has so far prevented this to proceed but it is clear that all collected material belongs to new taxa, including a new early triainoceratid genus (relative of the strange, so far unique *Tamarites*). A series of papers is needed to deal with the large amount of pharciceratids from southern Morocco. Investigations of other Givetian goniatites, such as maenioceratids, wedekindellids and tornoceratids, has also continued. There are may new species and even some new genera.

At Beijing and in subsequent public talks in Germany I have tried to sort out the current myths and facts concerning the Frasnian-Famennian boundary (BECKER 2006a). It would be nice to see that widely quoted but wrong concepts and allegations that are not based on any hard data eventually disappear from the discussions of causes and patterns. For non-specialists, the understanding of the Kellwasser Crisis is still strongly clouded by very contradictive hypothesis.

Zhor Sarah ABOUSSALAM

continued her work, as much as little Amira (now 22 month) allowed, on Middle Givetian to Lower Frasnian conodont faunas from Morocco, the Montagne Noire (sections Pic de Bissous and Col de Tribes) and Germany. Moroccan sections provide a precise correlation with the revised goniatite zonation and results were presented in Novosibirsk (ABOUSSALAM & BECKER 2005). In the eastern Rhenish Massif the well known but poorly published Giebringhausen section was re-sampled in detail. The Flinz limestones yielded interesting Upper Givetian to basal Frasnian faunas and peculiar sorting patterns by the turbidites. But Sarah has also to deal with Emsian conodonts from the Dra Valley, Eifelian to Frasnian conodonts from the Moroccan Meseta (that allow dating of reef complexes), topmost Tournaisian conodonts from the Montagne

Noire (BECKER & ABOUSSALAM 2005) and with interesting samples from the Frasnian/Famennian boundary of the Rhenish Massif (Beringhauser Tunnel, Wallersheim, Adorf), Frankenwald (Nordeck), Thuringia, Montagne Noire (Mont Peyroux), Morocco, and from South China. A review of the Taghanic Crisis of the Tafilalt, including many new data, is planned to be published in the forthcoming Middle Devonian volume coordinated by C. BRETT.

Tanja STEGEMANN

has published her results on phacopids from around the Middle/Upper Givetian boundary of the Tafialt (STEGEMANN 2005) but did not feel confident to establish new taxa. The taxonomic revision will have to continue. Subsequent sampling by RTB & ZSA in the latest Middle Givetian of Hassi Nebech yielded more and better specimens of the unusually large-eyed new species that Tanja recognized based on very incomplete remains.

Maren HÜBERS

has finished her B. Sc. thesis on *Gerastos* (Proetida) from Morocco (Tafilalt and Dra Valley), which resulted in the recognition of several new species that still need to be published. She has since turned to the paleobiology of Devonian ammonoids. Her M. Sc. thesis will deal with relationships between septal spacing and conch patterns.

Jennifer REMKE

also started a M. Sc. thesis on Devonian ammonoid palaeobiology. She studies relationships between sublethal shell injury rates (predator attack rates) and shell morphology, concentrating on Famennian taxa. A comparison with Lower Tournaisian injury rates may show (or not) if there was a change of predator interactions after the global Hangenberg Events.

Judith NAGEL-MYERS

finished her Ph. D. on bivalves from the pelagic facies of the Rhenish Massif in summer 2006: **Middle and Upper Devonian Cryptodonta (Bivalvia) from the pelagic Hercynian Facies – Taxonomy, stratigraphy, and palaeoecocology**. 184 pp. + 14 pls. The project was jointly supervised with M. W. AMLER (Munich/Hannover). Because of the taxonomic complexity and due to the too large amount of available material she had to concentrate on specific groups. These are the loxopteriids, supposed praecardiids, lunulacardiids, prosochasmids, chaenocardioliids and supposed "Devonian cardioliids". There is still much left to do. She has prepared several manuscripts that hopefully will come out soon. Since she got married to a nice guy from New York State, she has moved over to America and is currently allowed to use facilities at the PRI in Ithaca where she now lives.

Sandra I. KAISER

finished her Ph. D. thesis on "**Mass extinctions, climatic and oceanographic changes at the Devonian/Carboniferous boundary**" early in 2005. Her project was jointly supervised with T. STEUBER (Bochum). She has moved since to the museum in Stuttgart but continues conodont work and is busily preparing various publications. Results of her thesis were presented at meetings in Erlangen (KAISER et al. 2005), Leicester (KAISER et al. 2006a, 2006b), Cologne (KAISER et al. 2006a, 2006b), and Kiel (KAISER et al. 2006c). The most significant isotopic data were published at the end of the last year (KAISER et al. 2006d) and suggest that the Hangenberg Blackshale was deposited during an interval of climatic heating and that it led to a very massive burial of organic carbon, as evidenced by significant positive carbon isotopic excursions both in organic and inorganic carbon (carbonate). This obviously resulted in a significant draw down of atmospheric CO_2 and seems to have triggered an autocyclic very rapid cooling and even the sudden and short-termed glaciation of southern Gondwana. The data point to a scenario where eutrophication and biotic productivity (plankton blooms) first caused mass extinction (by creating anoxia) and then, in a time of strongly increased humidity, glaciation. This model works if one accepts a major role of CO_2 levels for climate but the global water cycle may have the capability to cause such effects alone.

Sven HARTENFELS

continued his Ph. D. thesis on the comparison of the *Annulata* and Dasberg Events in Europe and North Africa. He works on sections in the Rhenish Massif (Reitenberg, Oese, Effenberg, Riemke, Riescheid), Frankenwald (Köstenhof), Holy Cross Mountains (Kowala), Maider (Mrakib, Rich Bou Kourazia), and

Tafilalt (e.g., Bine Jebilet, El Atrous, Oum el Jerane, Takhbtit, Hassi Nebech). In the Rhenish Massif there are two transgressive and hypoxic levels around the Hembergian/Dasbergian (UD IV/V) boundary, one still in the range of *Po. styriacus*, one obviously above. The Moroccan Dasberg Event interval, either a black shale or limestone, or a red shale, invariably contains the oldest ammonoids of Upper Devonian V. Sven´s data will play a role in our Famennian discussion in Nevada and hopefully he will be able to attend the meeting. He presented preliminary results at meetings in Graz (HARTENFELS & BECKER 2005), Beijing (HARTENFELS & BECKER 2006a), and Kiel (HARTENFELS & BECKER 2006b). Ammonoids collected in some of his sections surprisingly yielded an admixture of typical Hembergian (e.g., *Prionoceras*) and Dasbergian (e.g., *Endosiphonites*, *Discoclymenia*) genera in the Dasberg Event interval (UD V-A1).

Several students (e.g., Benjamin BOMFLEUR and Gottfried REIMANN) continued the mapping project of Givetian to Visean strata of the eastern part of the Remschein-Altena Syncline (areas from Iserlohn to the Hönne Valley) in the northern Rhenish Massif. The mapping is supervised jointly with M. PIECHA from the Kreveld survey (now "Geologischer Dienst"). It led to the (re-)discovery of some important outcrops but, unfortunately, the conodont sampling of limestone units was only partly successful. Outcrops of the famous Seiler Conglomerate have become very poor. *Bispathodus ultimus* or the Upper *expansa* Zone was recognized in micritic limestone above the main sandstones and conglomerates. This disproves the idea (e.g., PAPROTH 1986) that the clastic interval was shed into an incised valley (Seiler Channel) during the regressive interval of the Hangenberg Event. The Seiler River system discharged clastics and oolites during a long Famennian interval. Agnes SKUPINSKI will continue the Devonian mapping E of the Hönne Valley and will study the initial phase of the thick Givetian reef complexes.

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MA, X.-P., BECKER, R. T., LI, H. & SUN, Y.-Y. (2006): Early and Middle Frasnian brachiopod faunas and turnover on the Suth China shelf. – *Acta Palaeontologica Polonica*, **51** (4): 789-812.

TM ALAIN BLIECK

Present research deals mostly with Devonian vertebrates. Several papers are in press, submitted, or in progress, on the following topics : The biostratigraphic and palaeogeographic framework of the earliest diversification of tetrapods (Late Devonian), by A. Blieck, G. Clément *et al*., in Becker, R.T. & Kirchgasser, W.T. (eds.), *Devonian Event Stratigraphy : Neritic-Pelagic Correlations - SDS volume in honour of M. House, Geol. Soc. Spec. Publ.* ; A new *Ctenaspis* (Agnatha, Heterostraci) from the Early Devonian of Nevada, with comments on paleobiology and biogeographic significance, Elliott, D.K. & Blieck, A.R.M., in Yu Xiaobo, Maisey, J. & Miao Desui (eds), *Fossil Fishes and Related Biota : Morphology, Phylogeny and Paleobiogeography – in Honor of Meemann Chang*, Verlag Dr. F. Pfeil, München ; A revised biostratigraphy of the Wood Bay Formation (Lower Devonian, Spitsbergen), and correlation with Russian Arctic archipelagos, by Pernègre, V. & Blieck, A., in *Norwegian Journal of Geology ;* Cosmopolitan Late Devonian-Early Carboniferous vertebrate microremains from the Carnic Alps, northern Italy, by Randon, C., Derycke, C., Blieck, A., Perri, M.C. & Spalletta, C., in *Geobios ;* New data on *Tesseraspis mosaica* Karatajute-Talimaa 1983, and other tesseraspid material from the Lochkovian (Lower Devonian) of Severnaya Zemlya, Russia (Vertebrata : Pteraspidomorphi : Heterostraci), by Blieck, A. & Karatajute-Talimaa, V.N., to be submitted to *Geodiversitas ;* The Lochkovian-Pragian boundary of Podolia (Lower Devonian, Ukraine) based upon placoderm vertebrates, by Dupret, V. & Blieck, A., to be submitted to *C. R. Geoscience ;* Early Devonian vertebrate biodiversity in Paliseul and Wihéries, Belgium, by Pille, L. & Blieck, A., to be submitted to *Journal of Vertebrate Paleontology ;* Vertebrate microremains from the Devonian of the Asturo-Leonese facies, Cantabrian Mountains (northern Spain), by Randon, C., Blieck, A., Derycke, C. & Garcia-Lopez, S., to be submitted to *Geobios.* Next year activities will concentrate on Early Palaeozoic vertebrates (a synthetic paper on the Cambrian-Ordovician vert database, with S. Turner, Queensland, Australia), early vert in general (*Handbook of Paleoichthyology* volume 1 on « agnathans », with D.K. Elliott ; Verlag Dr. F. Pfeil, München), heterostracans (oral communication with D.K. Elliott at the 11th Intern. Symp. on Early Vertebrates, Uppsala, August 2007 ; followed by a field trip on the Silurian of Gotland), and Middle Palaeozoic vertebrates (collaboration with V.N. Karatajute-Talimaa & Z. Zigaite, Vilnius, Lithuania in the course of a French-Lithuanian cooperative project on the Middle Palaeozoic vertebrates of Eurasia, including the Early Devonian agnathans of Severnaya Zemlya, the late Ordovician and Silurian vertebrates of Lithuania, Siberia, and central Asia ; prospection of the Famennian of the Ardenne massif, Belgium, for fishes and tetrapods, organized by

G. Clément, MNHN, Paris). I will participate to a series of local, national or international meetings (French biennial Meeting on Earth Sciences, Dec. 2006 ; Centennial anniversary of the Barrois collection – Carboniferous mostly, Natural History Museum of Lille, 2007 ; 30th anniversary of the lab of palaeontology of the University of Lille 1 in Villeneuve d'Ascq as a CNRS-associated research unit, 2007 ; national meeting of the French Association of Palaeontology, Digne-les-Bains, May 2007 ; 1rst Intern. Palaeobiogeography Symposium, Paris, July 2007), and probably also to the SDS meeting & field trip in Nevada, Sept. 2007. A pleasant year apparently …

Publications dealing with the Devonian (2005-2006)

Papers

BLIECK, A. (2005).- Dossier spécial : Stratigraphie du Paléozoïque — Introduction.- *In* : BLIECK, A. (coord.), Dossier spécial : Stratigraphie du Paléozoïque. *Ann. Soc. Géol. Nord*, **11** (2e série) (4) : 127-128, 1 fig. ; Villeneuve d'Ascq. [In French]

BLIECK, A. (2005).- La biodiversité au cours du Paléozoïque d'après l'exemple des Vertébrés aquatiques.- *Les Amis du Muséum national d'Histoire naturelle*, **221** : 4-7, 2 fig. ; Paris. [In French]

WEHRMANN, A., HERTWECK, BROCKE, R., G., JANSEN, U., KÖNIGSHOF, P., PLODOWSKI, G., SCHINDLER, E., WILDE, V., BLIECK, A. & SCHULTKA, S. (2005).- Palaeoenvironment of an Early Devonian land-sea transition: a case study from the southern margin of the Old Red Continent (Mosel valley, Germany).- *Palaios*, **20** (2) : 101-120, 17 fig., 2 tabl. ; SEPM (Society for Sedimentary Geology) publ., Tulsa (OK, USA).

BLIECK, A., BRICE, D., COURVILLE, P., CRÔNIER, C., DERYCKE, C., HUBERT, B., MISTIAEN, B., NICOLLIN, J.-P. & ZAPALSKI, M. (2006).- La Vie en Ardenne occidentale au Paléozoïque supérieur (Dévonien-Carbonifère, -416 à –299 Ma) : paléobiodiversité, événements paléobiologiques, paléoenvironnements, paléobiogéographie.- *In* : [LACQUEMENT, F. (organ.)] Géologie de l'Ardenne occidentale (Journées spécialisées, Givet, 4-6 mai 2006). *Géologie de la France*, **2006** (1-2) : 21-27, 1 fig. : Editions du BRGM, Orléans [also World Wide Web address : http://geolfrance.brgm.fr/revues\articles\GF3-1-2006.pdf]. [In French ; with English abstract]

DUMBRAVA, M. & BLIECK, A. (2006).- Review of the pteraspidiform heterostracans (Vertebrata, Agnatha) from the Devonian of Podolia, Ukraine, in the Theodor Vascautanu collection, Bucharest, Romania.- *In* : 5th Romanian Symposium of Paleontology (Bucharest, 15-17 Sept. 2005). *Acta Paleontologica Romaniae*, **5** [2005] : 163-171, 5 fig., 1 pl. ; Bucharest.

Volume

BLIECK, A. coord. (2005).- Dossier spécial : Stratigraphie du Paléozoïque.- *Ann. Soc. Géol. Nord*, **11** (2e série) (4) : 127-167, 12 fig., 7 articles, 15 auteurs ; Villeneuve d'Ascq. [In French]

Abstracts

BLIECK, A. & PILLE, L. (2005a).- Early Devonian vertebrate biodiversity, after the study of the Paliseul and Wihéries localities, Belgium.- *In* : HAIRAPETIAN, V. & GINTER, M. (eds), Devonian vertebrates of the continental margins (IGCP 491 meeting, Yerevan, Armenia, May 22-27, 2005).- *Ichthyolith Issues, Spec. Publ.* **8** : 6 ; Inst. Geol. Sci., Yerevan [abstract].

BLIECK, A. & PILLE, L. (2005b).- Early Devonian vertebrate biodiversity, after study of the Paliseul and Wihéries localities, Belgium.- *In* : IVANOV, A. & YOUNG, G. (eds), Middle Palaeozoic Vertebrates of Laurussia : relationships with Siberia, Kazakhstan, Asia and Gondwana (IGCP 491 in conjunction with 6th Baltic Stratigraphical Conference, St Petersburg, Russia, August 22-25, 2005).- *Ichthyolith Issues, Spec. Publ.* **9** : 6 ; Inst. Earth Crust, St Petersburg Univ. [abstract].

BLIECK, A., BRICE, D., COURVILLE, P., CRÔNIER, C., DERYCKE, C., HUBERT, B., MISTIAEN, B., NICOLLIN, J.-P. & ZAPALSKI, M. (2006).- La Vie en Ardenne occidentale au Paléozoïque supérieur (Dévonien-Carbonifère, -416 à –299 Ma) : paléobiodiversité, événements paléobiologiques, paléoenvironnements, paléobiogéographie.- *In* : LACQUEMENT, F. (organ.), Géologie de l'Ardenne occidentale (Journées spécialisées, Givet, 4-6 mai 2006). Communication orale [extended abstract: see papers - Blieck *et al.*, 2006]. [In French]

BLIECK, A.R.M. & ELLIOTT, D.K. (2006).- Early Devonian biostratigraphic and palaeogeographic correlations of the Old Red Sandstone Continent, with data on new heterostracans from Nevada, Spitsbergen, and Severnaya Zemlya.- *In* : YANG Qun, WANG Yongdong & WELDON, E.A. (eds), Ancient Life and Modern Approaches (IInd Intern. Palaeont. Congress, IPC 2006, June 17-21, 2006, Beijing). Abstracts : 327-328 ; Univ. Sci. Technol. China Press.

CM ILIANA BONCHEVA
About: Devonian investigations and publications –Bulgaria and Romania

Activity: A small team working at Geological Institute of Bulgarian Academy of Sciences –Sofia, Bulgaria, deal with Devonian stratigraphy, regional geology and sedimentology in Bulgaria. Dr. Iliana Boncheva - conodontologist, Dr. Iskra Lakova- palynologist, Dr. Valeri Sachanski – macropaleontologist - graptolites. Sedimentologists : Dr. Slavcho Yanev, Dr. Marlena Yaneva, ph student Polyna Andreeva. Tectonic – Dr. Yordan Malyakov.

Devonian specialists from Romania are: Dr. Mari Vaida - palynologist, Dr. Antoneta Seghedi – sedimentology, regional geology; ph student (don't know his name) who studies Devonian placoderm fishes.

1***) International projects:***
Participants from Bulgaria: Iliana Boncheva, Valeri Sachanski, Iskra Lakova

IGCP Projects 497 "Rhein ocean – its origin, evolution and correlation" 2004-2008
IGCP Project 499 "Devonian Land –sea interaction:Evolution of ecosystems and climate (DEVEC) " 2004-2008

2) ***Projects funded through collaboration between Academies and foreign institutions***

Bilateral project 102Y157 between BAS and TUBITAK, Turkey (2003-2006) –

"Correlation of the Paleozoic terranes in Bulgaria and NW Turkey in the frame of tectono-paleogeographic evolution of Gondwana" - Assoc. Prof. I. Lakova, Assoc. Prof. I. Boncheva, Assoc. Prof. V. Sachanski, Prof. Dr Slavcho Yanev.

Bilateral project BAS–CSIC–Spain (2006-2007) -

"Lithostratigraphy and biostratigraphy of Devonian-Carboniferous carbonate sections from Moesian terran (Northern Bulgaria): comparison and correlation with the same age sections from the Western board of Paleo-Tethyan. Leader: Prof. Dr Slavcho Yanev and Dr. Pedro Cozar.Participants: Assoc. Prof. Dr. I. Boncheva, Assoc. Prof. Dr. Iskra Lakova, Assoc. Prof. Dr Daria Ivanova, P. Andereeva.

3) ***Projects granted by National Scientific Foundation***
Project NF1401/20004-2007
"Correlation of stratigraphic, tectonic and metamorphic events in the Lower Paleozoic terranes of SE Bulgaria, Strandja area, Central Stara Planina and SW Bulgaria (Kraishte)" - Leader: Assoc. Prof. Jordan Malyakov, Participants: Assoc. Prof. Dr. I. Boncheva, Assoc. Prof. Dr. Iskra Lakova, , Assoc. Prof. Dr. Valeri Sachanski.

participants: tectonic and pethrography: Jordan Malyakov; paleontology, biostratigraphy, tectonic, paleoenvironment: Iliana Boncheva, Valeri Sachanski, Iskra Lakova.;

Project NF1404 /2004-2007:
"Pre-Variscan Paleozoic rocks in the Kraishte Zone: biostratigraphy, correlations, paleogeography" Leader: Assoc. Prof. Dr Iskra Lakova, Participants: Assoc. Prof. Dr I. Boncheva , Assoc. Prof. Valeri Sachanski, Dr. M.Yaneva

participants: paleontology, biostratigraphy, tectonic, paleoenvironment: Iskra Lakova, Iliana Boncheva, Valeri Sachanski,.; sedimentology, microfacial analyses : Marlena Yaneva.

Project NF1501/2005-2008:
" Microfacies analysis of the Devonian and Lower Carboniferous rocks in some bore holes in Northern Bulgaria for the aims of the paleogeography and oil, gas and geothermal waters prognosis. Correlation with the Paleozoic from the Romanian part of the Moesian terrane and the terranes in NW Turkey". Leader: Prof. Dr S. Yanev ; Participants: Assoc. Prof. Dr I. Boncheva, Assoc. Prof. Dr V. Sachanski, Assoc. Prof. Dr Iskra Lakova, Assoc. Prof. Dr D. Ivanova, P. Andreeva.

participants: paleontology, biostratigraphy, tectonic, paleoenvironment: Iliana Boncheva, Iskra Lakova.; sedimentology : Slavcho Yanev
Ph student – Polyna Andreeva – sedimentology and microfacial analyses of the Devonian and Carboniferous carbonate sediments

Recent publication lists:

Bulgarian (and Turkish) authors:

Andreeva, P.2006. Givetian microbial carbonates from the carbonate-sulphate suite in well P-119 Kardam (NE Bulgaria). –*Compt.rendus BASc* , (in reviw)
Yanev, S, Göncüoglu, M. C., Gedik, I , Lakova, I. , Boncheva, I. Özgül, N. , Sachanski, V., Timur, E., Malyakov, Y., Saydam, G.2006. Stratigraphy, correlations and palaeogeography of Palaeozoic terranes of Bulgaria and NW Turkey: a review of recent data. – *Geological Society of London, Special Publications, 260,* 51-67.

Romanian authors:

Vaida, M. & Verniers, J. 2005. Biostratigraphy and Palaeogeography of Lower Devonian chitinozoans, from East and West Moesia, Romania. Symposium Volume, *Geologica Belgica*, 8/4, 121-130.
Vaida, M. & Verniers, J.2006. Chitinozoan implications in the palaeogeography of the East Moesia, Romania. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 241: 561-571.

Abstracts and reports:
Boncheva, I., Sachanski, V. Correlations of Silurian-Devonian successions in the Balkan Terrain, Western Bulgaria. Programme & Abstracts International Conodont Symposium ICOS 2006, Leicester, 21. (2006)
Lakova I. Biodiversity, stratigraphic and geographic distribution of Pridoli and Lochkovian acritarchs and prasinophyte algae from the Moesian Terrane, North
Bulgaria. – CIMP Meeting, Praha 2006, Prague, September, p. 32, (2006). Joint Session of CIMP and IGCP 499.

CM CARLO CORRADINI

My research is mainly devoted to conodont biostratigraphy in Sardinia and in the Carnic Alps.
In Sardinia the Famennian-Tournaisian conodont biostratigraphy has been revised on the basis of all data available in literature and a few additional data from new localities: the result is a regional zonation scheme, which is broadly similar to the standard zonation schemes used in the Upper Devonian and Lower Carboniferous, though a few variations are needed to better accommodate the species occurrences in Sardinia: the *velifer* Zone and the *styriacus* Zone have been reintroduced, even if with slightly different meanings than previously used in old zonations; the Lower *praesulcata* Zone has been expanded to include the Middle *praesulcata* interval. This zonation scheme has been presented at the ICOS 2006 meeting in Leicester, and is in press in the *Revue de micropaleontologie*.
Specimens of *Siphonodella* very close to *Si. sulcata* together with a frankly Devonian association have been collected in the Monte Taccu area (SE Sardinia). The levels which yielded this fauna have been resampled and are currently in study, in order to check if it is a local anomaly, or if this have some implications on the D/C boundary definition.
A Middle-Upper Devonian section in SE Sardinia is in study together with Sofie Gouwy. Researches on Middle Devonian of Sardinia will be greatly improved in the near future, since Sofie is going to start a new PhD project (granted by Modena and Reggio Emilia University) on the Middle Devonian of Sardinia and relationships with other Mediterranean areas.

Poorly preserved conodont fauna have been recently found by two students in their master thesis projects: one from the Lochkovian of SW Sardinia, the second from the Frasnian and Famennian of the Monte Lora area (SE Sardinia).
In the Carnic Alps researches are mainly devoted to the Silurian-Lower Devonian *Orthoceras* limestone. However geological mapping includes also the different Devonian facies cropping out in the area.

Published papers and abstracts related to Devonian (2004-2006)

CORRADINI C., 2004, Famennian (Late Devonian) conodonts from the Corona Mizziu sections (SE Sardinia, Italy). *Palaeontographia Italica*, 89 (2002), 63-114.

CORRADINI C., SERVENTI P., SIMONETTO L. & PONDRELLI M., 2004, Loboliths (Crinoidea, lowermost Devonian) from Mount Zermula area (Carnic Alps, Italy). Devonian neritic-pelagic correlation and events, International meeting on stratigraphy, Rabat, Morocco. March 1-10, 2004 – Abstracts, 52-53

CORRADINI C., 2004, Late Devonian-Early Carboniferous conodont biostratigraphy of the "Clymeniae limestones" of Sardinia, Italy. GSA annual meeting, Boise, May 2004 Geological Society of America Abstracts with Programs, 36(4), 65.

CORRADINI C., 2004, Silurian and Devonian biostratigraphy and palaeontology of Sardinia (Italy) and palaeogeographic implications. GSA annual meeting, Boise, May 2004 Geological Society of America Abstracts with Programs, 36(4), 83.

LARGHI C., CORDEY F., CORRADINI C., GAETANI M. & NICORA A, 2005, Palaeozoic (Silurian and Devonian) radiolarians and conodonts from the chert olistoliths of the Volissos Turbidites, Chios island, Greece. *Eclogae Geologicae Helveticae*, 98, 123-131.

CORRADINI C., SIMONETTO L., SERVENTI P., CALLIGARIS C. & RIGO R., 2005, Loboliti (Crinoidea) del Devoniano basale di Monte Zermula (Alpi Carniche, Italia). *Rendiconti della Società Paleontologica Italiana*, 2, 27-34.

SIMONETTO L & CORRADINI C., 2006, Il Paleozoico carnico – The Palaeozoic succession of the Carnic Alps. In: Corradini C., Muscio G. & Simonetto L. (a cura di), Escursione in Friuli. Edizioni Università di Trieste, 84-92.

PONDRELLI M. & CORRADINI C., 2006, Inquadramento geologico dell'area del Cason di Lanza – Geological settings of the Cason di Lanza area. In: Corradini C., Muscio G. & Simonetto L. (a cura di), Escursione in Friuli. Edizioni Università di Trieste, 100-102.

CORRADINI C. & SIMONETTO L., 2006, La facies di retroscogliera: i calcari ad Amphipore – The back reef facies: *Amphipora* Limestones. In: Corradini C., Muscio G. & Simonetto L. (a cura di), Escursione in Friuli. Edizioni Università di Trieste, 103-105.

SPALLETTA C. & CORRADINI C., 2006, La scogliera devoniana – The Devonian reef. In: Corradini C., Muscio G. & Simonetto L. (a cura di), Escursione in Friuli. Edizioni Università di Trieste, 96-99.

CORRADINI C. & SIMONETTO L., 2006, Il Siluriano e il Devoniano Inferiore carnico: la Sezione "Rio Malinfier" – The Silurian and Lower Devonian in the Carnic Alps: the "Rio Malinfier" Section. In: Corradini C., Muscio G. & Simonetto L. (a cura di), Escursione in Friuli. Edizioni Università di Trieste, 114-117.

HRATOVIC H., CORIC S., SCHÖNLAUB H.-P., SUTTNER T. & CORRADINI C., 2006, The conodonts from Palaeozoic from the Mid-Bosnian schist mountains, central Dinarids (Bosnia and Herzegovina). Proceedings of the XVIIIth congress of the Carpathian-Balkan Geological Association, September 3-6, 2006, Belgrade, Serbia, 226-228.

CORRADINI C., 2006, A Famennian-Tournaisian (Late Devonian-Early Carboniferous) regional conodont zonation in Sardinia (Italy). In: Purnell M. et al., ICOS 2006, Programme & Abstract, 27.

CM JED DAY
Givetian-Famennian of Western Canada

Western Alberta Miette and Ancient Wall Detached Reef Platform and Basinal Successions.—We (JD-C.M.; Michael Whalen, University of Alaska-Fairbanks, and Jeff Over-C.M. SUNY Geneseo) are nearing completion of field operations in western Canada to complete outcrop investigations of the late Givetian-Famennian in the Alberta and British Columbia Rocky Mountains and southern Northwest Territories. The focus of this major project is to develop a high resolution brachiopod-conodont biostratigraphy, shelly fossil records of late Givetian-Famennian bioevents at multiple sites featuring F-F boundary sections, and temporal control for detailed Magnetic Susceptibility records (fourteen basin-wide ms excursions or events) spanning the entire late Givetian-Early Famennian, as well as detailed sea level event records (see Whalen and Day,

2005, 2007-in press; Day and Whalen, 2005, 2006; Day et al. 2005; Lester et al., 2005). Thus far we have replicated the late Givetian-Famennian brachiopod sequence in the Alberta Rocky Mountain outcrop

documented in earlier studies by workers including McLaren, Sartenaer, Raasch, Warren, and Warren and Stelck, now tied directly to the conodont sequence initially documented by Gil Klapper and Richard Lane in the 1980s. Work is underway on monographic description of well preserved, diverse and abundant middle Frasnian-early Famennian brachiopod sequence in the Hay River and Mckenzie River areas of the southern NWT (see Day and Whalen, 2006, in preparation), Alberta, and BC. Initial digital images of all taxa will be posted on website as they become available, with the website coming on-line later this year, all new taxa will be listed in open nomenclature prior to formal descriptions are completed and inpress.

Kakwa Park-Eastern BC.—We anticipate completing field-based sampling in the Kakwa-Cecilia Lakes area featuring well developed late Givetian-Famennian continental shelf succession originally illustrated by Gil Raasch in the early 1970s, featuring well-developed brachiopod and conodont sequences in July of 2007. The base of the Devonian continental shelf sections can now be documented to be older than previously thought (Raasch interpreted base as late Givetian or early Frasnian), with the initial marine transgression coinciding to the initial Taghanic Event (upper Middle varcus Subzone), with Flume Formation fringing reef development likely beginning during the *disparilis* Zone (Day et al., 2005), and Flume reef drowning by offshore facies of the Waterways Formation likely during the very late Givetian *norrisi* Zone.

Eifelian-Famennian of the Iowa and Illinois Basins.

Eifelian-Early Frasnian of the Iowa Basin-Southeastern Iowa.—Preliminary results of current sequence stratigraphic, conodont-biostratigraphic, magnetostraigraphic, and chemostratigraphic investigations of the Late Eifelian-Middle Givetian Wasipinicon Group and Middle Givetian-Early Frasnian Cedar Valley Groups, and Late Frasnian-Early Famennian Sweetland Creek-Grassy Creek shales were recently outlined in number of contributed articles contributed to the Great Lakes Section of the Society for Sedimentary Geology Fall 2006 Field Conference Guidebook (see Day et al. [eds.] below. The Guidebook will be available for download as a PDF from the Iowa Geological Survey's website shortly (http://www.igsb.uiowa.edu).

Authors and Titles of Contributed ISGS Guidebook 25 Papers

1]-J. Day: Overview of the Middle – Upper Devonian Sea level Event History and Biostratigraphy of the Wapsipinicon and Cedar Valley Groups of Southeastern Iowa.
2]-B. J. Witzke and B. J. Bunker: Middle Shelf Facies of the Cedar Valley Group (Devonian) and their Stratigraphic Relationships in Eastern Iowa.
3]-B. J. Witzke and B. J. Bunker: Stratigraphy of the Wapsipinicon Group (Middle Devonian) in Southeastern Iowa.
4]-B. Elwood and J. Day: Magnetic Susceptibility Magnetostratigraphy of the Late Eifelian-Early Frasnian Rocks of Southeastern Iowa and Provisional Correlation to the Eifelian-Givetian and Givetian-Frasnian GSSPs in North Africa and Europe.
5]-C. Stock and M. Turner: Stromatoporoids in the Idlewild Member of the Lithograph City Formation in Iowa: How they reflect global paleobiogeographic trends of the Middle-Late Devonian.
6]-R. van Geldern, M. Joachimski, and J. Day: Devonian Stable Isotope Records from the Iowa Basin.
7]-D. J. Over: Frasnian-Famennian Boundary at the Type Sweetland Creek Shale Locality.
8]-B. D. Cramer*[1], M. A. Kleffner[2], and M. R. Saltzman[1]: Chemostratigraphic Correlation of Lower Silurian Deposits in Eastern Iowa: Placing the Llandovery-Wenlock Boundary in the Mid-Continent.
9]-Emerson, N. and J. A. Simo Sedimentology and Sequence Stratigraphy of a Mixed Carbonate-Siliciclastic System within the Ordovician (Caradocian, Mohawkian) Epeiric Sea, Decorah Formation, Upper Mississippi Valley Region, USA
10]-John A. Luczaj: Sulfur Isotopes from Mississippi Valley-Type Mineralization in Eastern Wisconsin

Late Frasnian-Famennian Event Stratigraphy-Biostratigraphy, Organic Matter Characterization-Floral Dynamics and the Famennian Greenhouse-Icehouse Transition.—A working group (CM J. Day, B.J. Witzke, Iowa Geological Survey; CM D.J. Over; S Rimmer and Harry Reid, Universityof Kentucky) is presently engaged on study of the late Frasnian to late Famennian in the subsurface Sullivan Core from the western margin of the Illinois Basin. The Sullivan Core features a nearly complete late Frasnian to late

Famennian hemipelagic basinal succession with virtually pristine organic-rich shales (conodont CAI of 1 or less), displaying cyclicity at varying scales (cm, m, 10s m). We have completed preliminary sampling at fine scale (every 30 cm, continuous sampling at 5 cm or less scale across the F-F boundary interval) to provide unprecedented biostratigraphic control to constrain the timing of major 3rd order sequence packages. Rimmer and her colleague (H. Read) and students are characterizing the organic matter in the sequence to asset the role that terrestrial higher plants played in altering the mode of organic carbon accumulation in the extensive, anoxic marine setting in the Appalachian and Illinois basin and document a marine record of this terrestrial colonization using organic petrography and organic geochemistry, and demonstrate that an increased influx of terrestrial organic matter may have been a more important factor in the accumulation of organic-rich sediments during that time in Earth history than previously realized. This study is in progress and we would encourage participation by specialists in Devonian miospores interested in assessing a potentially complete miospore floral record for the Famennian.

Eifelian-Middle Givetian of the Southern Illinois Basin.—J. Day and students are presently engaged in restudy of the sequence stratigraphy, conodont biostratigraphy, brachiopod sequence and stable carbon isotopic chemostratigraphy of Grand Tower and Saint Laurent formations in the southern Illinois Basin Sparta Shelf area, and have documented a significant ∂C^{13} excursion coincident with the initial major marine flooding event of Devonian T-R cycle If, at or just above the Eifelian-Givetian boundary, recognized elsewhere in Europe (van Geldern et al., 2006; Buggisch and Joachimski, 2006), to be formally reported later this year.

Very Late Famennian Hangenberg ∂C^{13} Excursion.—We (see recent reports by Day et al., 2005; Cramer et al., in press).recently completed a study of the whole-rock (micrite) ∂C^{13} chemostratigraphy of the very late Famennian Louisiana Limestone in eastern Missouri (Upper *praesulcata* Zone) with a major plus 5-7 per mil ∂C^{13} event recording the peak of the very late Famennian excursion reported from European and north African sections by TM Becker and his student Sandra Kaiser.

RECENT PUBLICATIONS OF CM J. DAY.

Journal Articles

Day, J. and Whalen, M.T., 2005, Thornton Creek Member (new) of the Flume Formation and the initial Middle Devonian Onlap of the West Alberta Arch: Canadian Rocky Mountains. Bulletins of American Paleontology. No. 369, p. 123-149.

Van Geldern, R.., Joachimski, M.M., *Day, J.*, Jansen, U., Alvarez, F., Yolkin, E.A., Ma, X-P., 2006, Carbon, oxygen and strontium isotope records of Devonian brachiopod shell calcite. Palaeogeography, Palaeoclimatology, Palaeoecology, v. 240, p. 47-67.

Guidebooks

Day, J., Luczaj, J., and R. Anderson, (eds.), 2006, New perspectives and advances in the understanding of Lower and Middle Paleozoic Epeiric carbonate depositional systems of the Iowa and Illinois basins. Iowa Geological Survey Guidebook Series No. 25, 168 p.

Guidebook Articles

Day, J., 2006, Overview of the Middle-Upper Devonian Sea level event history and biostratigraphy of the Wapsipinicon and Cedar Valley groups, with discussion of new conodont data from the subsurface Cedar Valley Group of southeastern Iowa. In Day, J, Luczaj, J., and R. Anderson, (eds.), New perspectives and advances in the understanding of Lower and Middle Paleozoic epeiric carbonate depositional systems of the Iowa and Illinois basins. Iowa Geological Survey Guidebook Series No. 25, p. 3-21.

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TM NADEZHDA IZOKH (NOVOSIBIRSK, RUSSIA)

In year 2006 the name of our institute have been changed. Now it is Trofimuk Institute of Petroleum Geology and Geophysics Siberian Branch of RAS (IPGG).

2005 экскурсия в рамках SDS и проекта 499

During the year 2006 different activities have to be reported. The Regional Stratigraphic Charts for Devonian of South of West Siberia have been revised during late 2005 and in 2006. Several regional meetings of Russian Devonian stratigraphers were taking place in Novosibirsk and Novokuznetsk. The first results have been included in Weddige (Ed), 2006 and Yolkin et al., 2006a (see references below). Revised version of Stratigraphic Charts for Siberia is under preparation.

Works continued on Upper Devonian conodonts and radiolarians. Talks were presented by TM N. Izokh and CM O. Obut during the 2nd International Palaeontological Congress (IPC2006), Beijing, China, June 17-21, 2006 (Izokh, Yolkin, 2006; Obut, 2006). Together with my colleague from IPGG O. Obut we attended field excursion from June 11-16, 2006 in Guilin, southern China. The mentioned above abstracts concerns mainly on fauna distribution and event boundaries. Shallow-water conodont associations are recovered from the Upper Devonian sections of the north-eastern Kuznetsk Basin. Radiolarian fauna from Frasnian-Early Famennian (*disparilis* to *triangularis* zones) of the Rudny Altai (South of West Siberia, Russia) was revised and described including the new species (paper by O.Obut, T.Tshcherbanenko, in press).

Early Famennian conodont association from the Domba Formation, West Taimyr (Domba River) is revealed (E.Yolkin, N.Izokh). It characterizes short stratigraphic interval of the Uppermost *crepida* Zone (Yolkin et al., 2006b)

Conodonts were obtained from the Devonian sediments of the Shchuchya Cape, north-western part of the West-Siberia Geosyneclise (E.Yolkin, N.Izokh). They allowed to recognized zonal intervals of Upper Emsian, Eifelian, Frasnian and Famennian useful for more precise interregional correlations (Izokh et al., 2006).

CM E.A. Yolkin (2006) summarized his investigations on the regular pattern in succession on the chronostratigraphic subdivisions of the Global Stratigraphic Chart. He showed there is no just one categorie between “Series” and “Stage” to incorporate informal units / regional Stages in System’ model. He proposed to use for this categorie the term “Etage”.

Field works in Novosibirsk, Kemerovo and Altai regions and in East Kazakhstan have been carried out in August-September 2006. The Middle and Upper Devonian sections have been examined. Sampling on microfauna (conodonts, ostracods, radiolarians and chitinizoans), brachiopods, corals, stromatoporoids and for isotopic studies (C and O) was made. Participants: CM N.K. Bakharev, TM N.G. Izokh, V.G. Khromykh, PhD student O.P. Izokh, master students of Novosibirsk State University T.A. Shcherbanenko and T.N. Toropova.

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CM ULRICH JANSEN (FRANKFURT AM MAIN)

During the last years, I have continued my work on Lower Devonian brachiopod stratigraphy of the Rheinisches Schiefergebirge. Some new strophomenid, orthid and spiriferid taxa are presently described, many other taxa are revised. A new biozonation consisting of 23 taxon range zones based on spiriferid taxa and 16 assemblage zones connected to the spiriferid zones shall be proposed in a forthcoming monograph. Devonian delthyridoid brachiopods from South China in comparison with European forms are studied in colloboration with Chen Xiuqin (Nanjing Institute of Geology and Palaeontology). We did some field work in

South China and the Rheinisches Schiefergebirge. A first paper has been submitted to *Fossils and Strata*, as a contribution to the symposium volume of the International Brachiopod Congress in Copenhagen 2005.
A new colleague, Mena Schemm Gregory, has started a Ph.D. on phylogeny of Devonian delthyridoid brachiopods, with focus on forms from North America, Europe and North Africa. She has already presented first results on conferences. A paper on a new Devonian terebratulid (rhenorensselaeriid) genus in collaboration with her could be finished in 2005 and submitted to Acta Palaeontologica Polonica.
I am working in a sub-project of the IGCP 499, the DEVEC-TR (project leaders V. WILDE Frankfurt and N. YALÇIN, Istanbul), dealing with stratigraphy, facies and palaeogeography of the Turkish Devonian. In May 2005 I joined field work in the Istanbul region organized by N. YALÇIN and colleagues. Rich brachiopod faunas have been collected which are now being studied.

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CM SEMEN A. KRUCHEK (MINSK, BELARUS)

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In recent years Dr. Kruchek together with colleagues (CM Dr. T.G. Obukhovskaya, Dr. V.I. Pushkin, Prof. E.A. Vysotsky et al.) has been engaged in studies of different aspects of Devonian deposits (stratigraphy, palaeontology, lithology, palaeogeography, mineral resources, etc.) in the western regions of the East European Platform (Belarus). Results of these studies were reported at various conferences:

51st Session of the Palaeontological Society of the Russian Academy of Sciences devoted to "Palaeontological records of regional and global events" (April 4–8, 2005, St. Petersburg), Russia.

International Meeting "Reef geology" (July 4–6, 2005, Syktyvkar), Russia.

International Meeting "The Sixth Baltic Stratigraphical Conference" (August 23–25, 2005, St. Petersburg), Russia.

International Symposium on the IGCP Project 491 "Middle Palaeozoic Vertebrates. Biogeography, Palaeogeography and Climate" (August 23–25, 2006, St. Petersburg), Russia.

Belarussian Republican Stratigraphical Meeting (September 29–30, Minsk), Belarus.

52nd Session of the Palaeontological Society of the Russian Academy of Sciences devoted to "Present-day palaeontology: classical and non-routine approaches" (April 3–7, 2006, St. Petersburg), Russia.

Scientific and Applied conference "Efficient ways of seaching for, prospection and exploration of oil pools in Belarus" (October 4–6, 2006, Gomel), Belarus.

A start has been made in the study of jawless fishes and fishes in Devonian deposits of Belarus. Young researcher Dmitry P. Plaksa has prepared a thesis for master's degree entitled : "Devonian (Upper Emsian-Frasnian) fish fauna of Belarus and its stratigraphic importance".

As a Chief of the Stratigraphic Commission of Belarus Dr. Kruchek was an organizer of the scientific conference "Belarussian Republican Stratigraphic Meeting" (September 29–30, 2005, Minsk), where a New Stratigraphic Chart of Devonian deposits of Belarus was presented and discussed (authors of the Chart: Obukhovskaya T.G., Kruchek S.A., Pushkin V.I., Nekryata N.S., Obukhovskaya V. Yu.).

List of papers published in 2005–2006

1. Kruchek S.A. (2006) Important contribution to the development of stratigraphic investigations.(New issue of "Stratigraphic Code of Russia".3rd edition. A.I. Zhamoida, Editor-in-chief. VSEGEI Publ., 2006. 96 p. // Lithosphere. № 2(25). P. 1`59–160 (in Russian).

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3. Kruchek S.A., Obukhovskaya V.Yu. (2005).The age and Devonian volcanism stages in the North-Pripyat region of Belarus in the context of searching for diamondiferous structures // Analysis of the current state of the art and avenues of future diamond prospection in Belarus: Proceedings of the Scientific and Practical Meeting, 2005. Minsk. P. 49-59 (in Russian).

4. Kruchek S.A., Obrovets S.M., Antipenko S.V. (2005). Early–Famennian organogenic formations in the Pripyat Trough (Belarus) // Geology of reefs: Proceedings of the International Symposium. Syktyvkar, Komi Republic, Russia, July 4–6, 2005. Syktyvkar: Geoprint. P. 93–94 (in Russian, English summary).

5. Obukhovskaya T., Kruchek S. (2005). The substage division of the Eifelian and Givetian in Belarus // The Sixth Baltic Stratigraphical Conference, August 23–25, 2005. St. Petersburg, Russia: Abstracts. St. Petersburg. P. 87–90.

6. Obukhovskaya T.G., Kruchek S.A., Pushkin V.I., Nekryata N.S., Obukhovskaya V.Yu. (2005). Stratigraphic Chart of Devonian deposits of Belarus // Lithosphere. № 1(22). P. 69–88 (in Russian, English summary).

7. Obukhovskaya V.Yu. (2005). Some characteristic species of miospores from Lower Frasnian deposits of Belarus // Lithosphere. № 2(23). P. 38–44 (in Russian, English summary).

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9. Plaksa D.P. (2005). New data of the acanthodians (Pisces, Acanthodii) of the Devonian of Belarus // Lithosphere. № 2(23). P. 33–37 (in Russian, English summary).

10. Plaksa D.P. (2005). Ichthyofauna assemblage from Upper-Devonian deposit of the "Gralevo" quarry (Ruba settlement, Vitebsk region) // Palaeontological records of regional and global events: 51st Session of the Palaeontological Society of the Russian Academy of Sciences, April 4-8, 2005: Abstracts. St. Petersburg. C. 96–98 (in Russian).

11. Plaksa D.P. (2005). Comparate analysis of vertebrate assemblages from Upper Devonian deposits of the Orsha Depression and Main Devonian Field // Ichthyolith Issues. Special Publication 9. St. Petersburg. P. 29–30.

12. Plaksa D.P. (2006). Alternation of vertebrate assemblages of the sea coast ecosystems in the Middle and Late Devonian of Belarus // Modern palaeontology: classical and unconventional. 52nd Session of the Palaeontological Society at the Russian Academy of Sciences, April 3-7, 2006: Abstracts. St. Petersburg. P. 101–103 (in Russian).

13. Plaksa D.P. (2006). Stratigraphy of Middle and Upper Devonian deposits of the southeast of Belarus (from fish fauna data) // Lithosphere. № 2(25). P. 25–36 (in Russian, English summary).

14. Resolutions of the Belarussian Republican Stratigraphic Meeting 2005 (2006). Lithosphere. № 1(24). P. 137–155 (in Russian).

15. Vysotsky E., Kruchek S. (2005). Formation stages and stratigraphic position of Paleozoic potassium-bearing deposits in the Pripyat Trough // Problems of Water Resources, Geothermies and Geoecology: Proceedings of the International Scientific Conference devoted to the 100th anniversary of academician G.V. Bogomolov. Minsk, June 1–3, 2005. Minsk. Vol. II. P. 149–151 (in Russian).

CM ELGA MARK-KURIK (TALLINN, ESTONIA)

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Last year was hard for our Institute of Geology, Tallinn University of Technology (previous Institute of Geology, the Estonian Academy of Sciences). We were to leave our old rooms in the centre of the city in Estonian Ave 7 we housed half of a century, and removed to the university campus (Ehitajate tee 5, 19086 Tallinn). Our enormous collections got a new storeroom, unfortunately again in the basement. And packing of collections etc took almost a year. Fossil fishes needed a special care, many of them being extremely fragile, in particular the famous psammosteid heterostracan collection.

Not much could be done in scientific research work. In the abstract of the Palaeontological Congress, Beijing an inevitable negative biostratigraphical result was presented. Even so poor fish assemblage of the basal part Middle Devonian of Canning Land, East Greenland lost from its list one of the gigantic arthrodire, *Heterostius*. Its holotype and single specimen appeared to belong to another large placoderm from the same locality, now with a corrected name *Homostius groenlandicus* (Stensiö, 1938). A table to the abstract (not published) shows the occurrences of both arthrodires on the Northern Hemisphere. They do not obligatorily occur together: in a number of regions either *Homostius* or *Heterostius*, or their related forms have been known.

Homostius	***Heterostius***
Baltic area: Estonia, Latvia, NW of Russia (Leningrad, Pskov Districts). Middle Devonian	
Siberian arctic, **Severnaya Zemlya**. M. Devonian + Lower Devonian heterostiid *Tollichthys*	
Svalbard. *Homostius* in Middle? and Lower Devonian + L. Devonian heterostiid *Herasmius*	
Canadian arctic, Ellesmere I**.** **Homostiid, Middle Devonian**	
Canning Land, East Greenland**.** ***Middle Devonian***	
Scotland**. Middle Devonian**	Rhineland**. Middle Devonian**
	S China**. Lower Devonian heterostiid *Yinosteus***

On the conference of the Geological Survey of Estonia a review was given on the long lasted excavations in the Karksi locality, SW Estonia. Twelve excavations took place from 1953 to 1973 in this Middle Devonian (Givetian) fossil fish locality, yielding thousands of well-preserved skeletal elements and several new species of psammosteid heterostracans, placoderms and sarcopterygians.

Two papers are in press and will be published in 2007. In the paper on the actinolepid genus *Erikaspis* n.gen. it was pointed out that the Early Devonian basin in Podolia had direct contact with marine basins in Lviv and Radom – Lublin areas in western Ukraine and Poland. The rich fish fauna lived in a shallow marine environment. The second paper on the Kačák Event gave among others a valuable result, concerning the Eifelian age of the Achanarras horizon in Scotland and the Kernavė Formation in Baltic area, i.e. units permitting to correlate the fish dominating Middle Devonian of these regions.

Cooperation with colleagues, actively collecting and studying fossil fishes in Scotland, resulted in a short but productive and pleasant visit of Michel Newman (Aberdeen University) and Jan den Blaauwen (Amsterdam

University) to Tallinn, and then to Riga, where were met by Ivars Zupiņš (Natural History Museum of Latvia). As weather in last November in Baltic was unusally mild, even a visit of the famous Lode fish locality and two more Devonian outcrops was possible.
Anne Põldvere (Geological Survey of Estonia) and E. M.-K. are busy with a more recent version of the Devonian stratigraphical chart that will be distributed as CD disks among mapping and exploration geologists, and perhaps a published variant as well.

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TM JOHN MARSHALL
SOUTHAMPTON (NATIONAL OCEANOGRAPHY CENTRE)

It has been a busy Devonian year. In March I participated in the joint project with the Nanjiang Institute of Palaeotology and Stratigraphy. The UK end is sponsored by the Royal Society and is led by Chris Berry (Cardiff) with Charlie Wellman (Sheffield). The NIGPAS participants are Wang Yi and Huai Cheng Zhu. The project runs for two years and is an attempt to integrate the Devonian macrofossil plant and spore record from China. There is particular emphasis on *in situ* spores (i.e. in sporangia). Significant effort has been put into comparing Devonian vegetation and spores on the different microplates that make up China. Fieldwork has, to date, been in South China (Yunnan). Huai Cheng Zhu and Wang Yi subsequently visited Southampton and Cardiff in December.
In July I visited Syktyvkar and Ukhta in the Timan, Komi Republic, Russia. This is a joint project with Olga Telnova from Syktyvkar, again sponsored by the Royal Society. Fieldwork was carried out on sections in the Frasnian and Famennian on the River Ishzma. Olga Telnova visited Southampton in November to complete a m/s on the palynology of the Givetian-Frasnian boundary.
In July I attended the ECOS VI meeting in Leicester, UK. This was primarily to attend the SDS business meeting. This was held in the evening in the conference accommodation and finished just before midnight in time for 'last orders at the bar'.
In late July and August I led an expedition to the Old Red Sandstone in East Greenland to study the Late Devonian to Early Carboniferous interval. Other participating scientists were Chris Berry (Cardiff, macroplants) and Henning Blom (Lund, vertebrates) together with Simon Johnson (Southampton) and Clive Johnson (CASP, Cambridge who organised the logistics). Field transport was by inflatable boats from a forward tundra strip in Strindberg Land. The first locality was the classic *Ichthyostega* section in Paralleldal on Gauss Halvø. We relocated the famous 1174m in situ *Ichthyostega* locality and managed to cycle correlate to the coastal sections. We then moved to these coastal sections on Stensïo Bjerg and Nathorst Bjerg. Here we studied the plants and fish in the latest Famennian including the terrestrial D-C boundary section where a detailed collection of spore samples was also made. The group then moved to Celsius Bjerg on Ymer Ø and studied the same interval but in a more proximal section. Importantly the section on Celsius Bjerg was found to continue above the D-C boundary into the earliest Carboniferous.
In early September I attended the CIMP palaeozoic palynology conference in Prague and gave 2 talks and contributed to a third.

In October I attended the GSA meeting in Philadelphia and did a presentation at the Beerbower Symposium. (Astin & Marshall, *The age and environment of the East Greenland tetrapods*). I took the opportunity to go on the Catskill fieldtrip led by Ted Daeschler that included the important Red Hill tetrapod site. Many Devonian colleagues were present at the meeting and there was a very interesting and well attended session on Devonian-early Carboniferous glacials. The other important thing that we learnt was the high quality data that comes from conodont isotope studies. We can expect, with time, even better high resolution isotope curves for the Devonian.
The year concluded at the Palaeontological Association 50th Annual Meeting in Sheffield.

This year Ian Troth completed his PhD on the Devonian of Bolivia. He has now joined BG as a geologist.

TM GRZEGORZ RACKI
TWO NEW DEVONIAN MONOGRAPHS FROM POLAND

Acta Palaeontologica Polonica **51** (4), 2006, 606 -828
Thematic issue: Biotic aspects of the Early-Middle Frasnian eventful transition
(http://www.app.pan.pl/app51-4.htm)

Generally unappreciated significance is the fact that important changes in of global carbon budget are not always associated with recognized Devonian biotic events: they can still be found during quiet 'background' intervals, as exemplified by the Silurian–Devonian boundary interval that appears to coincide with one of the largest carbon isotope excursions in the Phanerozoic. Even larger δ13C spike is discovered recently in the Early-Middle Frasnian (E-MF) passage beds of Ardennes (Yans et al., *Geological Magazine*, 144, 2, in press). A high stratigraphical resolution of the brachiopod calcite record at intra-zonal scale allowed Alain Preat's group to identify the abrupt negative δ13C excursion in the *Palmatolepis punctata* Zone and interrupts the more slow, at least regionally greatest Devonian positive δ13C shift initiated during the Early Frasnian *Palmatolepis transitans* Zone; similar large-scale isotopic signals are reported in literature from Early-Middle Frasnian timespan of Moravia and South China, and suggest it is supra-regional, and possibly even global event. Noteworthy, in light of these data, the biogeochemical turnover in the *Pa. punctata* Zone was not linked neither with a main sea-level change nor essential climatic and evolutionary turning points.

The multidisciplinary study of Frasnian localities of the South Polish-Moravian shelf (mainly in Holy Cross Mountains) has highly refined this general ecosystem pattern. In fact, the project was inspired by results of previous Belgian-Polish geochemical study presented in Yans et al. (in press). The collective works were performed within the international research programme "Ecosystem aspects of major carbon isotope anomaly in the Lower–Middle Frasnian transition" (grant 3 P04D 040 22 for G. Racki), funded from 2002 to 2005 by the Committee for Scientific Research in Poland, and the comprehensive geochemical results will be presented in a monograph volume elsewhere. The main aim of this thematic issue of *Acta Palaeontologica Polonica* (vol. 51, issue 4), edited by A. Baliński, E. Olempska and G. Racki, was to present the spectrum of biotic responses to the major Frasnian perturbation of carbon cycle, as well the reference successions.

The results of 11 studies (see the list below) were presented in this collected volume by contributors from Poland, Russia, Belgium, China, U.S.A and Germany. Papers are ordered reflecting palaeogeographical location, and the main suite of papers is devoted to the reference South Polish epeiric domain, based on Holy Cross and Cracow regions.
The opening paper by Pisarzowska et al. is a regional event-stratigraphical synopsis, based on high-resolution and multi-proxy biotic and geochemical records, thought to be representative at least of the south-eastern Laurussian carbonate shelf. With introductory emphasis on improved conodont zonal framework and combined bio- and chemostratigraphic correlations, the authors as a final point outline the regional reef ecosystem response to the pronounced four-step biogeochemical perturbation (with a major abrupt positive δ13C shift of about 5‰), superimposed on large-scale sea-level fluctuations referred to Timan, Middlesex and Rhinestreet global events. In particular, temporal trends in nektonic conodont faunas, partly replicated by benthic communities, indicate that the faunal turnover steps well correlate with the main δ13C excursions, and probably record related habitat adjustments, still poorly understood. In particular, negative carbon

isotopic spikes are associated with diversity loss and other biotic responses to a high-stress setting. Nevertheless, with exception of collapsed endemic biota of the Kadzielnia-type mud-mound, and moderate biodiversity loss due to overall ecosystem stagnation and transient breakdown of carbonate production, no more significant crisis can be proved in the regional perspective.

As a comprehensive documentation of the overview inferences, the first group consists of five articles dealing with succession of particular fossils groups across the key Frasnian interval on the South Polish carbonate shelf, with emphasis on the key foreslope section of the Dyminy reef complex at Wietrznia in Kielce. The next supplementary suite is three papers that in matching way document paleoecological aspects of the Early–Middle Frasnian timespan over adjoined inner shelf habitats in the north-west domain of East European Platform (Main Devonian Field), also regarded them in the context of positive-negative carbon isotopic excursions, firstly detected in brachiopod calcites from this region. The last paper pair provides significant comparative Early-Middle Frasnian biotic records from the distant areas of South China and western Laurussian shelves, showing a minimal influence of the well-proved Alamo Impact Event on shallow-marine environments in the E-MF interval in Nevada.

This monograph issue, improved in thanks of review by several SDS members, including Gilbert Klapper, Jared Morrow, Jeff Over, Charles Sandberg and Jed Day, successfully addresses integrated bio- and chemostratigraphical approach, and all contributions assess and more or less combine various ecosystem parameters, altogether leading to better understanding of previously undervalued Late Devonian interval from palaeobiological and biogeographical viewpoints. In particular, very various record of the Domanic Crisis, recognized by Kuzmin et al. (1997; Paleontological Journal *31: 251-258) in Early-Middle Frasnian deep-marine biotas of the South Timan, north-eastern East European Platform, is extensively shown. To sum up, the broadly-defined E-MF passage timespan is correlated neither with catastrophic environmental nor radical biotic change in worldwide scale. This is surprising biotic response because the contemporary turnovers in carbon cycling are of distinctly higher-amplitude than the highlighted perturbation related to the F-F extinction (maximal positive δ13C excursion to 3.5‰), and noteworthy strengthened by at least one medium-size marine icy bolide strike (and even a comet shower is presumed!). Therefore, the thematic issue merely started to explore some of the intricate Late Devonian ocean-climate-biosphere interactions as at length recorded in tropical epeiric realms. This inference emphasizes an urgent need of similarly comprehensive data especially from high-latitude and/or deep-water, oceanic domains.*

Issue Content:

Andrey V. Zhuravlev, Elena V. Sokiran, Irina O. Evdokimova, Ludmila A. Dorofeeva, Galina A. Rusetskaya, and Krzysztof Małkowski: Faunal and facies changes at the Early-Middle Frasnian boundary in the north-western East European Platform, p. 747-758

Elena V. Sokiran: Early-Middle Frasnian cyrtospiriferid brachiopods from the East European Platform, p. 759-772

Irina O. Evdokimova: Benthic ostracods from the Early-Middle Frasnian transition in the north-western East European Platform, Russia, p. 773-788

Xue-Ping Ma, Ralph Thomas Becker, Hua Li, and Yuan-Yuan Sun: Early and Middle Frasnian brachiopod faunas and turnover on the South China shelf , p. 789-812

Jean-Georges Casier, Ivan Berra, Ewa Olempska, Charles Sandberg, and Alain Préat : Ostracods and facies of the Lower and Middle Frasnian at Devils Gate in Nevada: Relationship to the Alamo Event, p. 813-828

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Jerzy Dzik, 2006. The Famennian 'Golden Age' of conodonts and ammonoids in the Polish part of the Variscan sea. Palaeontologia Polonica 63, 1-360 (http://www.palaeontologia.pan.pl/).

The stratigraphically complete and extremely fossiliferous geological sections in the Holy Cross Mountains and Sudetes, Poland, cover the whole history of the Famennian tropical high-diversity pelagic ecosystem. Apparatus reconstruction of 142 conodont species allowed paleobiological interpretation of the faunal succession. Three families, nine genera and 39 species are newly proposed. 76 species of goniatites, with one genus and five species new, and 70 species of clymenias were also identified. Like in all other equatorial localities, a significant (but not catastrophic) decline of diversity marks the beginning of the Famennian. The local pelagic fauna developed mostly as a result of successive reappearances of lineages earlier occurring in the area but temporally removed from it by environmental factors. During the whole Famennian, 101 immigrations of conodont lineages are documented. In 31 of the lineages persisting in the area a more or less complete record of their phyletic evolution is represented; they cover about half (46%) of the summarized ranges of all the lineages. About half of them are suitable for stratophenetic studies. The fossil record of the ammonoids is much more punctuated, but it is estimated that 110 lineages was represented there, only 14 of them possibly evolving phyletically in the area (single case was stratophenetically proven). At the transition between goniatites and clymenias, a succession within the plexus of closely related sympatric species is observed, but the exact phyletic change is not recorded and probably all the first clymenias are immigrants from the east. At least two profound rebuildings of the fauna within the Famennian are observed, but only the terminal Devonian Hangenberg event was of truly dramatic nature. The newly acquired evidence supports the earlier notion thate it is more difficult to trace evolution stratophenetically in the equatorial regions than in high latitudes.

TM EBERHARD SCHINDLER (FRANKFURT, GERMANY)

The present report covers the interval from 2004 to the end of 2006. An overall "umbrella" of research activities has been the IGCP Project 499 (see separate report in this SDS newsletter). In a number of business meetings, workshops, and excursions related to the project participation has to be reported, e.g., the inaugural meeting of IGCP 499 in Morocco (2004), the workshops and excursions in Siberia and Turkey (both 2005 including business meetings). During the Annual Meeting of the German Paläontologische Gesellschaft at Göttingen University in fall 2005 a special symposium on Devonian matters has been organized together with Helga GROOS-UFFENORDE (Göttingen). On the occasion of this conference the first IGCP 499 business meeting has been organized.
At and in the aftermath of the Morocco meeting several articles on sections from the Dra Valley have been published (see references) – a summarizing paper will appear in spring 2007 in the Geological Society of London volume in honour of Michael HOUSE (JANSEN et al., in press).

Studies on the Lower Devonian siliciclastic rocks of the Rheinisches Schiefergebirge have continued within the Senckenberg group and together with other colleagues. An extensive paper on the famous outcrop near the village of Alken (Mosel area) analysing a tidal flat setting of the Nellenköpfchen Fm. (upper part of the Lower Emsian) has been published (WEHRMANN et al. 2005). Other investigations in the Rheinisches Schiefergebirge were devoted to Lower Devonian temporary outcrops that had been sampled during the construction of the tracks for the high-speed railway between Frankfurt and Köln (Aegidienberg Tunnel). Reports on material from trenches in connection with the construction of a new transeuropean gas pipeline (TENP) in the Eifel Hills area have been given in two articles published by the Geologischer Dienst Nordrhein-Westfalen in Krefeld (BROCKE, JANSEN et al. 2004 and JANSEN, BROCKE et al. 2004).
In 2005 cooperation started with TM Nacho VALENZUELA-RIOS, Teresa LIAO (Valencia), and Peter Königshof (Senckenberg) on sections from the Spanish Pyrenees including trips for comparative studies to the German Rheinisches Schiefergebirge. A first publication will be submitted early in 2007.
Also in 2005 work started within a bilateral Turkish-German research project (DEVEC-TR) including extensive fieldwork in the Central, Eastern and Southern Taurides in 2005 and 2006 as well as laboratory work at Istanbul University. The goal of the project, successfully proposed by Namik YALCIN (Istanbul) and Volker WILDE (Frankfurt), is to compare Devonian sections from different regions and different environmental settings adjacent to the two main Devonian continents Laurussia and Gondwana, respectively. For comparison, a group of the Turkish team members have been guided by the Senckenberg collaboration team in the Devonian of the Sauerland area and the Lahn Syncline in summer 2006.
A proposal in 2005 to the German Alexander von Humboldt Foundation to make TM Carlton BRETT (Cincinnati) a research awardee has been successful. The award enables Carl BRETT to spend several time intervals at the Forschungsinstitut Senckenberg for joint research in Germany. Mainly in 2006 intense joint fieldwork has been conducted in the Eifel Hills as well as the Sauerland area and the Wittgenstein and Lahn synclines of the Eastern Rheinisches Schiefergebirge. Main goals of this joint research is to compare the European sections with those of the Northeastern U.S. (and possibly with those in the Moroccan Anti-Atlas). Based on biostratigraphical data (which do already exist in many of the areas) special focus will be set on cyclic sedimentation processes, evolution of faunal (and floral) assemblages, sea-level changes, palaeoclimate and global events. Besides other members of the Senckenberg team and collaborators of Carl BRETT mainly from New York State, Frank LANGENSTRASSEN from Göttingen University is contributing to these studies.
In 2006 joint fieldwork has been carried out in the Rheinisches Schiefergebirge, the Harz Mountains, and the Thüringer Schiefergebirge with CM Brooks ELLWOOD (Baton Rouge) and Manfred GEREKE (Marburg University) in order to investigate Upper Devonian pelagic sections (mainly spanning the Frasnian/Famennian boundary) with respect to the potential of magnetic susceptibility analysis.
Two new projects which were successfully proposed towards the end of 2006 will start in the year 2007. A joint application to the National Geographic Society with TM Carl BRETT and collaborators will lead a group of Devonian researchers from the U.S., Morocco and Germany to the Dra Valley of the Moroccan Anti-Atlas in order to investigate trilobite-rich successions. A successful proposal to the German Deutscher Akademischer Austausch-Dienst (DAAD) together with PhD student Mena SCHEMM-GREGORY (Forschungsinstitut Senckenberg, Frankfurt) will enable comparative investigations (preferably brachiopods and tentaculitids) from sections in New York State and the German Rheinisches Schiefergebirge.
Other activities:
An invited talk has been given at the Pardee Symposium on Global Events (embedded in the GSA meeting 2004 in Denver) on late Devonian Bioevents.
Contributions to the explanations volume of the German Stratigraphical Correlation Chart (Stratigraphische Tabelle von Deutschland 2002) have been published in 2005 (WEDDIGE et al. 2005a,b).
There have been presented talks and/or poster about southern Moroccan reefs, traces from the siliciclastic Emsian of the Mosel area, and on plant taphonomy.

Publications after SDS Newsletter No. 20 (chronological order) – from a number of announcements of IGCP 499 only one example is included

BROCKE, R.; FATKA, O.; JANSEN, U.; SCHINDLER, E. & WEDDIGE, K. (2004): Palynology and biostratigraphy of the Lower-Upper Emsian boundary (Lower Devonian) in the Rheinisches Schiefergebirge (Germany) and in the Barrandian area (Czech Republic). – Polen, **14**: 147-148; Cordoba.

BROCKE, R.; JANSEN, U.; KÖNIGSHOF, P.; RIBBERT, K.-H.; SCHINDLER, E.; SCHINDLER, T.; SCHMIDT-GÜNDEL, O.; VOGEL, O.; WEDDIGE, K. & WINTGEN, C. (2004): Fazies und Stratigrafie temporärer Schürfe (Erdgastrasse TENP 2) im Unter- und Mitteldevon der Rohrer Mulde, der Blankenheimer Mulde und der Sötenicher Mulde, Eifel. – Scriptum, **11**: 7-107; Krefeld.

JANSEN, U.; BROCKE, R.; KÖNIGSHOF, P.; RIBBERT, K.-H.; SCHINDLER, E.; SCHINDLER, T.; SCHMIDT-GÜNDEL, O. & WINTGEN, C. (2004): Ein Profil im Paläozoikum des südöstlichen Venn-Sattels (Ordovizium bis Unter-Devon, Rheinisches Schiefergebirge). – Scriptum, **11**: 109-131; Krefeld.

BECKER, R.T., JANSEN, U., PLODOWSKI, G., SCHINDLER, E., ABOUSSALAM, Z.S. & WEDDIGE, K. (2004): Devonian litho- and biostratigraphy of the Dra Valley area – an overview. – Documents de l'Institut Scientifique, **19**: 3-18; Rabat.

JANSEN, U., BECKER, G., PLODOWSKI, G., SCHINDLER, E., VOGEL, O., & WEDDIGE, K. (2004): The Emsian to Eifelian near Foum Zguid (NE Dra Valley, Morocco). – Documents de l'Institut Scientifique, **19**: 19-28; Rabat.

JANSEN, U., PLODOWSKI, G., SCHINDLER. E. & WEDDIGE, K. (2004): The Pragian at Assa (SW Dra Valley, Morocco). – Documents de l'Institut Scientifique, **19**: 64-68; Rabat.

JANSEN, U., BECKER, G., PLODOWSKI, G., SCHINDLER, E., VOGEL, O. & WEDDIGE, K. (2004): Pragian and Emsian near Aouinet Torkoz (SW Dra Valley, Morokko). – Documents de l'Institut Scientifique, **19**: 75-84; Rabat.

KÖNIGSHOF, P.; BENSAID, M.; BIRENHEIDE, R.; EL HASSANI, A.; JANSEN, U.; PLODOWSKI, G.; RJIMATI, E.; SCHINDLER, E. & WEHRMANN, A. (2004): Carbonate buildups in the Middle Devonian – examples from the western Sahara. – In: REITNER, J.; REICH, M. & SCHMIDT, G. (Eds.): Geobiologie. – Universitätsdrucke Göttingen: 128-130; Göttingen.

SCHINDLER, E., JANSEN, U., PLODOWSKI, G. & WEDDIGE, K. (2004): Lower to basal Middle Devonian stratigraphy and facies in the Dra Valley (Moroccan Anti Atlas). – In: REITNER, J.; REICH, M. & SCHMIDT, G. (Eds.): Geobiologie. – Universitätsdrucke Göttingen: 205-206; Göttingen.

WILDE, V., SCHINDLER, E., PLODOWSKI, G., KÖNIGSHOF, P., JANSEN, U., BROCKE, R., HERTWECK, G., WEHRMANN, A. & VOGEL, O. (2004): Arthropod tracks from the Emsian (upper Lower Devonian) of Burgen (Mosel Syncline, Rheinisches Schiefergebirge). – In: REITNER, J.; REICH, M. & SCHMIDT, G. (Eds.): Geobiologie. – Universitätsdrucke Göttingen: 247; Göttingen.

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SCHINDLER, E. (2004): Late Devonian Bioevents: What must be considered? – Geological Society of America, Abstracts with Programs, **36** (5): 322; Boulder.

SCHINDLER, T., AMLER, M.R.W., BRAUN, A., GRIMM, M.C., HAAS, W., HEUMANN, G., JANSEN, U., OTTO, M., POSCHMANN, M. & SCHINDLER, E. (2004): Neue Erkenntnisse zur Paläontologie, Biofazies und Stratigraphie der Unterdevon-Ablagerungen (Siegen) der ICE-Neubaustrecke bei Aegidienberg (Siebengebirge, W-Deutschland). – Decheniana, **157**: 135-150; Bonn.

KÖNGISHOF, P., LAZAUSKIENE, J., SCHINDLER, E., WILDE, V. & YALCIN, M.N. (2004): "Devonian land-sea interaction: Evolution of ecosystems and climate" (DEVEC) – the new IGCP Project 499. – Episodes, **27** (4): 303-304; Beijing.

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SCHINDLER, E. (2005): Tentakuliten – Fossilien paläozoischer Meere. – Natur und Museum, **135** (7/8): 182-183; Frankfurt am Main.

KÖNIGSHOF, P. & SCHINDLER, E. (2005): Facies and sedimentology of Frasnian/Famennian boundary sections from the Western slope of the Middle Urals. – Devonian terrestrial and marine environments: From continent to shelf, Contributions: 87; Novosibirsk.

LIAO, J.-C., KÖNIGSHOF, P., VALENZUELA-RIOS, J.I. & SCHINDLER, E. (2005): Palaeoenvironmental interpretation and development of a Givetian and lower Frasnian section from the Aragonian Pyrenees (N. Spain). – Devonian terrestrial and marine environments: From continent to shelf, Contributions: 96-97; Novosibirsk.

SCHEMM-GREGORY, M., JANSEN, U. & SCHINDLER, E. (2005): Die Brachiopoden-Fauna aus dem Ober-Siegenium (Unter-Devon) bei Aegidienberg (Siebengebirge, Rheinisches Schiefergebirge). – Berichte des Institutes für Erdwissenschaften, Karl-Franzens-Universität Graz, **10**: 113-114; Graz.

WEHRMANN, A., SCHINDLER, E. & WILDE, V. (2005): Plant taphonomy of marine-terrestrial transitions: The Rhenish Devonian and modern analogues. – International Workshop on "Depositional Environments of the Gondwanan and Laurussian Devonian", 26 September – 3 October 2005 Turkey, Abstracts & Field Trip Guide Books: 26-27; Istanbul.

JANSEN, U., WEDDIGE, K., SCHINDLER, E. & SCHEMM-GREGORY, M. (2005): Neritic-pelagic correlation in the Lower Devonian of Europe and North Africa. – Schriftenreihe der Deutschen Gesellschaft für Geowissenschaften, **39**: 192; Hannover.

SCHEMM-GREGORY, M., JANSEN, U. & SCHINDLER, E. (2005): The Upper Siegenian brachiopod fauna from Aegidienberg (Lower Devonian, Siebengebirge, Germany). – Schriftenreihe der Deutschen Gesellschaft für Geowissenschaften, **39**: 330; Hannover.

LIAO, J.-C., KÖNIGSHOF, P., VALENZUELA-RIOS, J.I., SCHINDLER, E. & GINTER, M. (2005): Biofacies y litofacies del Givetiense y Frasniense inferior (Devónico) de la sección Renanué (Pirineo Aragonés): Una interpretación paleoambiental preliminar. – XXI Jornadas de la Sociedad Espanola de Paleontologia (Sevilla, 2005): 192-193; Sevilla.

BROCKE, R., JANSEN, U., KÖNIGSHOF, P., SCHINDLER, E., WEDDIGE, K., WEHRMANN, A. & WILDE, V. (2005): Ökosysteme im Devon: Im Spannungsfeld zwischen Land und Meer. – Senckenberg 2004: 28-29; Frankfurt am Main.

WEDDIGE, K., JANSEN, U., SCHINDLER, E., RIBBERT, K.-H., WELLER, H. & ZAGORA, K. (2005): Das Devon in der Stratigraphischen Tabelle von Deutschland 2002. – Newsletters on Stratigraphy, **41** (1-3): 43-59; Berlin, Stuttgart.

WEDDIGE, K., MENNING, M., JANSEN, U. & SCHINDLER, E. (2005): Die Devon-Zeitskala der Stratigraphischen Tabelle von Deutschland 2002. – Newsletters on Stratigraphy, **41** (1-3): 61-69; Berlin, Stuttgart.

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WILDE, V., WEHRMANN, A., SCHINDLER, E., YALCIN, M.N., YILMAZ, I., ÖZKAN, R., NAZIK, A., NALCIOGLU, G., KOZLU, H., GEDIK, I., ERTUG, K. & BOZDOGAN, N. (2006): Devonian coastal sequences from the northern margin of Gondwana (Central to Eastern Taurids, Turkey). – Schriftenreihe der Deutschen Gesellschaft für Geowissenschaften, **45**: 182; Hannover.

KÖNIGSHOF, P., SCHINDLER, E., WILDE, V., LAZAUSKIENE, J. & YALCIN, M.N. (2006): Joint IGCP 499/SDS Meeting – Siberia, Russia, July 25 – August 9, 2005. – Episodes, **29** (2): 134; Beijing.

KÖNIGSHOF, P., SCHINDLER, E., WILDE, V., LAZAUSKIENE, J. & YALCIN, M.N. (2006): IGCP 499 Workshop "Depositional Environments of the Gondwanan and Laurasian Devonian" – Istanbul, Turkey, September 26 – October 3, 2005. – Episodes, **29** (2): 135; Beijing.

WEDEL, A. & SCHINDLER, E. (2006): „Konzert" mit fossilen Lebenswelten – Der Lahnmarmor im Kurhaus Wiesbaden. – Jahrbücher des Nassauischen Vereins für Naturkunde, **127**: 11-21; Wiesbaden.

JANSEN, U., LAZREQ, N., PLODOWSKI, G., SCHEMM-GREGORY, SCHINDLER, E. & WEDDIGE, K. (in press): Neritic-pelagic correlation in the Lower and basal Middle Devonian of the Dra Valley (S Anti-Atlas, Morrocan Pre-Sahara). – Geological Society of London, Special Publications.

TM NACHO VALENZUELA (VALENCIA, SPAIN)

Recent work is focussing in fine conodont chrono and -biostratigraphy from selected boundaries S/D, L/P, P/E, Ei/G, G/F and in recognizing Givetian substage boundaries in several sections from the Pyrenees. All Givetian and Frasnian activities are in cooperation with Jau-Chyn Liao (aka Teresa) who is the main contributor.

Besides Givetian, (informal) subdivision of the Lochkovian is being tested in several sections and a better understanding of the Emsian, in cooperation with CMs Peter Carls and Ladislav Slavík is on-going.

Results of the conodont chrono and -biostratigraphycally oriented research in the Pyrenees have been recently published in *Seckenbergiana lethaea* as a contribution to the Devonian Correlation Table.

In addition to conodonts, cooperation with other Devonian colleagues aiming at independent biozonations, microfacies analysis and palaenvironmental reconstructions of selected areas has started. In this respect, close cooperation with Dodo Dojen (Braunschweig) shows possibilities of an ostracod biozonation for Lower Devonian in both, Rhenish and Hercynic facies (Celtiberia and Pyrenees respectively). Also, fish remains are integrated in our data-base thanks to cooperation with my former Ph. D. student Héctor Botella (mainly Lower Devonian) and with Michal Ginter (Givetian). A paper submitted together with Jau-Chyn Liao (senior author), Peter Kónigshof and Eberhard Schindler is the outcome of a new aspect of Pyrenean research

combining biostratigraphy and microfacies analysis; this is the first of a series of papers aiming at palaeoenvironmental reconstruction of the Pyrenean basins for selected intervals.
Also in the south of Spain we have started a multidisciplinary approach with Spanish colleagues for a series of Lower Devonian sections. Several abstracts have already been presented and first papers are almost finished.
Below you will find some selected papers dealing with Devonian matters from 2004-2006.

BOTELLA, H.; **VALENZUELA-RÍOS, J. I.** & CARLS, P. (2006). A new Early Devonian Thelodont from Celtiberia (Spain); with revision of Spanish Thelodonts. *Palaeontology* **49** (1): 1-15.
VALENZUELA-RÍOS, J. I. & LIAO, J-C (2006): Annotations to Devonian Correlation Table, R 357-360 di-ds 06: Spanish Central Pyrenees, southern part. *Senckenbergiana lethaea*, **86** (1): 105-107.
VALENZUELA-RÍOS, J. I. (2006): Annotations to the Devonian Correlation Table, R 350-353 di-ds 06: Spain. *Senckenbergiana lethaea*, **86** (1):103-104.
VALENZUELA-RÍOS, J. I. & LIAO, J.-C. (2005): Conodontos y los límites de los Pisos Devónicos en los Pirineos Centrales Españoles. *In*: Lamolda, M. A. (ed.) *Publicaciones del Instituto Geológico y Minero de España, Serie: Geología y Geofísica*, **3**: 205-210.
MARTÍNEZ-PÉREZ, C. & **VALENZUELA-RÍOS, J.I.** (2005): Conodontos del límite Praguiense/Emsiense (Devónico Inferior) en la sección Isábena (Huesca, Pirineo Aragonés). *In*: Meléndez, G., Martínez-Pérez, C., Ros, S., Botella, H. y Plasencia, P. (eds.) *Miscelánea Paleontológica*. Publicaciones del Seminario de Paleontología de Zaragoza, 6: 287-319.
BOTELLA, H.; **VALENZUELA-RIOS, J.I** & MARTINEZ-PEREZ, C. (2005): Morfología e Histología de las escamas de *Leonodus carlsi* MADER, un condrictio primitivo del Devónico Inferior de la Cordillera Ibérica (España). *In*: Meléndez, G., Martínez-Pérez, C., Ros, S., Botella, H. y Plasencia, P. (eds.) *Miscelánea Paleontológica*. Publicaciones del Seminario de Paleontología de Zaragoza, 6: 205-219.
VALENZUELA-RIOS, J.I.; LIAO, J.-C,: MARTINEZ-PEREZ, C.; CASTELLO, V. & BOTELLA, H. (2005): Datos preliminares sobre los conodontos y restos de peces del Lochkoviense (Devónico Inferior) de Compte-I (Valle del Noguera Pallaresa, Pirineos de la Corona de Aragón). *In* J.A. Gámez, E. Liñán y J. I. Valenzuela-Ríos; (eds.), *Memorias de las VIII Jornadas Aragonesas de Paleontología: "La cooperación Internacional en la Paleontología española. Homenaje al Profesor Peter Carls"*. 1131-145. Institución Fernando el Católico, Zaragoza.
MURPHY, M.A.; **VALENZUELA-RÍOS, J.I.** & CARLS, P. (2004): On Classification of Pridoli (Late Silurian)-Lochkovian (Early Devonian) Spathognathodontidae (Conodonts). *University of California, Riverside, Campus Museum Contribution*, **6**: 1-25.
CARLS, P.; GOZALO, R.; **VALENZUELA-RÍOS, J.I.** & TRUYOLS-MASSONI, M. (2004) : La sedimentación marina devónico-carbonífera. En: *Geología de España* (J.A. Vera, Ed.), *SGE-IGME*, Madrid, 475-479.
DOJEN, C.; GOZALO, R.; CARLS, P. & **VALENZUELA-RÍOS, J.I.** (2004): Early and Late Devonian Ostracod Faunas from the Iberian Chains. *Revista Española de Micropaleontología*, **36** (1): 171-185

TM GAVIN C. YOUNG (CANBERRA, AUSTRALIA)

Recent research projects concerning Devonian vertebrates has focused on tetrapod evolution (first land vertebrates), in particular Australian evidence for a Gondwana origin based on morphology, biostratigraphy and biogeography of the fish/tetrapod transition. This research is supported by an Australian Research Council (ARC) Discovery Project Grant shared with Dr. John Long (now Head of Science, Museum Victoria). Other work has included systematics and biostratigraphy of Early-Middle Devonian non-marine fish remains in the Georgina and Darling Basins (Qld/NT border, and western NSW), acid prepared skull and braincase material from Early Devonian limestones at Lake Burrinjuck, NSW, and biostratigraphy and biogeography of Devonian fish remains from the far south coast of NSW and adjacent Victoria compared to the Aztec fauna of the Transantarctic Mountains, Antarctica (eastern sector, Australian Antarctic Territory). Fieldwork during 2006 included a return trip to the Cravens Peak Beds in the Georgina Basin (western Qld, NT; see Young & Schultze 2005), and new discoveries on the far south coast of NSW. Presentations were given at the IPC 2006 in Beijing (IGCP 491 session).

Recent publications

2006

Long, J.A., Young, G.C., Holland, T., Senden, T.J. & Fitzgerald, E.M.G. 2006. An exceptional Devonian fish from Australia sheds light on tetrapod origins. *Nature* **444**: 199-202.

Young, G.C. 2006a. Devonian fish remains, biostratigraphy and unconformities, Narromine 1:250 000 sheet area, central New South Wales (Lachlan Fold Belt). *Australian Journal of Earth Sciences* **53**: 605-615.

Young, G.C. 2006b. Biostratigraphic and biogeographic context for tetrapod origins during the Devonian Period: Australian evidence. *Alcheringa Special Issue* **1**: 409-428.

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Young, G.C. 2005a. Early Devonian arthrodire remains (Placodermi, ?Holonematidae) from the Burrinjuck area, New South Wales, Australia. *Geodiversitas* **27**: 201-219.

Young, G.C. 2005b. A new Middle Devonian arthrodire (placoderm fish) from the Broken River area, Queensland. *Records of the Australian Museum* **57**: 211-220.

Young, G.C. 2005c. A new phyllolepid placoderm occurrence (Devonian fish) from the Dulcie Sandstone, Georgina Basin, central Australia. *Proceedings of the Linnean Society of New South Wales* **126**: 203-213.

Young, G.C. 2005d. An articulated phyllolepid fish (Placodermi) from the Devonian of central Australia: implications for non-marine connections with the Old Red Sandstone continent. *Geological Magazine* **142**: 173-186.

Young, G.C. 2005e. New phyllolepids (placoderm fishes) from the Middle-Late Devonian of southeastern Australia. *Journal of Vertebrate Paleontology* **25**: 261-273.

Young, G.C. & Long, J.A. 2005. Phyllolepid placoderm fish remains from the Devonian Aztec Siltstone, southern Victoria Land, Antarctica. *Antarctic Science* **17**: 387-408.

Young, G.C. & Schultze, H.-P. 2005. New osteichthyans (bony fishes) from the Devonian of central Australia. *Mitteilungen aus dem Museum für Naturkunde in Berlin, Geowissenschaftliche Reihe* **8**: 13-35.

Burrow, C.J. & Young, G.C. 2005. Acanthodian fishes from the Cravens Peak Beds, Western Queensland. *Memoirs of the Queensland Museum* **51**: 3-25.

Burrow, C.J., Jones, A.S. & Young, G.C. 2005. X-ray microtomography of 410 million year old optic capsules from placoderm fishes. Micron **36**(6): 551-557.

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Young, G.C. (ed.) 2004a. *Lower vertebrates from the Palaeozoic*. First International Palaeontological Congress (IPC 2002), Sydney, Australia, July 2002. Proceedings of Symposium 6 (Palaeozoic Vertebrates). *Fossils & Strata,* **50**, 123 pp., 61 figs.

Young, G.C. 2004b. Large brachythoracid arthrodires (placoderm fishes) from the Early Devonian of Wee Jasper, New South Wales, Australia. *Journal of Vertebrate Paleontology* **24**:1-17.

Young, G.C. 2004c. A Devonian brachythoracid arthrodire skull (placoderm fish) from the Broken River area, Queensland. *Proceedings of the Linnean Society of New South Wales* **125**: 43-56.

Young, G.C. 2004d. A homostiid arthrodire (placoderm fish) from the Early Devonian of the Burrinjuck area, New South Wales. *Alcheringa* **28**: 129-146.

Young, G.C. & Burrow, C. 2004. Diplacanthid acanthodians from the Aztec Siltstone (late Middle Devonian) of southern Victoria Land, Antarctica. *Fossils & Strata,* **50**: 23-43.

Goujet, D. & Young, G.C. 2004. Placoderm anatomy and phylogeny: new insights. pp. 109-126, In: G. Arratia, M.V.H. Wilson & R. Cloutier [editors]. *Recent Advances in the Origin and Early Radiation of Vertebrates* Verlag Dr. Friedrich Pfeil, München, Germany.