

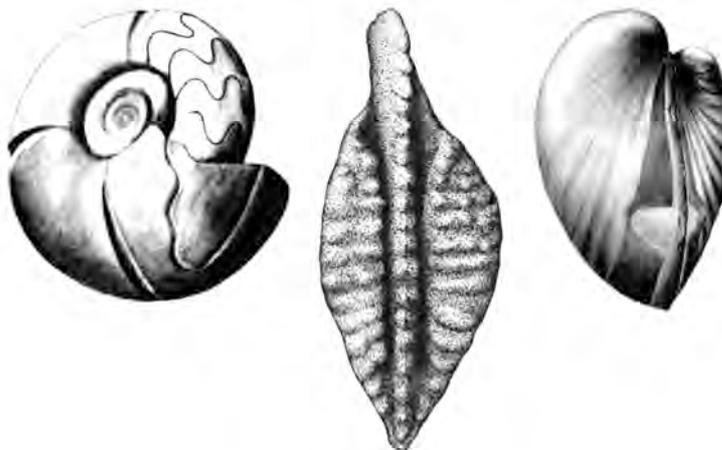


INTERNATIONAL UNION OF  
GEOLOGICAL SCIENCES  
COMMISSION ON STRATIGRAPHY

—s—D—s—  
SUBCOMMISSION ON  
DEVONIAN STRATIGRAPHY

***NEWSLETTER No. 23***

R.T. Becker, Editor  
WWU Münster  
Germany



February 2008

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### MESSAGE FROM THE CHAIRMAN

At our annual business meeting in Eureka, Nevada, and in a subsequent email message to all members, it was announced that the current SDS Officers, Vice-Chairman Ahmed El HASSANI, Secretary John MARSHALL, and myself, are willing to continue to serve SDS for a second period, starting with the forthcoming IGC in Oslo, this summer (period from 2008 to 2012). It was agreed that any other candidates for a potential vote should be proposed to our past Chairman Pierre BULTYNCK. In the case of no proposal, this would be taken as evidence of your approval of our past and future SDS work (confirmation of re-election). No proposal was submitted to Pierre, and therefore, and in behalf of our Vice-Chairman and Secretary, I like to express our thanks for your confidence and support. We will do our best to keep SDS as a very lively, successful and innovative subcommission within the International Commission on Stratigraphy. Our multidisciplinary Devonian volume published in 2007 in honour of Michael HOUSE, as the first joint IUGS/ICS-GeolSoc volume in the Geological Society of London, Special Publications series, is a good sign that we continue to be at the forefront of stratigraphical progress.

Generally, I feel that 2007 was a good year for our subcommission and I like to mention the voluminous Newsletter 22, our new SDS homepage, and, especially, our very successful and enjoyable field meeting in Nevada and western Utah. I wish to express once more our thanks to all involved in the organization, and especially to Jeff Over, Jared Morrow, Charlie Sandberg, John Warne, and Mike Murphy. The Great Basin not only offered wonderful landscape and a superb barbecue organized by incredibly hospitable locals in Baker but also spectacular Devonian highlights, such as the Alama Impact Breccia, F-F-boundary sections, all sorts of carbonate platform facies, and the complex history of the Pilot Basin. Contributions at our symposium in Eureka covered a wide array of topics and significant, often interdisciplinary stratigraphic progress. I am convinced that the proceedings volume in the Palaeontographica Americana series, which is already on its way, will become another "must" for all Devonian stratigraphers. In this context I like to re-emphasize the very fruitful co-operation with IGCP 499, which will

continue this year. Consequently, a long IGCP 499 report is included in this Newsletter.

Apart from the "House volume" another important Devonian publication has been published very recently (end of December) in the Geological Quarterly series, edited by our CM M. NARKIEWICS. It contains papers presented at our Devonian conodont symposium at ICOS 2006 in Leicester (see content list in the publications section). All contributions can be downloaded freely as pdf files from the journal homepage. I especially welcome the speed of publication. The volume is highly significant both for Devonian conodont taxonomy and stratigraphy, including graphic correlations and proposed zonation changes. Three more volumes are currently under preparation: Middle Devonian stratigraphy ("Palaeo x 3", TM C. BRETT), Novosibirsk contributions (Journal of Geosciences, P. KÖNIGSHOF), and IGCP 499 contributions (another Special Publication of the Geological Society, P. KÖNIGSHOF). This underlines the productivity of our membership and other Devonian specialists.

This forthcoming year will have four highly interesting international Devonian meetings and symposia, first in Libya (April), then in Oslo (first half of August), Lille (end of August), and Uzbekistan (end of August to early September). I hope many of you will be able to attend despite the fact that funding is not getting better in most countries. Especially we need to show presence at the Oslo IGC, where all other subcommissions are thought to gather and where ICS symposia will take place, too. We will have formal SDS meetings at Oslo (Annual Business Meeting) and in the Kitab Reserve (with a focus on the Emsian). Please prepare documents for lively discussions. We have decided that a formal vote on Famennian substages shall take place after our business meeting, where special time will be given for Famennian discussions.

Our Annual Report for 2007 to ICS, included in this Newsletter, provides you with more information of past achievements and objectives. It also gives a list of the current and future SDS tasks. I am looking forward your active participation and: don't forget to feed our homepage.

Yours sincerely

R. Thomas BECKER

## IN MEMORY OF VLADIMIR VLADIMIROVICH MENNER

Vladimir Vladimirovich Menner, outstanding geologist, specialist in the Devonian of Russian and Siberian platforms, died on the 18th of September, 2006.

Vladimir Vladimirovich Menner was born in 1931 in the family of enthusiastic scientists – geologists Vladimir Vasilievich Menner and Lidia Dmitrievna Shorygina. This very largely determined his choice: having finished school as a gold medal winner, in 1949 he entered the Geology and Prospecting Faculty of the Geological Prospecting Institute, which he brilliantly graduated from in 1954. After Vladimir Vladimirovich finished the two-year post-graduate course under the supervision of M.S. Shvetsov, he started working at the Institute of Geology and Combustible Minerals Development (IG&RGI), first in the Laboratory of Lithological Research, and in the recent years – in the Laboratory of Northeastern European areas of the Russian Federation. In 1972, Vladimir Vladimirovich Menner completed his Ph.D. thesis on the Devonian of Northwestern Siberian Platform and Adjacent Areas.

Since his first steps in professional life, Vladimir Vladimirovich Menner was engaged in studying the Devonian of Siberian Platform. He had been keeping this interest to his dying day. In late 50-ies of the last century he developed the first Devonian stratigraphic chart. With new information added, it was later repeatedly improved, its correlation part was extended, ages of many regional and local units were specified. The validity of some outdated, poorly chosen terms was evaluated, local charts of particular structure and facial zones (stratigraphical areas) were unified, the stratigraphic division of sections in natural exposures and deep bore-holes was coordinated, Devonian strata of Siberian Platform, West Siberian Plate, Russian Arctic isles, Taimyr, Verkhoyano-Kolymskaya and Sayano-Altayskaya areas were correlated.

Of special importance were the field works headed by Vladimir Menner, carried out on Sedov and Severnaya Zemlya archipelagoes by the “Interdepartmental Group” of Soviet geologists (IG&RGI, Siberian Research Institute for Geology, Geophysics and Mineral Resources /SNIIGG&MS/, Lithuanian Research Institute for Geological Prospecting

/LithNIGRI/, All-Union Research Institute for Marine Geology /VNIImorgeo/). At present, the group members live and work in different countries.

The field research was carried out on Severnaya Zemlya Archipelago in 1978. The Ordovician-Silurian-Devonian section, over 3000 meters thick, was fully studied. In addition to the description of the rock lithological composition and specific bedding, great attention was paid to searching and collecting organic fossils, including microscopic ones (spores, conodonts, vertebrate microfossils). The latter helped determining the age of rocks and section completeness in the field.

In 1980, Vladimir Vladimirovich kept on studying the Silurian-Devonian deposits in the Severny Timan (Velikaya River), in 1981 – in Northern Ural (Bolshaya Synya River).

Vladimir Vladimirovich was very much concerned about applying an appropriate methodology of section investigation and organizing transportation and life of expedition members. Being in the field, he did not think of himself or his convenience. He cared very much of everybody beside him, therefore it was very easy and interesting to work with him even under difficult conditions in the North.

These investigations in an almost inaccessible area made it possible to develop regional Silurian and Devonian stratigraphic charts. The work resulted in the following: the major geological events of the sedimentation basins history represented by the specific structures of the local and regional markers were traced; the transgressive-regressive recurrence of sedimentation and unconformity occurrences were analyzed; the levels of standard boundaries determined according to various fossil groups were specified; different-facies sections of the Russian Arctic, Taimyr, Siberian and Russian Platform islands were correlated. The natural sections of Severnaya Zemlya accessible for investigation are an important source of information about the geological structure and mineral resources of the adjacent water area shelf.

The above mentioned investigations were summarized in the monograph “Silurian and Devonian stratigraphy of Severnaya Zemlya Archipelago”, issued in Novosibirsk, 1999, edited by R.G. Matukhin and V.V. Menner. The discussion of the key issues of the Arctic regional geology and biostratigraphy at the international workshops in Tallinn (1996),

Bukow (Germany), St. Petersburg (1997), Warsaw (198), Yurmala (1999), which V.V. Menner always very constructively participated in, played an important role in writing this joint work. The stratigraphic base of the Siberian Platform Devonian system was reported on at the XXX session of the International Geological Congress (Peking, 1996.) Later, the data on the historical and geological development of Severnaya Zemlya Silurian and Devonian basins were presented at the XXXI session of the International Geological Congress (Rio de Janeiro, 2000).

Vladimir Vladimirovich was very much interested in developing a new version of the Siberian Platform Devonian stratigraphic chart to be discussed at the Interregional Meeting on Stratigraphy. In early 2006, V.V. Menner submitted his proposals to the Section of Devonian Stratigraphy, Siberian Regional Stratigraphic Committee, member of which he remained to the end of his life. We hope these will be taken into account.

From 1993 to 1998, V.V. Menner was coordinator (on the Russian part) of the INTAS international project on the Middle Paleozoic anoxic and eustatic events in Timan, Urals and western Europe. On the foreign part, the project involved Professor Michael House (Great Britain) and Pierre Bultynck (Belgium), who headed the Subcommission on Devonian Stratigraphy of the International Union of Geological Sciences during our cooperation, and Professor Becker (Germany). The main objectives of the projects were to specify the correlation of the Russian Platform Upper Devonian different-facies sections and to determine the possibilities of using the vertical and lateral variability of conodont biofacies and paleobasins eustatic cycles. The investigations carried out within the projects contained a comprehensive stratigraphic, biostratigraphic and historical-geographic database; they were based on rich paleontological collections made in previous years and during field excursions, including those made in the process of the projects implementation. To identify the stratigraphical regularities of conodont biofacies mutual transition, new correlational stratigraphic charts were developed for Upper Devonian different-facies sections of Timan-Pechora Province in two profiles from the Urals western slope to eastern Pritiman area, covering all paleobasin zones.

The correlation of the different-facies sections by boreholes and exposures and their comparison with regional horizons were carried out, with the zonal microspore scheme of the Pripyat Depression being used as the most detailed one of those developed for the Russian Platform Devonian. In addition, data on foraminifers, brachiopods, conodonts and ostracodes were considered; also, lithological, geophysical, historical-geological criteria and correlation methods were widely used. At the same time, the transgressive-regressive Cycles of the Late Devonian basin development was investigated and the curve of sea level eustatic fluctuations was developed on the basis of the new stratigraphic correlation charts and a series of regional maps. A comparative qualitative evaluation of the sea level rise amplitudes was based on the analysis of area changes in the deep-water starved sedimentation. The comparison of the eustatic curve with the standard conodont scale made it possible to correlate it with the global eustatic scale and to prove the coincidence of the main eustatic events in basins of different areas of the Russian Platform and other Late Devonian epicontinental and shelf basins of Northwestern Europe, North America and Australia, which most likely is of eustatic nature. The results of project activities were published in a number of in-country and foreign issues.

From 1996 to 1999, V.V. Menner managed the project of the Russian Foundation for Fundamental Researches (RFFR) on the Devonian different-facies Devonian deposits correlation based on reconstructing conodont biofacies and sea level fluctuations. The project resulted in the analysis of biofacies in continental shelf deposits (Lemva facies), open deep-water shelf deposits (domanikoids), isolated banks, barrier reefs and shelf slopes, in enclosed shelf zone, epicontinental platform basins with a regime strongly deviating from normally marine, and the development of new correlation stratigraphic charts specifying regional schemes adopted in 1988.

V.V. Menner had been long-term TM and CM of the Subcommission on Devonian Stratigraphy of the International Union of Geological Sciences.

Blessed memory of Vladimir Vladimirovich Menner – modest, highly respectable, kindhearted, utterly devoted to his family, genuine intellectual and committed to his profession scientist-geologist will always

remain in the hearts of all those who was lucky to work and to be friends with him.

**KARATAYUTE-TALIMAA, V.N., MATUKHIN,  
R.G., MENNER, A.V., OVNATANOVA, N.S.,  
LEBEDEV, O.A.**



**Vladimir Vladimirovich Menner**  
(1931-2006)

## International Commission on Stratigraphy Subcommission on Devonian Stratigraphy

### ANNUAL REPORT TO ICS, 2007

#### 1. TITLE OF CONSTITUENT BODY

Subcommission on Devonian Stratigraphy

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

SDS was the first Subcommission that has finalized the initial goal to define all series and stages internationally by the selection of formally approved and published GSSPs. Since the decided formal chronostratigraphic units have widely different durations in terms of absolute ages, since stage subdivisions have become common use in many publications, but without any common sense, and since major global events and mass extinctions occurred within some stages, SDS started a program for formal stage subdivision/substage definition in the Emsian and younger half of the Devonian (Givetian to Famennian), where highest stratigraphical precision is available and widely used globally. With progress and increased knowledge it became also evident that some of the GSSP decision were unfortunate since levels were chosen that differ significantly from the original intention when GSSP votes took place. Eventually this will have to lead, after 10 years of moratorium, to GSSP revisions. It underlines - an important insight for all Subcommissions - that GSSP decisions are important major achievement but subsequent monitoring and testing are equally important. SDS objectives of 2007 can be summarized as follows:

- Improvement of the internationally agreed time framework by formal voting on Givetian and Frasnian substages.
- Improvement of correlation in the very long Famennian substage by the continuing search for Famennian substage levels.

- Invite/stimulate new research on Emsian and Devonian/Carboniferous Boundary GSSPs as preparation for future GSSP revision.
- Advances in interdisciplinary stratigraphical correlation, involving biostratigraphy, chemostratigraphy, isotope stratigraphy, magnetostratigraphy (magnetic susceptibility studies), gamma ray spectroscopy, event, sequence and cyclostratigraphy.
- Improvements of cross-facies correlation between terrestrial, neritic and pelagic realms.
- Improvements of the global eustatic sea-level curve for the Devonian.
- Stimulate high-level Devonian stratigraphic research by intensive co-operation with other research bodies, such as IGCP 499 on "Devonian land-sea interactions – evolution of ecosystems and climate".
- Communicate Devonian stratigraphy and SDS activities via the new SDS Homepage, international Devonian symposia, and the new SDS Newsletter (no. 22).
- Increase involvement of young Devonian stratigraphers and of specialists from regions/countries with a past poor international co-operation.

All listed objectives fit the directions of IUGS and ICS:

- development of an internationally approved chronostratigraphical timescale for the Devonian with maximum time resolution;
- promotion of new and modern stratigraphical techniques and their integration into Devonian multidisciplinary schemes;
- application of GSSP decisions internationally and as a base for a better understanding of patterns and processes in Earth History, including Devonian major global environmental changes.

It should not be undervalued that significant recent advances in Devonian stratigraphy forms an important base for hydrocarbon exploration. It came to the attention of SDS that consulting companies have started to scan recent SDS publications, especially for relevant sequence stratigraphic data.

### 3. ORGANIZATION

Officers for 2004-2008

Chair: Prof. Dr. R. Thomas BECKER, WWU Münster, Germany

Vice-Chair: Prof. Dr. Ahmed EL HASSANI, Institute Scientifique, Rabat, Morocco

Secretary: Dr. John E. MARSHALL, University of Southampton, U. K.

The Subcommission has currently further 19 Voting Members that cover many major Devonian outcrop areas and many stratigraphical disciplines (see Appendix).

The Corresponding Membership covers several additional countries (South Africa, Austria, Latvia, Estonia, Lithuania, Belarus, Vietnam, Tadjikistan, Uzbekistan, Iran, New Zealand, Bolivia, Taiwan) but, unfortunately, SDS has been unable to recruit more active Devonian stratigraphers from South America (especially from Brazil), although Devonian rocks form important source and reservoir rocks there.

SDS has generated Working Groups for the substage subdivision of the Emsian (chaired by R. MAWSON), Givetian (chaired by P. BULTYNCK), Frasnian (chaired by J. OVER), and Famennian (chaired by R. T. BECKER). They will cease with formal substage decision/ratification and publication. A new Working Group on the Devonian-Carboniferous boundary has been planned to be installed jointly with SCS; SDS nominations took place in September 2007 – a chairman has to be selected when the Working Group is formally founded.

At national level several Devonian Subcommissions exist in various countries, partly under different organisational names (e.g., Germany, Russia, “Friend of the Devonian” at GSA meetings).

**Website:** A new website, run by Corresponding Members C. CORRADINI and S. Gouwy at the University of Cagliari (Sardinia), has been established in spring 2007: <http://www.unica.it/sds/>

The old SDS website at the University of Texas at Arlington is not served any more and should be deleted from links and bookmarks. The new website includes the last two and future issues of the SDS Newsletter (No. 21 and 22), Minutes of SDS Business Meetings

since 2002, a list of SDS publications, its membership with full addresses, links to ICS and IUGS, and information on SDS meetings. GSSP information and photos will soon be added.

### 4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

SDS is traditionally strongly tied with IGCP projects that have a Devonian focus. This is currently IGCP 499, which emphasized the correlation of terrestrial, shallow and deeper marine successions. It is lead by P. KÖNIGSHOF and colleagues from the Senckenberg Institute, Frankfurt a. M., Germany. There is a strong overlap of SDS and IGCP 499 members and several joint field meetings have been organized: Dra Valley, Morocco (2004), southern Siberia, Salair, Rudny and Gorny Altai (2005), Nevada-Utah (2007). For 2008 a joint meeting is planned in the Kitab Reserve, including the Emsian GSSP, Uzbekistan, and SDS members are invited to take part in a Devonian fieldtrip to Libya (April 2008) and to the final IGCP Symposium at the Senckenberg Institute in autumn 2008. A Devonian symposium was also organized at the 2nd International Palaeontological Congress in Beijing (2006) and SDS members took the opportunity of an IGCP 499 excursion in spring 2007 to see Devonian successions of Argentine. IGCP 499 meetings are all advertized on the official SDS Homepage.

### 5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2007

Chronostratigraphic definitions: Via email ballot the SDS Voting Members have decided formally on the boundary levels (all entries of conodont species) for the base of the Middle Givetian (entry of *Polygnathus rhenanus* or *varcus*), base of the Upper Givetian (entry of *Schmidtoognathus hermanni*), base of the Middle Frasnian (entry of *Palmatolepis punctata*), and base of the Upper Frasnian (entry of *Palmatolepis semichatovae*). All defining species had global (pantropical) distribution and allow a worldwide recognition of substage levels. There is good correlation with sequence and event stratigraphy but correlation into neritic facies partly needs more

data from benthic fossil groups, such as brachiopods, trilobites and corals. The past rules excluded the selection of GSSPs for substages and demanded only the selection of regional reference sections. This may change in future and, therefore, SDS will point out potential GSSP sections. Following communication with the ICS Chairman it was decided to adopt the style of stage definitions. Consequently, the substage working groups are currently preparing comprehensive proposals to ICS for the ratification of substage decisions.

The discussion of Emsian and Famennian substages is continuing. A formal vote on the Famennian has been decided for summer 2008. An Emsian vote is delayed until after the forthcoming Uzbekistan field meeting (Sept. 2008), which will have a Lower Devonian focus.

A detailed re-sampling at the D/C boundary GSSP at La Serre, Montagne Noire confirmed the old suspicion that the supposedly defining conodont *Siphonodella sulcata* enters in the oolitic succession with mostly reworked conodonts several beds earlier than published in the original GSSP proposal. This places the GSSP level well above the intended boundary level, above the traditional *Gattendorfia* boundary level, and in a position that cannot be correlated with precision into any other section. The supposed *praesulcata-sulcata* transition is an artifact at the GSSP position and the rarity of siphonodellids, their poor preservation and the dominating reworking processes prevent the recognition of the decided GSSP level by other means. A GSSP revision seem unavoidable.

Additional reviews of conodont and brachiopod data and their correlation with the Zinzilban Emsian GSSP provide new and convincing evidence that it was placed much lower than originally intended, at a level that correlates with a position in the middle of the type Pragian and much much below the Emsian of the German type area. A GSSP revision without change of the GSSP section seems unavoidable.

**Publications:** The proceedings of the SDS 2004 Rabat/Dra Valley meeting and other invited papers on multidisciplinary event stratigraphy and cross-facies correlation were published as a volume on "Devonian Events and Correlations", vol. 278 of the "Geological Society of London, Special Publication" series.

It is the first volume that was nicely published under the auspice of the formal IUGS-Geol. Soc. co-operation. The volume contains 12 articles that cover all of the Devonian and a very wide array of classical and modern stratigraphical techniques [of course, a MUST for all libraries]. It honors the life-time achievement of our long-term SDS member and former chairman M. R. HOUSE.

The edition of the SDS Newsletter was shifted from Arlington, Texas, to Münster, Germany. Newsletter 22, edited by the SDS Chairman, was published in February 2007 and is rather voluminous (109 pp.). It includes all SDS news from 2005 and 2006, including meetings minutes and documents presented at 2005 and 2006 SDS meetings in Novosibirsk and Leicester, U.K. Newsletter 23 is due in February 2008.

Papers presented at the 2005 Novosibirsk meeting are currently being revised and assembled for a Devonian volume of the Bulletin of Czech Geological Survey, edited by P. KÖNIGSHOF and others. Devonian conodont contributions presented at the ICOS/SDS meeting at Leicester, 2006, are about to be published (end of 2007) in Geological Quarterly (BULTYNCK & NARKIEWICS, Eds.). Manuscripts for two other Devonian volumes (Geol. Soc. Spec. Publ., Palaeogeogr., Paleocl., Palaeoec.) have been submitted but these will not be published before 2008.

**Meetings:** Aspects of the Devonian-Carboniferous boundary that require a GSSP revision were presented at the International Congress on the Carboniferous and Permian in Najing, June 2007. The SDS Chairman took part in the SCS Business Meeting in order to form a future joint new working group on the D/C boundary.

The SDS Annual Business Meeting took place in Eureka, Nevada, in September 2007, in conjunction with a joint SDS/IGCP 499 field meeting to the Great Basin of Nevada and western Utah and with an international symposium on "Devonian Global Change". The very successful event was perfectly organized by TM J. OVER and CM J. MORROW. A proceedings volume will be published in Palaeontographica America as yet

another Devonian book in 2008 (manuscript deadline = 1st Dezember 2007).

**Membership:** Unexpectedly our former, highly regarded Russian TM V. V. MENNER passed away in autumn 2006.

TM T. UYENO has offered to step down but in the absence of any other representative for Canada he was asked to continue until the end of the voting period. CM J. DAY, who has conducted intensive work on the Canadian Devonian in the last years, was nominated to replace him subsequently. Further changes of Titular Membership with the next voiting period (with the Oslo IGC) are currently being discussed.

Our former SDS Newsletter editor and TM R. CRICK has left his academic position and resigned from SDS. CM N. IZOKH from Novosibirsk followed in 2006 E. YOLKIN as TM for the eastern parts of Russia.

Co-operation and increased communication enabled the recruitment of new CMs that will represent in future Myanmar, Vietnam, Turkey, and Bulgaria/Romania. The juvenation of SDS was continued by electing young scientist with permanent position from Germany, the U.S., and Belgium as CMs.

## 6. CHIEF PROBLEMS ENCOUNTERED IN 2007

Palaeozoic stratigraphy is in steady decline in several countries, which used to be a stronghold (Canada, Australia). Funding for remaining SDS members in these countries has become so difficult that they hardly can attend SDS meetings any more. IUGS and ICS strongly have to consider how to improve the funding situation and how to better support and highlight the importance of non-industrial/non-profit stratigraphical research. Despite the incredible economic progress, funding has remained very difficult for Russian and Chinese SDS members. The very restricted funding for ICS/SDS meant that no member could be supported to attend the annual meeting and SDS field symposium.

The ICS demand for formal substage proposals delayed their ratification but manuscript are being prepared.

## 7. SUMMARY OF EXPENDITURES IN 2007

INCOME	
carried over from 2006	256 \$
IUGS subvention 2007	350 \$
donations from members	100 \$

Sum	706 \$
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EXPENSES	
SDS Newsletter 23, 02/2008	
printing/mailing	400 \$
balance early 2008	306 \$

## 8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2008)

- Submit proposals for the formal definition of Givetian and Frasnian substages to ICS for ratification
- Publication of brief note on Givetian and Frasnian substage definition in Episodes
- Publication of more extensive substage definition and reference sections in Geological Quarterly
- Formal founding of joint SDS/SCS Working Group on D/C boundary; first WG discussion (new results from 2007 Chinese section re-sampling by S. I. KAISER & R. T. BECKER) at IGC in Oslo
- Publication of volume on Middle Devonian stratigraphy and correlation in Palaeogeography, Palaeoclimatology, Palaeoecology (TM C. E. BRETT, Ed.)
- Publication of SDS Newsletter 23 in February 2008
- Publication of proceedings volume of 2007 Field Meeting in Palaeontographica Americana (J. OVER & J. MORROW, Eds.)
- Update of Devonian Timescale for next GTS volume (GRADSTEIN et al.)
- Annual Meeting and Devonian symposium at IGC, Oslo, August 2008, some emphasis on formal voting on Famennian substages
- Joint field meeting with IGCP 499 on "Global alignments of Lower Devonian Carbonate and Clastic Sequences; revision and re-sampling of Zinzilban Emsian GSSP, September 2008
- SDS support/attendance to International Congress on "Palaeozoic Climates", August 2008, Lille, France

- Nomination of Honorary SDS Members that have contributed significantly to Devonian Stratigraphy and who have served long periods as voting members or SDS officers.

## 9. BUDGET AND ICS COMPONENT FOR 2007

### INCOME

balance from 2007 306 \$

### EXPENSES

SDS Newsletter 24 400 \$

support for SDS member to attend Oslo

IGC 1000 \$

support for SDS member to attend Uzbekistan

Field Symposium 500 \$

SUM 1900 \$

request for support/subvention from IUGS/ICS 400 \$

request for additional travel funding 1300 \$

## 10. SUMMARY OF CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2003-2007)

- Decisions on substage definitions for the Givetian and Frasnian.
- Compilation of numerous new data for immanent substage subdivision of the Famennian.
- Integration of modern stratigraphic techniques (magnetic susceptibility, chemostratigraphy, isotope stratigraphy, cyclostratigraphy) with classical bio-, event and sequence stratigraphy (many contributions or special sessions at SDS sponsored/organized Devonian meetings).
- Constant monitoring of decided GSSP; their application worldwide and recognition of significant complications, not apparent at the time of decision, in the case of the Emsian and D/C boundary.
- Publication of the SDS Newsletter and further promotion of SDS as the main body of Devonian specialists for communication and co-operation.
- Successful co-operation with IGCP 499.
- International Devonian symposia in 2004 (Rabat, Dra Valley; IGC Florence), 2005 (Novosibirsk, southern Siberia; 6th Baltic Stratigraphic Conference, St. Petersburg),

2006 (2nd International Palaeontological Congress, Beijing; ICOS, Leicester), and 2007 (Eureka, Great Basin, Nevada and Utah).

- Publication of proceedings volume of SDS/joint IGCP 499 meetings, e.g., Over et al. (Eds. 2005), *Developments in Paleontology & Stratigraphy*, vol 20 (Elsevier), Becker & Kirchgasser (Eds. 2007), Geological Society, Special Publication, vol. 278, Bultynck & Narkiewicz (Eds, 2007 in press), *Geological Quarterly*. Three more volumes currently in preparation.
- Better correlation of stratigraphical and new geochronological data, resulting in new absolute time scale.

A more extended activity report for 2000-2005 was submitted to the IUGS Review Committee of ICS in November 2005 and is available from SDS Newsletter 22 (also available on SDS Website).

## 11. OBJECTIVES AND WORK PLAN FOR NEXT 4 YEARS (2008-2011)

- Continue the integration of active young Devonian stratigraphers from many countries and involve in SDS even more scientists from countries with poorly investigated Devonian sedimentary successions.
- Finalize the substage definition for the Emsian and Famennian; new substage subdivision for the Eifelian (probably two substages).
- Revision and new GSSP selection for the base of the Emsian and for the D/C boundary.
- Integration of biostratigraphic and sequence stratigraphic data from as many sedimentary basins as possible in order to produce a new, more detailed, high-resolution Devonian eustatic curve.
- Better integration of relative (combined stratigraphical methods) and absolute (geochronological) ages, including new ages from zircon dating of volcanoclastics.
- Correlation of traditional and widely used regional chronostratigraphic units (regional stages and series) with the formalized global chronostratigraphy, in order to allow a precise understanding of the wealth of past geological/palaeontological information.

- Integration of high-resolution stratigraphic, sedimentary, palaeontological and isotopic data for a refined reconstruction of the global Devonian climatic curve.
- Investigation of Devonian 1st to 5th order global events and extinctions in order to significantly improve the event stratigraphic timescale and our standing of global biosphere change during times of increased climatic warming.
- Further close co-operation with IGCP and other international projects that have a Devonian focus.
- Continue the of publication the annual SDS Newsletter.
- Annual SDS meetings in conjunction with other international symposia.
- Continue the publication of special Devonian volumes in high-level international journals and book series.
- Co-operation within ICS in order to further promote stratigraphy as a major fundamental discipline of Earth Sciences and to contribute to projects on the whole Earth history, such as the developing GTS or International Stratigraphic Code.
- Increase contact with industrial stratigraphers and seek additional ways of funding for meetings, publications and travel support for SDS members.

## APPENDIX A

### Subcommission officers

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1. Emsian correlation chart, P. Carls
2. Reference sections for the Middle Givetian substage, P. Bultynck & S. Gouwy
3. Late Devonian goniatite and conodont zonation, R. T. Becker & M. R. House, in press
4. Late Devonian goniatite, conodont and miospore zonation, compiled by J. Marshall from information supplied by R.T. Becker & M. Streel.
5. Brachiopod faunal successions and the subdivision of the Famennian in South China, Ma Xueping & Sun Yuanlin
6. Upper and uppermost Famennian miospore and conodont correlation in the Ardenne-Rhenish area, M. Streel.
7. The Dasberg Event in the Rhenish Massive, Carnic Alps, and the Anti-Atlas (Tafilalt, Maider) - implications for Famennian eustatics and chronostratigraphy, R.T. Becker & S. Hartenfels.
8. Reiteration of proposal for the only two Famennian Substage boundaries that are globally recognizable and coincident with major transgressions, C.A. Sandberg.
9. Should the Devonian/Carboniferous boundary be redefined? S.I. Kaiser & C. Corradini.

**SDS-Minutes, Annual Business meeting  
Eureka 2007**

**MINUTES OF THE SDS BUSINESS  
MEETING**

**Eureka Opera House, Eureka, Nevada,  
USA, 17<sup>th</sup> September 2007**

The SDS business meeting for 2007 took place during the SDS International Meeting and Nevada Field Excursion on *Rapid Geological Change* organized jointly by TM J. Over and CM J. Morrow, 9th-17th, September 2007.

**Attendance** The Chair (R. T. Becker) & Secretary (J. E. A. Marshall), **TM's** C. Brett, J-G. Casier, J. Hladil, N. Izokh. J. Over, C.A. Sandberg, E. Schindler, T. Uyeno, J. I. Valenzuela-Ríos. **CM's** G.C. Baird, D. Brice, C. Corradini, B. Ellwood, S. Kaiser, U. Jansen, M. Murphy, C. Ver Straeten. **Guests** J. Barrick, A. J. Bartholomew, F. Bigey, R. Brocke, C. Crônier, C. Dojen, S. Ellwood, S. Gouwy, S. Hartenfels, P. Königshof, L. Koptíková, T. Liao, F.W. Luppold, B. Mottequin, J. Nagel-Myers, M N. Savage, Schemm-Gregory, C. Stock, P. Yilmaz.

Documents were presented and numbered as follows:

**1. Introduction and apologies for absence**

The meeting started at 14:04. The Chairman welcomed the large group of participants and noted how pleased we were to be in North America. It was 20 years ago in 1987 the chairman gave his first talk at the second Devonian Symposium in Calgary, Canada. However, it was clear at the 2003 Friends of the Devonian meeting at GSA in Seattle that we would not be meeting in Calgary in 2007 but instead we were very pleased to get the offer of the western USA. We have had an excellent meeting and fieldtrips for which we have to thank our hosts Jeff Over, Jarred Morrow and Charlie Sandberg together with Mike Murphy. We hope that it will not be 20 years before we return.

The joint meeting with IGCP 499 organised with Peter Königshof had been a big success. It is now more complex to create new IGCP projects. We could perhaps be able to organise another programme which initiates new research areas for SDS.

An address list was being circulated. Could attendees please update the list, particularly emails. A new master SDS list is being compiled and will be held and maintained by the chairman.

The list of apologies was read out. In particular there was a problem with Ramadan and the vice-chair El Hassani had not been able to attend. Everyone was reminded that if members of SDS were not heard of and made no contact for 3 years they would be deleted from the membership list.

### **Apologies:**

TM's Blieck, El Hassani, Ma, Mawson, Tsyganko, Weddige; CM's Aung, Bakharev, Benfrika, Blake, Bultynck, Burrow, Chen Xiu-qin, Day, Ebert, Feist, Garcia-Alcalde, Hartkopf-Fröder, Kim, Kirchgasser, Klapper, Mistiaen, Narkiewicz, Obukovskaya, Obut, Ovnatanova, Paris, Richardson, Slavik, Spalletta, Streel, Truyols-Massoni, Wright, Streel, Turner, Wang Chen-Yuan, Yolkin. At this point TM Jeff Over, as the local secretary, arrived to inform the meeting that the water supply to the city of Eureka had been cut. The only available drink was cold beer.

## **2. Approval of the Minutes of the Business Meeting, Leicester, 18<sup>th</sup> July 2006**

The minutes had been distributed by email, were printed in *SDS Newsletter 22* and were available on the new SDS website. They were approved.

## **3. Chairman's Business**

*3.1 Devonian News* The SDS Newsletter had been distributed from Münster with the assistance of Mrs Klaus. There had been problems with Newsletter 21 which had not been distributed and Rex Crick had retired from his university post. It had been available on the former SDS website but with page 28 missing. TM Alain Blieck has it available for distribution as a pdf. It is now available on the new SDS website and page 28 will be added.

The SDS is one of the most active ICS sub-commissions and had regular meetings. Other sub-commissions were still trying to define stages and had lots of problems. Jim Ogg of

the ICS recognised that the SDS was very active and wanted us to go ahead with the first chapter of the Geological Time Scale '2010'. The SDS still has young workers who are still feeding into the sub-commission after their PhD's and the meeting had many new 'in progress' results.

The new SDS homepage had been created by CM Carlo Corradini and Sophie Gouwy. The chairman was very pleased with the homepage. The old homepage was still recognized on the ICS website and the chair would talk to ICS to get the links changed.

CM Carlo Corradini and Sophie Gouwy then demonstrated the new homepage which is at [www.unica.it/SDS](http://www.unica.it/SDS). The site contained a list of SDS members with contact details, links to the ICS and IUGS with a page of planned Devonian links. Pictures were needed of members and past meetings. The members needed to check their addresses. Input from SDS members was also required for the GSSP part of the site and links to other sites.

TM Carl Brett then raised the issue of SDS members placing pdf's of recent papers on the website. CM Carlo Corradini responded that at best we could only include links to pdf's on other website. Publishers were generally unhappy for third parties to be distributing copyright material. The Chairman did suggest the possibility of a list of low resolution pdf's that were available from authors by request.

CM Carlo Corradini also informed SDS members that as the website would include a list of all members together with their address, 'phone number and email details then under Italian law permission is required from the individual to permit the SDS to display this information. So, an email would be sent to all members requesting this permission, a simple 'yes' reply was the only response required. Could all members also check their address details, there were a few duplicates and some had no names and had not been updated.

All the minutes since the Morocco meeting are now online together with the last two newsletters. It is hoped to add more. In particular pdf's of old newsletters were requested.

There is a website link to the ICS GSSP pages. The Chairman has assembled all the figures (maps, logs and section) for the GSSP's but requests more GSSP photographs. In particular

some of the defining fossils (specific to the GSSP sections) have never been illustrated. Examples that are missing are the basal Frasnian marker *Ancyrodella rotundiloba* from Morocco and *Po. costatus partitus* from Wetteldorf for the base Eifelian GSSP.

CM Carlo Corradini commented that it would be good to keep a permanent website record of past meetings especially pictures. More space would be available to keep open links to meeting websites such as the Eureka site. The SDS homepage needed to be more entertaining. The request is for *pictures*. Carlo is happy to accept these and other information at any time.

At the end of the presentation the Chairman gave a big thank you to Carlo and Sophie for their hard work in establishing the new website. TM Jeff Over then arrived to inform members that there was now water at the Owl Club (allowing a sober continuation of the meeting).

### 3.2 SDS tasks and future work plan

The Chairman outlined these as:

- 1) Formal definition and documentation of the new sub-stages
- 2) the inclusion of modern stratigraphic techniques in these definitions such as chemostratigraphy, magnetic-susceptibility, graphic correlation and isotope curves. All of these to be linked to a Milankovitch cycle record perhaps with a special meeting on orbital tuning. This was especially important with the large error bars that exist in geochronology.
- 3) The production of an improved Devonian sea-level curve
- 4) the link between evolution and climate, perhaps again with a special meeting.

Ideas were then requested from the audience.

The Secretary commented that much of the Milankovitch cycle data was already known. It needed to be linked together.

TM Carl Brett highlighted the requirement for the C isotope stratigraphy

There was also a need for the formal definition of regional chronostratigraphic units, for example the Gedinnian and Siegenian are still used in Germany. The Secretary noted the

excellent example of the Belgian regional stages which are now all defined in *Geologica Belgica* and freely available on the web.

<http://popups.ulg.ac.be/Geol/sommaire.php?id=979>

TM Jindrich Hladil raised the question about the future of the Devonian numerical scales produced by TM Karsten Weddige and published by the Senckenberg. These are available online but difficult to access. TM Eberhard Schindler noted that Karsten was going to revise the tables but that there were problems with continuing publication of the printed versions. However, it was planned to place a link on the Senckenberg home page. In any event Karsten Weddige could be contacted for further information.

CM Peter Carls noted that the Early Devonian correlation table had a 'virus'. The interval occupied by the *serotinus* zone was very long and the scaling was odd. TM Nacho Valenzuela noted that it was very important to provide the table and to be able to read the annotation.

CM Uli Jansen commented that there was discussion of the German local and regional stages in the *House volume*.

## 4. ICS Matters

The ICS has been very busy and there has been lots of difficulties in the last 9 months including a breakdown in relations between the IUGS and the ICS. Subcommission chairs were approached in an attempt to remove Gradstein and Ogg as officers. The ICS funding for 2007 would have been removed unless the chairs agreed to 5 points in 4 weeks. However, all the chairs agreed that Gradstein and Ogg were doing a good job. The real issues were to do with a) the Quaternary and b) the nomination and proposal of new officers. However, there would be no money for the ICS unless the Quaternary was reinstated from the Neogene. There had been representation from INQUA to the IUGS and discussions as to the definition being at either 1.8 or 2.6 Ma. The ICS did as the IUGS requested but there were still issues with the Gelasian and the definition of the Neogene. The debate had not been good for the ICS. The funds for the ICS

had been eventually released but at 50% of the previous year.

CM Brooks Ellwood asked about the status of sub-eras and the need to have a common base to both the Quaternary and the Pleistocene. The Chair noted that all the problems were not solved as the Quaternary was back with the rank of a system.

The 2004 Geological Timescale had no Quaternary. The IUGS logo is on the book but it was not an IUGS approved time scale. The ICS had targeted the final production of the next timescale for the Oslo IGC in 2008. This date had now been revised to 2010. However, Berndt Kauffman (Graz, Austria) would not be adding his new timescale to the Gradstein compilation. The first version will soon be available for comment.

CM Peter Carls raised the question of the timescale. It requires our data but is a personal effort for the benefit of all. Science makes its own progress and cannot be governed by commissions. The Chairman replied that the time scale was an absolute goal and it was our duty to produce a time scale for 2010. CM Peter Carls commented as to why the SDS should publish an incorrect timescale. TM Charlie Sandberg noted that the project should be to question the biochronology of Kauffman and more directly tie the radiometric dates to the biochronology as emphasised by the 'short' age for the Eifelian.

The Chairman commented that the Kauffman chart had been discussed at the SDS meeting in Leicester. The scaling to the lithostratigraphic sections was sometimes based on single sections, e.g. large parts of the Famennian. More could be usefully added. There should be discussion between the time scales of Kauffman and Gradstein particularly involving the Eifelian and Emsian stages and the scaling of the *serotinus* and *costatus* zones.

CM Chuck Ver Straeten noted that Devonian timescales were work in progress and need more work. We require a more aggressive attitude to acquiring age dates but who can we get to produce the analyses. The Chairman remarked that it was not easy to generate the analyses, it takes 9 months to produce a single age date. CM Brook Ellwood reported that a group (details could be supplied) were getting

funding for the zircon dating of bentonites with 10 labs dating each bentonite and at present focusing on the Cenomanian/Turonian.

The Chairman noted that another timescale had been produced by *GeoArabia*. This had been flagged as good by the ICS although it includes units such as the Mid Carboniferous and Mid Cretaceous, which have no formal base. Heavy criticism have come from various subcommissions (e.g., Carboniferous, Jurassic) and the chart shows that ICS work still is not sufficiently transmitted to the wider geoscientific community. CM Brooks Ellwood commented that we needed to lobby the ICS so that the SDS could provide input from all our past work.

The Chairman reported that the International Subcommission on Stratigraphic Nomenclature is currently producing a new International Stratigraphy Guide. CM Mike Murphy objected to the general aim. M. Bianca-Cita, the ISSN chairman from Italy, had produced a chapter of stratigraphic nomenclature '*New Developments in Stratigraphic Classification*'. Authors were selected/invited for each of the methods e.g. chemostratigraphy (40pp), sequence stratigraphy (100 pp). All this was to be published in *Newsletters on Stratigraphy* and these publications will form the base for open discussion. SDS members are asked to take part in this.

The Chairman reported that the ICS prizes were open for nominations. There were the Digby McClaren prize for an individual who through a long period of time had contributed significantly to stratigraphy. The second prize was awarded on the basis of stratigraphic work in a single paper. SDS needed to submit CV's and a case by the end of October which would be difficult. The Secretary was of the view that SDS should always make a submission (otherwise how could we claim to the ICS that we were producing top science). At this point TM Jeff Over nominated TM Carl Brett for the Digby McClaren award.

The final item of ICS news was that voting was taking place on new names for the Cambrian. This included completely new and 'invented' names, such the Fortunian, a practise also adopted for the Ordovician and Silurian.

The meeting then broke for a coffee break from 15:35 until 15:54

## 5. Devonian Chronostratigraphic Definitions

### 5.1 Base of the Emsian

The Chairman expressed the view that this standing items was not to be discussed here and we should wait until we have seen the stratotype in Uzbekistan when it could be resampled. At the 2005 Novosibirsk business meeting it was agreed that we should revise the base of the Emsian but keep it within the same GSSP section.

CM Peter Carls then introduced Document 1. TM Nadya Isokh responded that we would have a more informed discussion of this next year. There would be a new publication on the section and she displayed some of the new conodont plates. CM Peter Carls had raised major issues but next year we could decide on this important question. In the year before the meeting the organisers would compile more data on conodonts from Zinzilban, European Russia and Salair. The Chairman noted that we needed data about "species 114" from elsewhere in the world and that we needed to bring this information to Zinzilban. TM Nacho Valenzuela commented that some of this information was available on the Macquarie University hosted Emsian working group website together with SDS Newsletter 22 and the ECOS VIII book. However, the chairman was still keen to have a presentation about "species 114" in Uzbekistan. Importantly TM Nadya Izokh will be visiting TM Nacho Valenzuela for 4 months before the meeting. The Chairman also commented that we would need both lower and upper Emsian documents. CM Peter Carls then discussed more Emsian issues. TM Eberhard Schindler noted that TM Karsten Weddige was undecided what to do about the lower and upper Emsian and was content to leave the topic to others. TM Nacho Valenzuela noted that it was important to resolve the base Emsian issues first.

The Chairman noted the requirement for the mid-Emsian boundary in Zinzilban. CM Chuck Ver Straeten contributed with an update on the forthcoming work in the Southern Appalachians where the lower Emsian would be defined with dacryoconarids.

### 5.2 Eifelian sub-stages

There is, as yet, nothing defined for possible lower and upper Eifelian stages. We need to think about this for the future but it was not urgent. CM Chuck Ver Straeten noted that the Eifelian was rather short and contained 2 full sequences plus part of another. It was worth splitting as the different sequences had very different evolutionary histories and ecology. CM Mike Murphy offered his Emsian collections from Nevada as a contribution to this study.

*Givetian*: Although not tabled in the agenda there was then a brief discussion on the sub-division on the Givetian stage. We need to submit a formal proposal that would then be voted on/agreed/ratified by ICS as if it was a stage definition. This is the reason that the formal publication in *Quart. Geol* has been delayed. Sophie Gouwy then introduced Document 2. The Chairman commented that with Sarah Aboussalam he had resampled another Tafilalt section at Jebel Amelane and had located *Polygnathus varcus* in a goniatite marker bed, confirming that the zonation works and supported Document 2. TM Nacho Valenzuela also supported the definition based on correlative sections in Spain.

The Chairman commented on the formal submission of the Givetian sub-division to the ICS and noted that we should add sequence stratigraphy to the document. Any relevant data should be sent to CM Pierre Bultynck and Sophie Gouwy. We also needed other workers (to include data on spores and brachiopods) to contribute to the definition of the base of the upper Givetian, and the middle and upper Frasnian. TM Jeff Over is organising the Frasnian working group.

### 5.3 Famennian sub-stages

The Chairman introduced the Famennian discussion. He noted that there was an *in press* Becker and House paper in the important Canning Basin monograph edited by P. Playford and to be published in the *Bulletin of the Geological Survey of Western Australia*. In this paper the base of the Mid Famennian was defined at the base of the *marginifera* zone. Document 4 was introduced which was a compilation of Famennian ammonoid, conodont and spore zonations produced by the Secretary from information supplied by the Chairman and CM Maurice Streef. The first

also reported that CM Christoph Hartkopf-Fröder (Nordrhein-Westfalen Landesamt) is just starting to investigate new palynological samples from Riescheid in the northern Rhenish Massif that will give better information on spore zonation in relation to conodont and ammonoid distribution.

Document 5 was a report (Ma & Sun) on the brachiopod successions in the Famennian of South China. The Chairman briefly commented on the generally low brachiopod turnover in the Famennian. However, CM Denise Brice added that although she agreed that brachiopod turnover was low in the upper Famennian, it was greater in the lower Famennian. TM Jeff Over noted that this was similar to the pattern observed in the conodonts. CM Peter Carls added that both brachiopods and corals were important in the definition but that the definition should be based on conodonts. In any event, there was much work still to be done on the brachiopods and more reviews are welcomed.

Document 6 by CM Maurice Strel was then discussed. The Chairman noted that it was important to compare it with the account of the Strunian available online in *Geologica Belgica*. He agreed that the lower base of *Retispora lepidophyta* (base LL) was much lower than the Upper *expansa* Zone and that the Strunian in the traditional sense occurs at a higher level. This was followed by a discussion of the significance of *Retispora lepidophyta* and particularly *R. lepidophyta minor*. The LN spore zone occurs above the Hangenberg Black Shale and the LE zone in the Hangenberg Black Shale. However, the base of the LE is not well correlated. If the Famennian is subdivided by the base of the Upper *expansa* Zone, then this was approximately equivalent to the base of *R. lepidophyta minor*.

The Chairman then introduced Document 7 which we had already heard about in a talk this morning. *Palmatolepis gracilis expansa* had proved to be unreliable for defining the base of the Lower *expansa* zone in all studied sections, hence other conodonts were used. The question was asked as to how the Lower *expansa* was defined. The Chairman also reported that there were problems with diachroneity in the age of the Dasberg transgression between German (top of Lower *expansa* Zone) and Moroccan (base of Middle *expansa* Zone) sections.

Document 8 was by TM Charlie Sandberg who gave a brief introduction to the document. He reinforced that the Famennian had to be split into 3 subdivisions rather than 4. The Strunian was difficult to define using conodonts in the type area and didn't match to the base of the Upper *expansa* Zone. The answers were to the comments by CM Maurice Strel in SDS Newsletter 22. Charlie had not enjoyed writing the response to this document. The Secretary commented that we had tried to attempt an informal solution when CM Maurice Strel came over to the 2006 GSA meeting in Philadelphia. However, at the last moment TM Charlie Sandberg had not been able to make the discussion with CM Maurice Strel, CM Sandra Kaiser and the Secretary.

The Chairman then asked for comments as to how we should proceed on Famennian subdivision. TM Jeff Over noted that we should look for disconformities at the base of flooding surfaces in black shales. There was useful information from Eastern North America on unconformities in black shales produced by Jürgen Schieber (University of Indiana <http://www.shale-mudstone-research-schieber.indiana.edu/sequence-strat.htm>). CM Brooks Ellwood commented that MS was an excellent tool in the Famennian but that we needed new data.

The Chairman then summarized the issue. We did not yet have the data to make good progress. We would therefore hold over the discussion to the next meeting at Oslo. Formal proposals are now needed which can then be voted upon. But we must remember that there was a clear majority for 4 rather than 3 sub-stages and this decision does not stand for reconsideration. There will be no further straw votes and formal voting on all three substage boundaries will take place right after the next annual business meeting.

#### 5.4 Revision of the Devonian-Carboniferous boundary

The document was tabled and following the talk by CM Sandra Kaiser in the morning we moved straight onto the discussion. TM Nacho Valenzuela noted that we needed to agree on the siphonodellid and protognathodid taxonomy. CM Brooks Ellwood made a plea for the GSSP to have potential for MS and

chemostratigraphy together with the need to co-ordinate with the SCS. The Chairman replied that he had attended the Carboniferous Congress in China and the SCS has agreed to set up a joint working group. The tasks of the joint working group were formulated as follows:

1. to refine and agree on the conodont taxonomy
2. to investigate new data
3. to consider the options of
  - a. La Serre at a different level/definition
  - b. a new section with the original GSSP definition
  - c. a new section at a different level

TM Charlie Sandberg then proposed that we should suspend discussion of the D-C boundary indefinitely. The discussion had taken over 50 years and he had worked on it with CM Maurice Streel since 1969. The present boundary had been accepted by a 11-0 decision of the working group. The views of the conodont workers had also been over-ruled at that time. We could perhaps move the boundary down by 2 to 3 beds and let the matter rest. In addition it was more the business of the SCS. CM Sandra Kaiser then raised the difficulties over the application of the same lineage in other sections. The Chairman emphasized that the *presulcata* to *sulcata* lineage has not been found preserved in any section world-wide. CM Brooks Ellwood noted that there were excellent section close to La Serre that would make an easier solution. CM Carlo Corradini reported results from Sardinia where there was no evidence of reworking and *S. sulcata* occurred with *S. presulcata* possibly in topmost Devonian pre-Hangenberg beds.

The Chairman emphasised the reasons for having a revised GSSP. It should be the best section in the world and we should be able to restudy it now and in the future to obtain new information from it using techniques that we don't yet know. La Serre does not meet these criteria. The current GSSP level cannot be correlated with precision into any other section but, based on its advanced siphonodellids (transitional forms between *sulcata* and *duplicata*) most likely post-dates the entry of *Gattendorfia*, which traditionally defined the Carboniferous.

The Chairman then moved the proposal for a working group. This would include the discussion of new samples collected from Chinese sections collected this summer. The members of the working group from the SDS side would be TM Thomas Becker, CM Sandra Kaiser, CM Carlo Corradini, CM Wang, Chen-yuan, Ji Qiang, CM Brooks Ellwood, TM John Marshall (spores), CM Hanna Matyja and CM Denise Brice. Other members would be suggested by the CSC. The working group would communicate by email rather than formal meetings.

## 6. Membership

### *Corresponding Members*

The chairman noted that CM's who had gone quiet would be removed although could still remain as SDS members. These included G. Brock, M. Dastanpour, Tsien, Hsien-Ho, and Wan yan Chong. The CM status of Morzadec and Racheboeuf would be held pending enquiries as to their future plans.

Six new CM's were proposed

	<b>Proposed</b>	<b>Seconded</b>
Sophie Gouwy Belgium/Italy	Th. Becker	J. Marshall
Phuong Ta Hoa Vietnam	E. Schindler	Th. Becker
Alex Bartholomex (USA)	C. Brett	Th. Becker
Maya Elrick	J. Over	C. Brett
M. Whalen	Th. Becker	Ch.Ver Straeten
R. Brocke	E. Schindler	J. Marshall

These proposals were approved by a show of hands with no dissent.

### *Titular Members*

The Chairman noted that the ICS now had more control over the nomination and retirement of TM's. We have to submit the names of the TM's to the ICS in advance of each IGC and then were only normally permitted two terms of four years. He reported that both TMs Charlie Sandberg and Karsten Weddige were both scheduled to retire at the IGC in Oslo. It was also doubtful whether Zhu Min would continue beyond Oslo.

As regards the terms of the Chair, Secretary and Vice-Chair there were no formal rules. Our four year term finishes in Oslo. As notified to all SDS member by email the present committee were willing to continue. Therefore it had been arranged that CM Pierre Bultynck would, until the end of October, collect the names of any candidates for the posts of Chair and Vice-Chair. If there were nominations a vote would be arranged. If no candidates were brought forward, this would be seen as a confirmation (re-election) of the current officers. The present membership agreed with this procedure. The post of Secretary is through nomination by the Chair rather than separate election. This is because, historically, several separately elected chairs and secretaries have not worked well together.

## 7. SDS Newsletter and Publications

The next newsletter would be produced in January 2008. The deadline for copy is the end of December 2007. Therefore we need members news before this deadline. **ALL SDS members are expected to contribute to the news section.** There is also a new publications section that needs contributions. The Secretary will issue an email newsletter reminder at the end of November.

Other publications include the Proceedings of the Eureka meeting to be published in *Palaeontographica America*. The deadline has been moved from 15<sup>th</sup> October to 1<sup>st</sup> December. Author instructions are available from the PRI webpage but manuscripts must be sent to TM Jeff Over.

The Secretary drew the attention of the meeting to the recently published House volume, *Geological Society of London Special Publication 278* and the copy that was on display. A substantial discount was available using the available flier. The volume was also available digitally on the Lyell Centre by institution or personal subscription or PPV (pay per view).

Other volumes that are in progress are the *Palaeo*<sup>3</sup> Middle Devonian sea-levels and bioevents volume organised by TM Carl Brett. This currently has 5 contributions. The final date for m/s submission is the end of January 2008.

Another *Geological Society of London Special Publication* is in progress to publish the findings of IGCP 499. This currently has Devonian contributions from Argentina, China, Australia and the USA. The deadline for manuscripts is the end of December.

The proceedings of the Novosibirsk meeting will be published in the Journal of the Czech Geological Society (now the *Journal of Geosciences*). Additional contributions are required for an end December deadline.

Marek Narkiewicz reported by email that the forthcoming Devonian special issue of *Geological Quarterly* (formerly *Kwart Geol*) will be published by the end of December 2007. A contents list will be placed in the next SDS newsletter.

## 8. Financial Report

The SDS had this year received \$400 from the ICS. There was \$256 left over from last year. All this money would be used to produce and distribute the newsletter. We have not been able to support travel to the meeting by an SDS member this year. Last year we were able to get money from an ICS special fund to enable Vice-chair El Hassani to attend the meeting in Leicester. This fund was not available this year. The ICS funding for next year is unknown.

CM Brooks Ellwood reported on the success in getting oil companies to contribute funds. His institution had just got \$5 million in sponsorship and the industry was short of biostratigraphers. However, TM Jeff Over reported that he had tried to get oil company funding for graduate students for the Eureka meeting but had had no success.

## 9. Future Meetings

Our next meeting is at the IGC in Oslo where we are formally required to meet. The 2<sup>nd</sup> circular is now out. There will be a special SDS sponsored symposium on the *Correlation of Devonian terrestrial, neritic and pelagic strata*. This would be held on the same day as the Annual Business Meeting which is 10<sup>th</sup> August 2008. A reduced rate (but not 50%) is available for half congress attendance.

The meeting in the Kitab Reserve, Uzbekistan, is in September 2008. Three copies of the circular were made available. The circular had also been distributed by email to SDS member. In addition, it is also available for download from the new SDS website. Arrangements for the meeting were in progress and CM Olga Obut would be acting as translator. SDS members who attended the Novosibirsk would remember the excellent contribution she made to that meeting.

IGCP 499 have their final meeting in September 2008 in Frankfurt. A meeting flier was available. Full details were also on the Senckenberg website.

There is also a meeting in Lille on Palaeozoic climates together with a field excursion in Belgium and France. SDS members should note that there is a session on Upper Palaeozoic climate. But the dates of the Lille sessions (28-29<sup>th</sup> August) mean that it clashes with the Kitab Reserve meeting. Members who cannot attend the Uzbekistan meeting are recommended to take part in the Lille congress.

Further ahead, ICOS 2009 (11) will be held in Calgary, Canada. It is hoped that this meeting will interface with the NAPC meeting (June 20<sup>th</sup>-26<sup>th</sup>) at the University of Cincinnati. TM Carl Brett has invited the SDS to hold a

symposium at NAPC and there will be a 4 day Devonian fieldtrip to Ohio, Kentucky, Indiana and Michigan. A good date for ICOS 2009 would be early/mid July.

TM Nadya Isokh then made a brief presentation on the Kitab Reserve/Uzbekistan meeting.

#### **10. AOB**

TM Charlie Sandberg requested clarification as to whether TM's were needed to be nominated a year in advance. The Chairman agreed to look into the rules but noted that there would be an email vote for the new TM's from existing TM's.

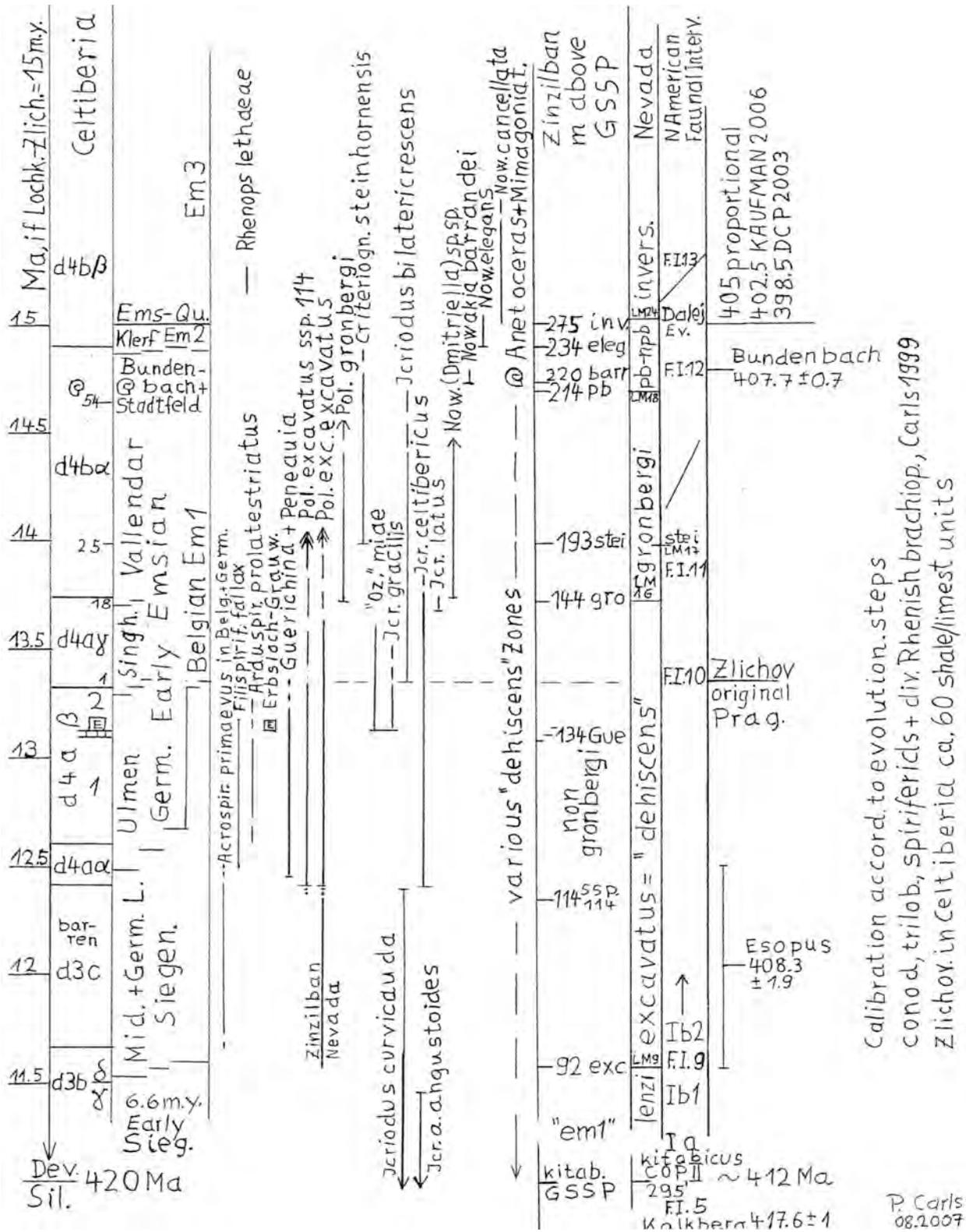
CM Carlo Corradini reported that the SSS were meeting in Sardinia in 2009 including a fieldtrip with Upper Silurian and Lower Devonian sections. The circular was circulated. It is available from [www.unica.it/silurian2009](http://www.unica.it/silurian2009)

The meeting closed with refreshments in the Opera House and informal discussion of a successor to IGCP 499.

**John E. MARSHALL**  
**SDS Secretary**  
November 2007

# SDS-REPORTS AND DOCUMENTS

## SDS-Report C. CARLS



## REFERENCE SECTIONS FOR THE MIDDLE GIVETIAN SUBSTAGE

P. BULTYNCK & S. GOUWY

### INTRODUCTION

SDS initiated the discussion on the formal subdivision of the Givetian in 1999. Initially a subdivision of the Givetian into a Lower and Upper Substage was recommended. The main argument for a twofold subdivision was that in accordance with the definition of the GSSP for the base of the Frasnian the stratigraphic interval dominated by the Pharciceratidae is included in the upper part of the Givetian whereas goniatite specialists consider this interval as the inception of the Upper Devonian goniatite radiation. It was also emphasized that the Taghanic Event Interval should be considered for defining an Upper Givetian Substage.

Aboussalam & Becker (2002) proposed the base of the *hermanni* conodont Zone as a base for an Upper Givetian Substage emphasizing that it represents an important conodont and ammonoid event corresponding to a significant eustatic sea-level rise (base of Genesee Shale in New York) that however is just above the Taghanic Event Interval. The consequence of a definition of an Upper Givetian Substage at this level is that in most Givetian successions, pelagic and neritic, a Lower Givetian Substage will represent a much longer-lasting period than the Upper Givetian. For this reason a more time-balanced threefold subdivision was proposed by Bultynck & Gouwy (2002). In 2004 they recommended the base of the *rhenanus/varcus* Zone (Bultynck, 1987), = upper part of the Lower *varcus* Subzone of Ziegler et al., 1976, as the base for a Middle Givetian Substage. SDS adopted this proposal by a formal vote in 2006 (13 yes, 3 abstentions and 0 no. The basic criteria for a threefold subdivision of the Givetian are shown in Fig. 1.

### DEFINITION OF THE BASE OF THE MIDDLE GIVETIAN IN THE MOROCCAN EASTERN ANTI ATLAS

The base of the Middle Givetian is best documented in the hemipelagic succession of the Bou Tchrafine Section near Erfoud in the

northern Tafilalt (Bultynck 1987; Figs. 2-4 herein). The Givetian is about 14 m thick and conodonts and goniatites are abundant, for the latter see Becker & House (1994, 2000). The base of the Middle Givetian is characterized by the first occurrence of *Polygnathus rhenanus* and *P. varcus* in sample 23. A *P. rhenanus* specimen from this sample is figured in Bultynck & Hollard (1980, pl.6, fig.15). Practically it means that the base of the Middle Givetian in a section can be recognized by the first occurrence of one of the two species. *P. pseudofoliatus* and *Icriodus obliquimarginatus* have not been recorded above this level. Sample 23 is at the top of a sequence with nodular limestones just below a crag with compact platy limestones in which conodonts and goniatites become sparse, and representing a shallowing upward trend. According to this definition the Lower Givetian of the Bou Tchrafine section is about 5 m thick, the Middle Givetian 8.25 m and the Upper Givetian 1 m.

Another important reference section in the Moroccan eastern Anti Atlas is the Ou Driss section (Bultynck 1989; Figs. 5-7 herein) in the southwestern extremity of the Ma'der Basin. The exposed part of the Givetian assigned to the *hemiansatus*, *timorensis* and *rhenanus/varcus* Zones, is about 57 m thick. Up to sample ODE 4 the megafauna contains pelagic and neritic elements: corals, brachiopods, trilobites and goniatites. Above sample ODE 4 only neritic elements occur: corals, brachiopods and trilobites. Rugosa dominate and have been studied by Coen-Aubert (1989) and Pedder (1999). This megafaunal change suggests a shallowing upward sequence. *P. rhenanus* first occurs in sample ODE 3, the first limestone bed above the megafaunal change, and *P. varcus* appears in sample ODE 2.

Graphic correlation between the Tafilalt sections and the Maider sections (Belka et al., 1997; Gouwy and Bultynck, 2002) indicates that *Icriodus difficilis* appears slightly above the base of the *rhenanus/varcus* Zone and it may be a tool for recognizing the base of the Middle Givetian in shallower water environments.

Notes on the taxonomy of *P. rhenanus* and *P. varcus* and on the *varcus* zone and subzones

The holotype of *P. rhenanus* is from a level just below the lower *pumilio* bed at Syring quarry near Oderhausen, Germany (Klapper et al. 1970). According to Lottmann (1990, p.91) this level is about 0.50 m below the first occurrence of *P. ansatus* in that section (note that in fig.35, p.91 the base of the Middle *varcus* Subzone is drawn too low according to its definition by Ziegler et al. 1976). The last authors regarded *P. timorensis* as a senior synonym of *P. rhenanus* “because the latter seems to have been based on a juvenile specimen of *P. timorensis*”. We agree that the holotype of *P. rhenanus* is not a fully adult specimen but Bultynck (1987, pl.7, figs.13-15) figures adult specimens of *P. rhenanus* that can be easily separated from adult specimens of *P. timorensis* (ibidem pl.7, fig. 9) by the very long free blade and the short, clearly asymmetrical platform, due to the prominent outward bowing of the outer anterior trough margin. Klapper (1980, 1981) introduced a late form of *P. timorensis*, specifying that it corresponds to *P. rhenanus*. The latter species is recognized and figured by Sparling (1999), including synonym list, Garcia-Lopez & Sanz-Lopez (2002) and Kaufmann (1998). So *P. rhenanus* is regarded herein as a valid species. Bultynck (1987, fig. 9) introduced an alternative zonation for the *varcus* Zone as defined and subdivided by Ziegler et al. (1976). This alternative zonation in ascending order consists of the *timorensis* Zone (= lower part of Lower *varcus* Subzone), *rhenanus/varcus* Zone (= upper part of Lower *varcus* Subzone), *ansatus* Zone (= Middle *varcus* Subzone minus uppermost part) and *semi-alternans/latifossatus* Zone (= uppermost part of Middle *varcus* Subzone and Upper *varcus* Subzone). This alternative zonation was first recognized in the above discussed Bou Tchrafine section.

The use of Lower, Middle and upper *varcus* subzones is deep-seated in Devonian conodont literature. But the alternative zonation provides a higher stratigraphic resolution than the *varcus* Zone and its subdivisions and reflects better the most important changes in the conodont faunas of that part of the Givetian.

In the first place *Polygnathus varcus* itself is not the critical species for recognizing the base of Lower *varcus* Subzone. According to the definition of Ziegler et al. (1976) it is defined by the first occurrence of *Polygnathus timorensis*. From the distribution tables in that

paper it appears that *P. varcus* first occurs well above the base of the zone. In the studied North American sections it occurs only in a few samples and there is not any stratigraphically critical specimen of the species figured in the paper. Huddle (1981) did not recognize it in the Givetian of New York. This were the main reason for replacing the Lower *varcus* Subzone by the *timorensis* Zone and the *rhenanus/varcus* Zone. The lower boundary of the Middle *varcus* Subzone was originally defined by the first appearance of *Polygnathus ansatus*, so in fact *ansatus* Zone is the appropriate name. *Ozarkodina semialternans* first occurs in the uppermost part of the “Middle *varcus* Subzone” and the first occurrence of *Schmidtognathus latifossatus* defines the base of the “Upper *varcus* Subzone”. However, in the southern Moroccan sections *O. semialternans* is common to abundant and *Schm. latifossatus* rare. This is also the case in other areas (Aboussalam, 2003, p. 13). For that reason Bultynck (1987) introduced the *semialternans/latifossatus* Zone, its base being only slightly older than the base of the “Upper *varcus* Subzone”. Moreover, in the Middle Devonian Standard Composite resulting from graphic correlation of sections in southern Morocco (Gouwy and Bultynck, 2002), there is little difference in composite standard units for the entries and last occurrences of *O. semialternans* (139, 19 – 140, 11) and *Schm. latifossatus* (139, 50 – 140, 42).

#### CORRELATION OF THE DEFINING LEVEL WITH OTHER FOSSIL GROUPS, EVENTS, T-R CYCLES.....

- **Ammonoids.** In the Bou Tchrafine section *Wedekindella* aff. *W. psittacina* first occurs at the same level as *P. rhenanus* and *P. varcus*. *W. psittacina* is a marker form for the *Maenioceras molarium* Zone. See Becker and House (1994, 2000).

- **Brachiopods.** Drot (1964, 1971: 71-73) described brachiopods from the Middle Givetian sample interval between ODE-3 and ODE-2 in the Ou Driss section and Hollard (1974: 33) mentions *Stringocephalus* cf. *S. burtini* from the interval between ODE-2 and ODE-1.

- **Rugose corals** from just below and above the Middle Givetian boundary level in the Ou

Driss section were identified by Coen-Aubert (1989) and described by Pedder (1999).

- **The Lower *pumilio* bed** in the Bou Tchrafine section is 3.20m above the base of the Middle Givetian and 1.80m below the base of the *ansatus* Zone (Bultynck, 1987). Its position is similar in the Syring Quarry (Rhenish Slate Mountains). According to Klapper et al. (1970) the holotype of *P. rhenanus* is from just below the Lower *pumilio* bed and according to Lottman (1990: 91, fig. 35) the top of that bed is about 0.40m below the first occurrence of *P. ansatus*.

- **The Lower *varcus*-Subzone regression (upper If)**. Johnson & Sandberg (1989) defined this regression in the Western US, starting in the upper part of the Lower *varcus* Subzone and continuing into the lowest part of the Middle *varcus* Subzone. The shallowing upward trend starting at the base of the Middle Givetian in the Bou Tchrafine section and in the Ou Driss section is considered herein as corresponding to the upper If-regression, on Fig. 1 herein indicated as If-2.

#### APPROXIMATE LEVEL OF THE BASE OF THE MIDDLE GIVETIAN IN OTHER AREAS

-**Belgium, Ardenne**, 50m above the base of the Mont d' Haur's Fm. Based on graphic correlation of the Ardenne Regional Composite with the Middle Devonian Standard Composite established in the Tafilaal-Ma'der (Gouwy & Bultynck, 2002, 2003).

-**Spain, Cantabrian coast**. Based on the occurrence of *P. rhenanus*, below the first appearance of *P. ansatus* in the uppermost part of Naranco Fm and lowest part of Candas Fm (Garcia-Lopez & Sanz-Lopez 2002: 139 and pl. 1, figs. 19-21).

- **Central Nevada**. Johnson et al. (1980) recorded the late form of *P. timorensis* (= *P. rhenanus*) and *P. ansatus* in the uppermost part of the Lower Mbr of the Denay Limestone, assigned to the Middle *varcus* Subzone. However, there is an important interval without conodont record that may belong either to the Middle *varcus* Subzone or to the Lower *varcus* Subzone. This interval corresponds to the Lower *varcus* Subzone-regression (upper If cycle) recognized in the upper part of the Lower Mbr of the Denay

Limestone in central Nevada by Johnson & Sandberg (1989) and correlated herein with the lower part of the Middle Givetian.

- **In north-central Ohio** Sparling (1999) recorded *P. rhenanus* and *P. ansatus* from the Prout Dolomite he assigned to the Middle *varcus* Subzone. But in this area there is an important sedimentary gap between the Prout Dolomite and the underlying Plum Brook Shale assigned by Sparling (1995) to the *ensensis* Zone s.l. According to Sparling (1999, fig. 2) the gap corresponds with the Lower *varcus* Subzone and the main part of the Middle *varcus* Subzone. However the correlation of the entire Plum Brook Shale with the *ensensis* Zone s.l. can be questioned. It contains also *Icriodus brevis* and *Polygnathus xylus* that first occur in the Lower *varcus* Subzone (Ziegler et al., 1976) or in the *timorensis* Zone (Bultynck, 1987). Moreover, *P. ensensis* ranges into the *timorensis* Zone. So the gap may start with the upper If-regression and explain the delayed first occurrence of *P. rhenanus* in the area.

- **Western New York**. Brett & Baird (1996) describe a shallowing upward hemicycle from the upper part of the Wanakah Mbr to the Jaycox Mbr (upper part of Ludlowville Fm and just below the Tichenor Mbr of the Moscow Fm), that may represent the upper If-regression. According to Klapper (1971) *P. ansatus* first appears at the top of the Kashong Mbr, overlaying the Tichenor Mbr. He also mentions *P. rhenanus* from the Tichenor Limestone in the condensed section at Eighteenmile Creek near Buffalo.

- **Canada, Great Slave Lake area**. The upper part of the Pine Point Fm, belongs to upper part of If cycle and is assigned to the upper part of the Lower *varcus* and to the lower part of the Middle *varcus* Subzones (Uyeno 1998).

- **Canada, southern Manitoba**. The unconformity between the Winnipegosis and Dawson Bay Fms is within the interval of the upper If-regression (Day et al. 1996).

- **Eastern Australia, Broken River region**. In the SD 12 section through the Papilio Fm, horizon 212 (Mawson & Talent 1989, fig. 8C) occur conodont specimens (pl. 4, figs. 11, 12) identified as *P. timorensis* that show a clearly asymmetrical platform like in *P. rhenanus*.

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### Legends of the figures

Fig. 1- Basic data for the subdivision of the Givetian into three substages based on the Bou Tchrafine section.

Fig. 2- Sketch map showing the location of the Bou Tchrafine section.

Fig. 3- The Eifelian, Lower and Middle Givetian (uppermost part not shown) in the Bou Tchrafine section.

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ig. 5- Sketch map showing the location of the eastern Ou Driss section (ODE) discussed herein.

ig. 6- The upper Eifelian and the lower part of the Lower Givetian in the ODE section (Bultynck, 1989).

Fig.- 7- The Lower – Middle Givetian boundary interval in the ODE section.

### BASIC DATA FOR SUBDIVISION GIVETIAN

Chrono	Conodonts		Ammonoids Becker & House 2000	Events R ← → T
	Standard Zones	Icriodus Zones / Faunas		
<b>FRASNIAN</b> 385 Ma	<i>falsiovalis</i>			↑Frasnes IIb ↓
Upper	<i>disparilis</i>	<i>subterminus</i>	Multilobed pharciceratids	II a-2
	* <i>hermanni</i>			
Middle	<i>/latifossatus semialternans</i>		Pharciceras <i>tridens</i> aff. <i>amplexum</i>	II a-1
	<i>ansatus</i>			
	<i>rhenanus / varcus</i>			
Lower	<i>timorensis</i>	<i>difficilis</i>	Wedekindella aff. <i>psittacina</i>	II f -2
	<i>hemiansatus</i>			
	<i>obliquimarginatus</i>			
<b>EIFELIAN</b> 392 Ma	<i>ensensis</i>		<i>Maenioceras koeneni</i>	Kačák II f -1

Fig. 1

\* Proposal Aboussalam & Becker 2002  
P. Bultynck & S. Gouwy August 2004

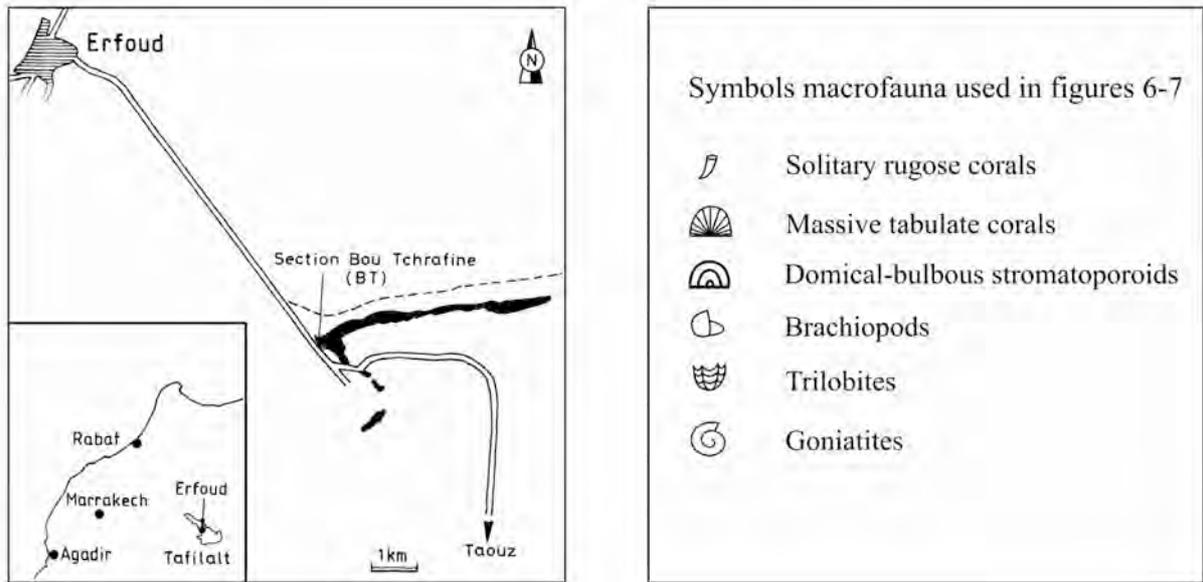


Fig. 2

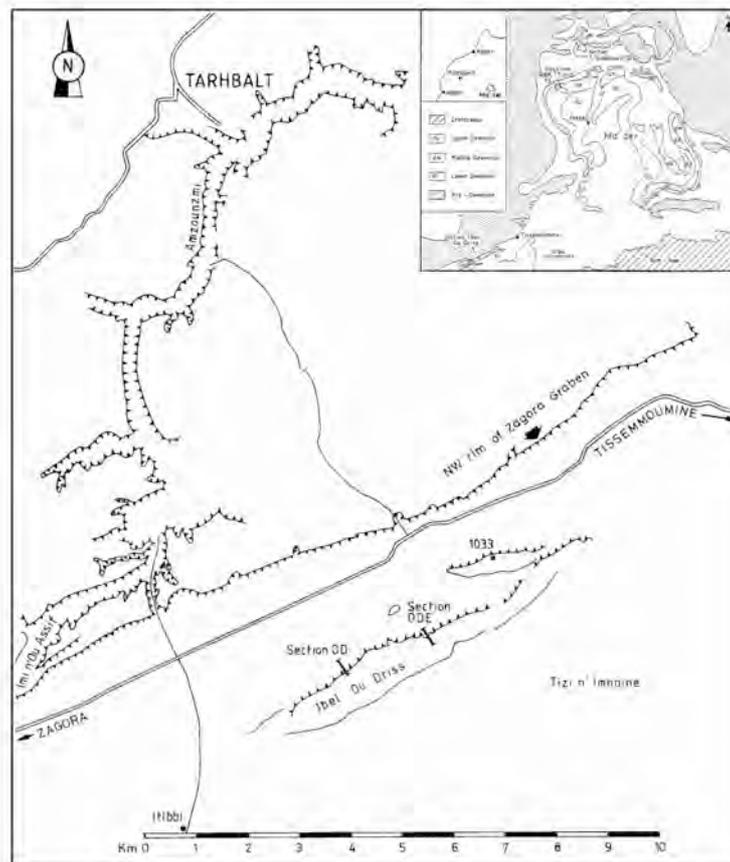


Fig. 5

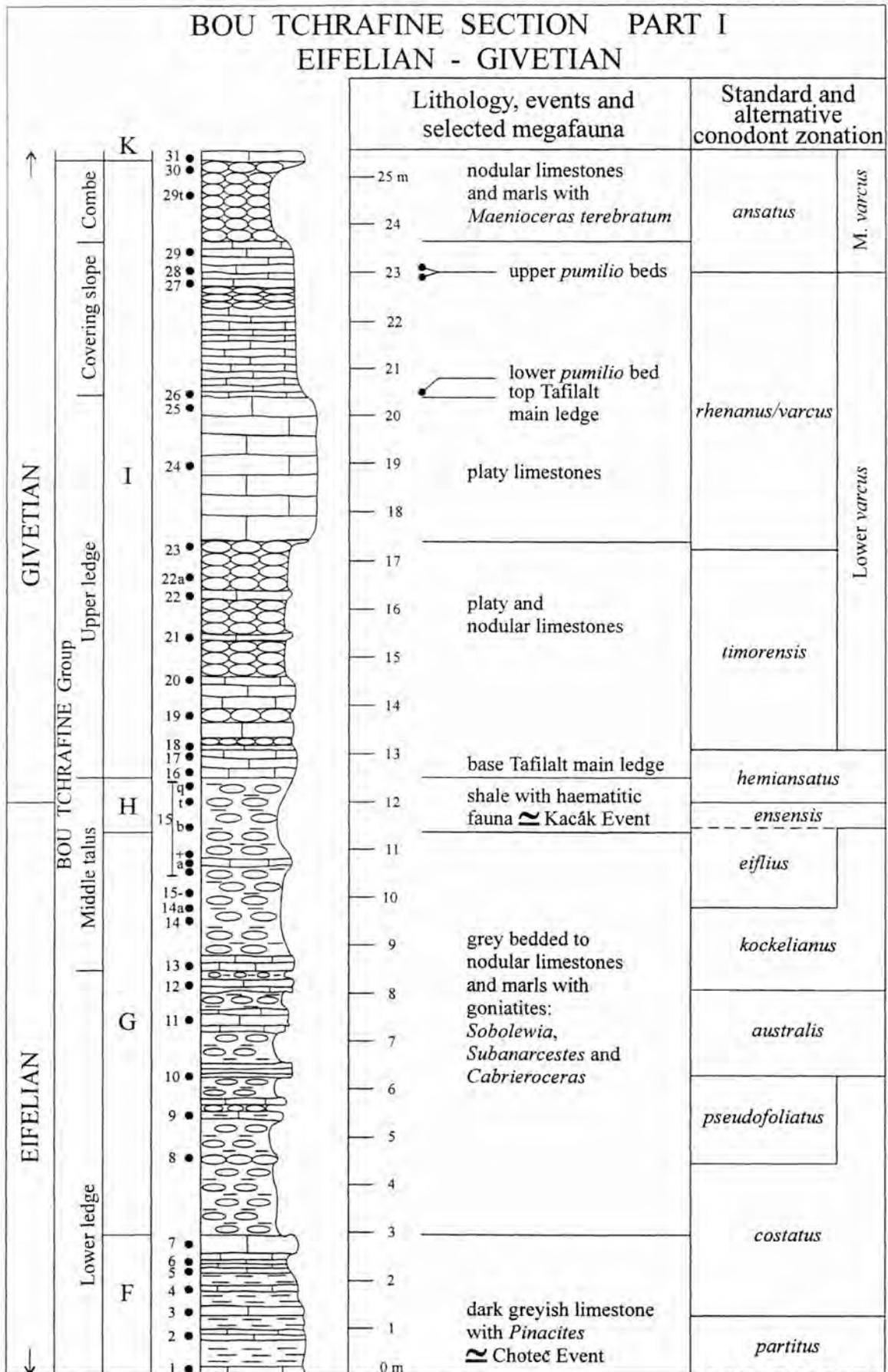
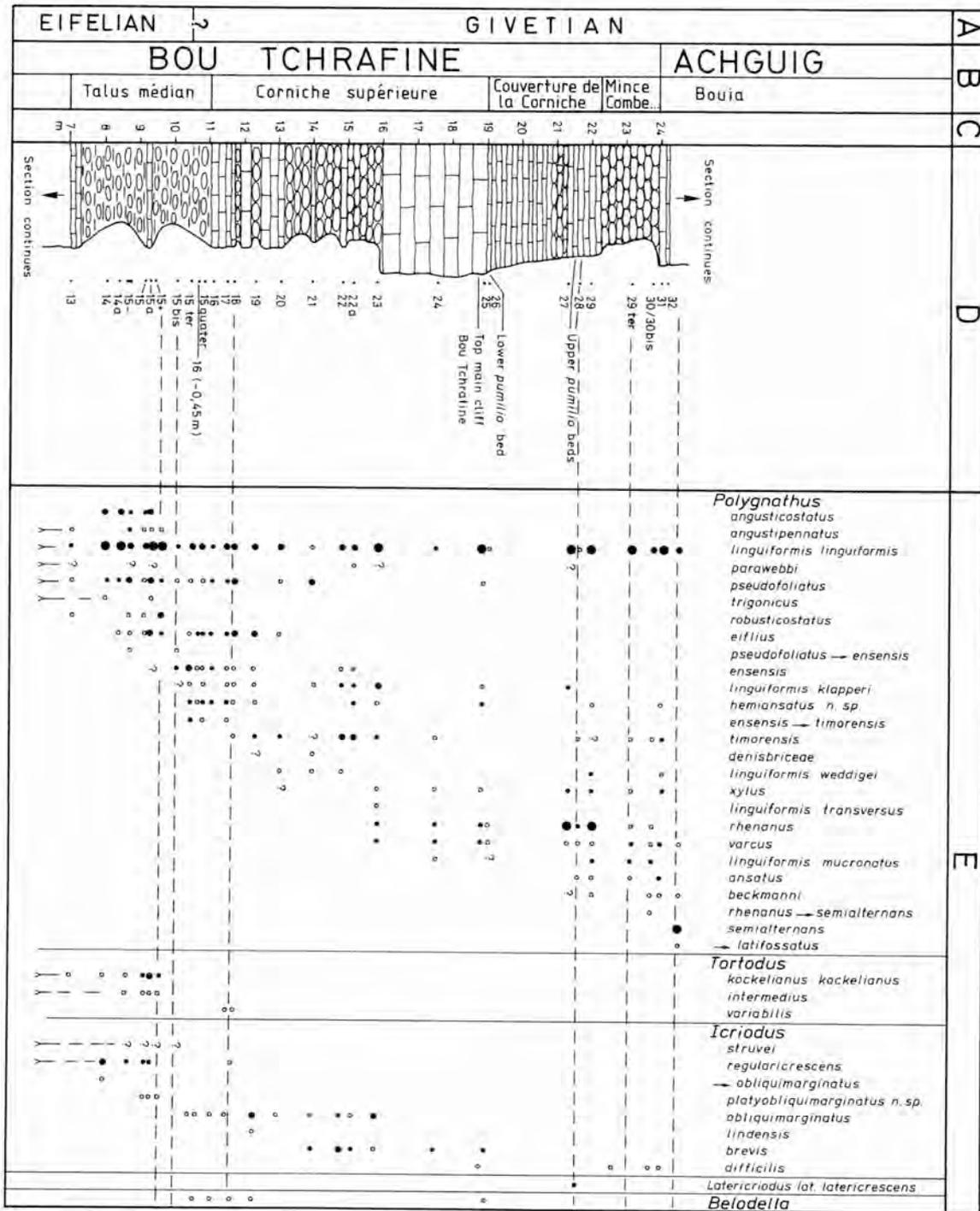


Fig. 3





MADER (Morocco)  
SECTION OU DRISS EAST

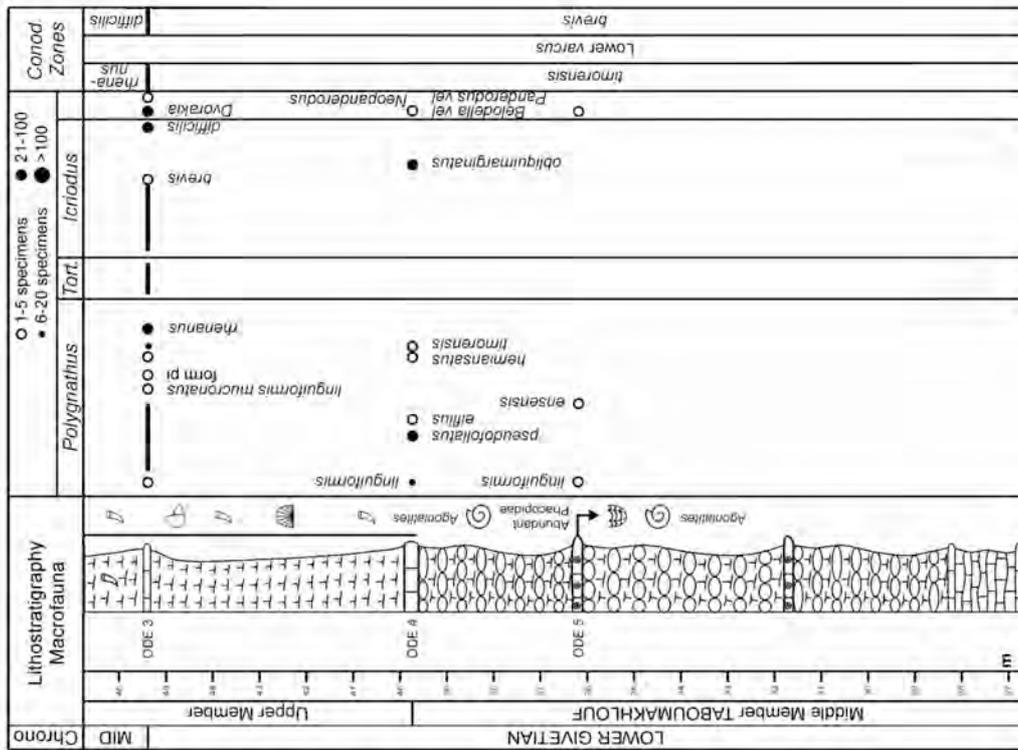


Fig. 7a

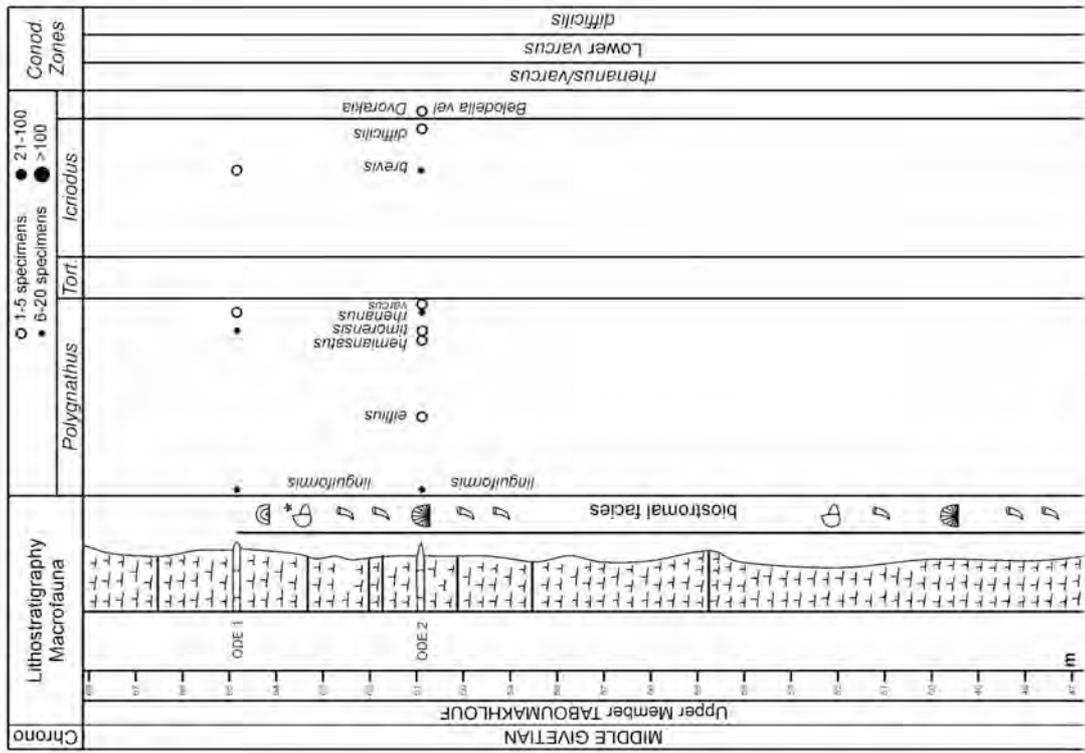


Fig. 7b  
\* *Stringocephalus cf burfini*

Dokument submitted to the Annual SDS Business Meeting, Eureka, Nevada, September 2007

## BRACHIOPOD FAUNAL SUCCESSIONS AND THE SUBDIVISION OF THE FAMENNIAN IN SOUTH CHINA

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### 1. Famennian brachiopod faunal succession

In South China, brachiopods are abundant in shallow water facies deposits where, unfortunately, only rare conodont index fossils are found. The Famennian brachiopod faunas are as follows, in ascending order.

#### (1) *Yunnanellina* fauna

This fauna occurs in the lower Famennian and is widely distributed in South China. It is characterized by the well-known brachiopod *Yunnanellina* Grabau, 1931. This brachiopod is a marker taxon that signifies approximately the beginning of the Famennian as recognized by Chinese Devonian workers, e.g., Tien (1938), Ma (1995, p. 403) etc. Apart from the nominal taxon, there are abundant productoids and cyrtospiriferids, including *Leioproductus hunanensis* Liu, 1982, *Productella lachrymosa asiatica* Tien, 1938, *Praewaagenoconcha linglingensis* (Wang, 1956), *Sinospirifer subextensus* (Martelli, 1902), *Lamarckispirifer hayasakai* (Grabau, 1931), *Plicapustula gortanioides* (Grabau, 1931), *Plicapustula subarchiaci* (Martelli, 1902), *Plicapustula pekinensis* (Grabau, 1931), *Platyspirifer paronai* (Martelli, 1902), *Cyrtiopsis davidsoni* Grabau, 1923, *Cyrtiopsis graciosa* Grabau, 1923, *Cyrtiopsis? cyrtiopsisiformis* (Yang, 1977), "*Cyrtiopsis*" *intermedia* Grabau, 1931, *Pseudocyrtiopsis spiriferoides* (Grabau, 1931). All the above brachiopods were redescribed or illustrated by Ma and Day (1999, 2007) and Ma et al. (2002).

In central Hunan Province, this fauna appears in the Changlongjie Fm (= upper part of the Changlongjie Shale of Tien, 1938) and the Tuzitang Member of the Xikuangshan Fm. The Changlongjie Fm. may be correlated with the *triangularis* through Lower *crepida* Zones (Ma and Bai, 2002, p. 328 and data of Ji,

1989). The age of the Tuzitang Member is uncertain. However, it may be reasonable to assign it within the *crepida* Zone judging from its thickness. It should be pointed out that according to Wang Chengyuan and Wang Zhihao's work (Yu et al., 1983, p. 275), *Palmatolepis rhomboidea* occurs in the topmost part of the *Yunnanellina* faunal range.

#### (2) *Yunnanella* fauna

This fauna is characterized by various species of *Yunnanella* Grabau, 1931, *Xinshaoella* Zhao, 1977, *Hunanospirifer* Tien, 1938, and "*Tenticospirifer*" as originally described by Tien (1938). This fauna occurs in the Nitangli Iron Bed and the overlying Magunao Member (both belonging to the Xikuangshan Fm.) in the Xikuangshan section. Index conodont fossils, such as *Pa. rhomboidea* and *Pa. marginifera* have been found (Wang G.X et al., 1986; Coen and Groessens, 1996). A joint occurrence of the index conodonts *Pa. rhomboidea* and *Pa. stoppeli* was reported in the middle of the Magunao Member, which suggests a level close to the *rhomboidea-marginifera* zonal boundary (Coen and Groessens, 1996). The top of the Magunao Member is still within the *marginifera* Zone (Wang, 2000).

#### (3) The Shaodong fauna

In late Famennian time (locally the Shaodongian stage), a new marine transgression occurred in South China, which brought a number of new brachiopods into shelf sea areas. These brachiopods are temporarily named the Shaodong fauna, as it is difficult to select one or two brachiopod names to represent the fauna. Characteristic brachiopods include *Trifidorostellum longhuiense*, cyrtospiriferids, *Acanthoplecta mesoloba*, *Plicochonetes ornatus*, *Yanguania dushanensis*, *Hunanoproductus* etc.

Hou Hongfei (Manuscript) recently suggested that the base of the Shaodongian be defined by the first occurrence of *Eoendothyra c. regularis* in the foraminifer *E. communis*→*E. regularis* lineage. It may be correlated with a level somewhere in the lower part of the *expansa* Zone (Yin Bao'an, MS).

### 2. Famennian subdivisions

The Famennian may be easily divided into four substages based on brachiopod faunas and

lithologic succession in the central-Hunan neritic facies (Fig. 1). Present knowledge on its conodont zonation does not allow to give a definite boundary level for each substage.

Substages	Regional names	Conodont Z.	Formation	Diagnostic fossils (data from various sources)	Brachiopod Fauna
Uppermost	Shaodongian	<i>praesulcata</i>	Menggong'ao (mainly limestone)	← <i>Cystophrentis</i>	Shaodong
		<i>expansa</i>	Shaodong (shale & argillaceous shale)		
Upper	Unnamed	? <i>postera</i> <i>trachytera</i>	Oujiachong (sandstone, siltstone, and shale)		No diagnostic brachiopods
Middle	Xikuangshanian	<i>marginifera</i>	Xikuangshan Magunao (mainly limestones)	← <i>Pa. marginifera</i> ← <i>Po. semicostatus</i> ← <i>Pa. rhomboidea</i> ← <i>Pa. pararhomboidea</i> ← <i>Pa. stoppeli</i> ← <i>Polylophodonta confluence</i>	Yunnanella
		<i>rhomboidea</i>			
Lower	Xikuangshanian	?	NIB Tuzitang (ls.)		Yunnanellina
		<i>crepida</i>	Changlongjie (shale, minor limestone)	← <i>Pa. crepida</i> ← <i>Icriodus deformatus</i>	
		<i>triangularis</i>			

Fig. 1 Famennian subdivisions, lithologic units, and brachiopod faunal successions. NIB=Nitangli Iron Bed, which is mainly composed of siltstone, shale, and sandstone, as well as iron oxide deposits.

(1) Lower Famennian (=lower part of the Xikuangshanian stage in Chinese regional standard)

This part includes the Changlongjie Formation, Tuzitang Member of the Xikuangshan Formation. It is characterized by the *Yunnanellina* brachiopod fauna and approximately coincides with the *triangularis* through Upper *crepida* Zones.

(2) Middle Famennian (=upper part of the Xikuangshanian stage)

This part includes the Nitangli Iron-bearing unit and Magunao Member of the Xikuangshan Formation. It is characterized by the *Yunnanella* brachiopod fauna and approximately ranges from the Uppermost *crepida*/Lower *rhomboidea* Zone to the Upper *marginifera* Zone.

(3) Upper Famennian (unnamed, and is being under study by Yin Bao'an)

This part includes the Oujiachong Formation, which represents deposits during a substantial sea level low-stand. No diagnostic brachiopods except for some linguilids are present. Its equivalent strata southwards in Guangxi are composed of carbonate deposits, which approximately range from the *trachytera* Zone through the Lower *expansa* Zone (Yin Bao'an, manuscript).

(4) Uppermost Famennian (=Shaodongian stage)

It consists of the Shaodong and Menggong'ao Formations, which represent deposits in a marine transgressive phase. It is characterized by the Shaodong brachiopod fauna and approximately can be correlated with the *expansa* and *praesulcata* Zones.

Biostratigraphically, the base or lower part of the Upper *expansa* Zone as the base of an Uppermost Famennian can also be readily recognized in South China. This interval is characterized by the coral *Cystophrentis* Zone, which is widely distributed in the Menggong'ao Formation of central Hunan and its equivalents (Etoucun Formation of Guilin, Guangxi; Gelaoh Formation of southern Guizhou). The foraminifer *Quasiendothyra kobeituzana* is also present. Among the brachiopods the following species are common: *Ptychomaletoechia kinlingensis* (Grabau), *Spinocariniifera dushanensis* (Yang), *Hunanoproductus hunanensis* Hou, and *Cleiothyridina serra* Hou.

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Submitted at the SDS Eureka meeting, 17<sup>th</sup>  
September 2007.

**UPPER AND UPPERMOST FAMENNIAN  
MIOSPORE AND CONODONT  
CORRELATION IN THE ARDENNE-  
RHENISH AREA.**

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**1. The Upper Famennian in the Condroz  
Sandstones of Belgium**

Dreesen *et al.* (1986, fig.1) indicate that, due to unfavourable facies, the stratigraphic interval Upper *trachytera* to Lower *expansa* in the Condroz Sandstones in Belgium lacks the characteristic conodonts of the “standard zonation” (Ziegler & Sandberg 1990). The Opper Zone VCo (*Diducites versabilis* – *Grandispora cornuta*) covers most of the stratigraphic interval where characteristic conodonts are poorly present.

The base of the VCo Opper Zone (Streel *et al.*, 1987), marked by the first occurrence of *G. cornuta*, *Retusotriletes phillipsii* and *Rugospora radiata*, matches the base of the *Rugospora flexuosa* (now *radiata*) – *Grandispora cornuta* Assemblage Zone of Richardson & McGregor (1986). These authors (p. 21 and fig. 7) and also Streel & Loboziak (1994, fig. 2) have tried to evaluate the respective control by faunas of both zones. The VCo Opper Zone base is obviously not older than the conodont Upper *trachytera* Zone (See *G. cornuta* FOB). The “*flexuosa-cornuta*” Ass. Zone might however well start in the middle Famennian part of the conodont *marginifera* Zone if the poor lithological correlation between a few faunas and the rich miospore assemblages in USA is confirmed.

The *Grandispora cornuta* FOB marks the base of the VCo Zone. The *Grandispora cornuta* FOB was found in the; now almost inaccessible, locality of the lower part (sample 36) of the Evieux Formation, in the La Gombe /Montfort section, Dinant Synclinorium,

Ardenne region (Bouckaert *et al.* 1971, fig. 6; Bouckaert & Streel 1974; Thorez *et al.* 1977, p. 18). Ten samples (from an interval between 50 and 180 m below sample 36) contained miospores lacking *G. cornuta*. *Scaphignathus velifer velifer* (first occurrence in the conodont Latest *marginifera* Zone) is known 162 m below sample 36 in the same section. *G. cornuta* first occurrence is also present in sample 54, above the base of the Evieux Fm in the Comblain-au-Pont “Bon-Mariage” section at a level believed to correspond to the conodont *postera* Zone (Streel 1986, Streel *et al.* 2003, fig. 2). Indeed conodonts have been restudied by Dreesen & Thorez (1994, p. 175) in a parallel section (Comblain-la-Tour) distant of 4 km only. They have proposed an Upper *trachytera* Zone at a lithostratigraphic level slightly below sample 54 of the Comblain-au-Pont section.

The *Vallatisporites hystricosus* FOB marks the top of the VCo Zone and the base of the *Apiculiretusispora verrucosa* – *Vallatisporites hystricosus* or VH Zone. The *Vallatisporites hystricosus* FOB is found in sample 20'd 10 m below the top of the Evieux Fm (Maziane *et al.* 1999, fig. 3 and Streel *et al.* 2007, fig.1). 11 samples without *V. hystricosus* are known below this sample in the same section and the same formation. The first occurrence of the conodont Late *expansa* Zone is known (Dreesen *et al.* 1993, Streel & Hartkopf-Fröder 2005, Streel *et al.* 2007) from the Comblain-au-Pont Fm in the same section, about 28 m higher than Bed 20'd. Conodonts of the Middle *expansa* Zone occur (Dreesen *et al.* 1993, p.23) in the underlying Evieux Formation of the Esneux railway section, 3 km from Chanxhe.

**2. The uppermost Famennian and the  
Devonian/ Carboniferous boundary.**

Almost all recently published papers on the Strunian as a chronostratigraphic unit refer to the old, now disused, “Fa2d” which base was correlated with the *Retispora lepidophyta* FOB at about the level as the Epinette event. Although the *R. lepidophyta* FOB is an excellent marker, the species reaching, higher in the sequences, sometimes 50 % of the miospore assemblages, and having a worldwide distribution in continental and neritic facies, it is unfortunately not matched by any well defined conodont limit. Therefore

the Uppermost Famennian Substage base, at the base of the conodont Upper *expansa* Zone and a reference section for neritic facies (Strunian) were proposed by Strel (2002, 2005) and Strel *et al.* (2003, 2005, 2006, 2007).

Richardson & Ahmed (1988, fig. 5) and Avkhimovitch and Richardson (1996) had proposed respectively to separate the lower part of the *Vallatisporites pusillites* (*sensu lato*) - *Retispora lepidophyta* Zone of Richardson & McGregor (1986) as an *Apiculiretusispora fructicosa* (now *verrucosa*) - *V. pusillites* Subzone (1988) or as a *V. pusillites*-*Knoxisporites literatus* PLi Zone (1996). They correlate the base of these (sub)zones with the base of the old (now disused) "Fa2d" in Belgium (starting in the conodont Middle *expansa* Zone) but also with the base of the Cattaraugus Fm, equivalent to the Uppermost *marginifera* in marine sediment after Kirchgasser and Oliver (1993, fig. 1) and Kirchgasser (2000). Such contradiction might depend on the diachronous character of the Catskill facies. As long as this situation is not clarified, these miospore zone subdivisions will not be taken in consideration here.

The transition from the Upper Famennian to the Carboniferous is covered by six conodont zones (from Middle *expansa* to *sulcata*), by three miospore Interval Zones i.e. the *Retispora lepidophyta* - *Knoxisporites literatus*, *R. lepidophyta* - *Indotriradites explanatus*, and *R. lepidophyta* - *Verrucosisporites nitidus* (respectively LL, LE, LN), and by one Assemblage Zone i.e. the *Vallatisporites vallatus* - *Retusotriletes incohatus* (VI) which extends across the Devonian - Carboniferous Boundary. The LL Interval Zone includes now (Maziane *et al.* 1999) the former LV Zone (Strel *et al.* 1987) and could be further subdivided by the first occurrence of *Tumulispora rarituberculatus* and the sudden change in abundance from *R. lepidophyta lepidophyta* to *R. lepidophyta minor* almost at the base of the Upper *expansa* Zone (Maziane *et al.* 2007). The extinction of *R. lepidophyta* seems to occur step by step. In the Sauerland (Germany) it is announced by the disappearance of peat swamps which produced *Diducites plicabilis*, followed by a strong reduction of the proportion of *R. lepidophyta* (from 30 % to 1 or 2 %, Higgs *et al.* 1993) suggesting the also progressive reduction of

the related swamp margin environment which seems to temporary disappear soon after, together with other swamp margin environments characterized by other species (*Vallatisporites hystricosus*, *Auroraspora asperella*,...) (Strel 1999). These miospore events partly correspond to, and immediately succeeded the Hangenberg event, a sedimentary cycle constituted of a transgression (the Hangenberg Black Shale) and a deep regression (the Hangenberg Sandstone and Shale) (Bless *et al.* 1993). The regression can be correlated by miospores with the glacial episode known in Gondwana (Strel *et al.* 2000, Melo & Loboziak 2003). The complete extinction of *Retispora lepidophyta* immediately below the base of the Carboniferous System, as defined by the first occurrence of the conodont *sulcata* Zone, is well known around the world (Strel 1986, Higgs *et al.* 1993, Loboziak *et al.* 1993, Strel & Loboziak 1996). It corresponds to the change from the LN Zone to the VI Zone. The VI Assemblage Zone is poorly defined, the two nominal species being present below the top of the LN Zone. Its base corresponds to the *Retispora lepidophyta* LOB

The *Retispora lepidophyta* FOB is found in samples 22, 2 m below the top of the Evieux Fm in the Chanxhe section, Dinant Synclinorium, Ardenne region (Maziane *et al.* 1999, fig. 3 and Strel *et al.* 2007, fig.1) i.e. 14 samples without this species are known below these samples in the same section and the same formation. The first occurrence of the conodont Late *expansa* Zone is known (Dreesen *et al.* 1993, Strel *et al.* 2007) from the Comblain-au-Pont Fm in the Bed 111 of the same section, about 20 m higher than samples 22. Conodonts of the Middle *expansa* Zone occur (Dreesen *et al.* 1993, p.23) in the underlying Evieux Formation of the Esneux railway section, 3 km from Chanxhe where the Fontin event has been traced in the VCo Opper Zone (Strel 1999, p.203-205). The lower part of the Comblain-au-Pont Fm contains abundant large specimens (var. *lepidophyta*) of *R. lepidophyta* (Strel 1966, Maziane *et al.* 2002) as in the Refrath 1 Borehole (Bergisch Gladbach-Paffrath Syncline, Germany) which contains a Middle *expansa* Zone (Strel & Hartkopf-Fröder 2006). Therefore the *R. lepidophyta* FOB is in the Middle *expansa* Zone.

The *Indotriradites explanatus* FOB is found in sample Rh10 in the greenish silty shales (Hangenberg Schiefer equivalent) of the Riescheid section, Remscheid Altena Anticline, Sauerland, Germany (Higgs & Strel 1984, fig. 3). Three samples in the underlying 2.5 m interval lacked *I. explanatus* (Higgs & Strel 1994). The conodont *costatus* Zone, after Lane & Ziegler (in Paproth & Strel 1982), was found in almost the same bed (equivalent to the conodont Lower or Middle *praesulcata* Zone ?). Another, better dated, sample is 50 cm below the top of the Wocklum Kalk, at Hasselbachtal (28 km east of Riescheid), same anticline (Higgs & Strel 1994). It is a single sample (Hbl) in the latest part of the conodont Lower *praesulcata* Zone, which occurs 35 cm below the base of the Middle *praesulcata* Zone. The latter conodont zone occurs 20 cm below the top of the Wocklum Kalk (Becker et al. 1984, p. 189). However no samples with miospores are known below this single sample. Consequently, the *I. explanatus* FOB is in the late part of the Upper *expansa* Zone or in the Lower *praesulcata* Zone.

The *Verrucosisporites nitidus* FOB is found in a sample collected in a 5-22 cm interval above the base of the Hangenberg Black Shale, i.e. on top of the Wocklum Kalk, at Hasselbachtal section, Remscheid Altena Anticline, Sauerland, Germany. Two specimens of *V. nitidus* have small (3µm) verrucate ornaments which fall within the lower part of the morphological range of the species. The presence of the Middle *praesulcata* Zone (See *I. explanatus* FOB) 20 cm below the top of the Wocklum Kalk in the same section allows to assign the *V. nitidus* FOB to the Middle *praesulcata* Zone.

The *Retispora lepidophyta* last Occurrence Biohorizon or LOB can be observed in sample Hb 18-19 in the Bed 85 of the Hangenberg Schiefer of the Hasselbachtal section, Remscheid Altena Anticline, Sauerland (Higgs & Strel 1984, figs. 5 and 6). Six samples in the overlying 14 cm did not yield *R. lepidophyta* but were dominated by simple laevigate taxa. The *sulcata* conodont zone occurs 14cm higher than the *R. lepidophyta* LOB.

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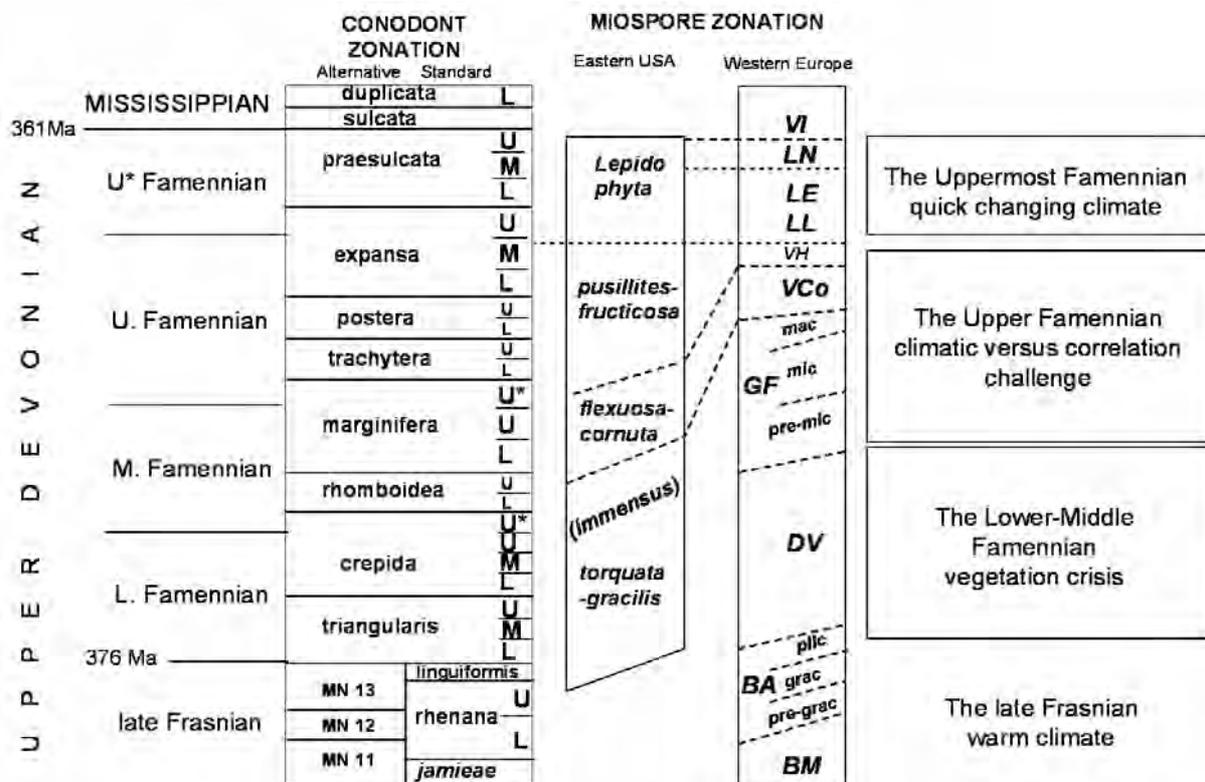
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DOKUMENT  
OF THE INTERNATIONAL SUBKOMMISSION  
ON DEVONIAN STRATIGRAPHY (SDS),  
ANNUAL MEETING, EUREKA, NEVADA,  
SEPTEMBER 2007

**THE DASBERG EVENT IN THE  
RHENISH MASSIVE, CARNIC ALPS,  
AND ANTI-ATLAS (TAFILALT,  
MAIDER) – IMPLICATIONS FOR  
FAMENNIAN EUSTATICS AND  
CHRONOSTRATIGRAPHY**

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Sections in the northern Rhenish Massive (Riescheid, Oese, Effenberg, all Remscheid-Altena Antikline), Carnic Alps (Malpasso), and SE Morocco (Maider: Mrakib, Rich Bou Kourazia; Tafilalt: Bou Tehrafine, Ouidane Chebbi, El Atrous, Takhbit, Oum el Jerane, Jebel Ouaoufilal, Hassi Nebech) have been studied in detail in the last years in order to document changes in facies, faunas and local/regional sea-level around the Hembergian/Dasbergian (Upper Devonian IV/V) boundary of classical German stratigraphy. This interval is supposed to include both the alleged (JOHNSON et al. 1985, SANDBERG et al. 1989) major eustatic rise at the base of the Lower *expansa* Zone and the transgressive and hypoxic Dasberg Event of BECKER (1993). The Dasberg Event is not only expressed by the sudden spread of organic-rich facies (black shales and limestones), intercalated in better oxygenated shales and limestones, but also by a significant extinction event. This extinction caused the sudden replacement of the *Prionoceras-Platyclymenia* ammonoid faunas that globally characterize the *Platyclymenia* Stufe by the first (UD V-A1) faunal complex of the *Clymenia-Gonioclymenia* Stufe with distinctive clymenids (e.g., first *Endosiphonites*, previously more widely known as *Costaclymenia*, *Kosmoclymeniidae*, *Biloclymeniidae*, *Nanoclymenia*, *Nodosoclymenia*, *Falciclymenia*) and goniatites (Posttornoceratidae: *Discoclymenia*, *Prionoceratidae*: *Rectimitoceras*). Subsequently (one zone higher, UD V-A2), the two name-giving genera *Clymenia* and *Gonioclymenia* appear together

with *Cymaclymenia* s. str., *Progonioclymenia* and others. Locally, faunas can be dominated by the sporadoceratid *Erfoudites*. Our study also aimed at an improved, high-resolution conodont-ammonoid correlation and tried to revise the ranges of marker conodonts. The result can be summarized as follows:

At the famous Riescheid section, below the published Devonian-Carboniferous boundary interval (e.g., PAPROTH & STREEL 1982), the conodont record is poor but pyritic *Kiaclymenia* and early kosmoclymenids suddenly enter in an interval with dark-grey limestones that we correlate with the Dasberg Event level (basal UD V). It seems that this transgression allowed a far westward spread of pelagic faunal elements into the more neritic Famennian succession of the Bergisches Land.

At Oese, above the well-developed Lower and Upper *Annulata* Events (UD IV-A), a thick succession of alternating greenish-grey silty shales, nodular shales and limestones is suddenly interrupted by a package of black shale. The much earlier entry of *Bi. stabilis* M2 indicates a position in the upper part of the Lower *expansa* Zone. *Po. styriacus* ranges at least into the second light grey limestone ABOVE the black shale and shows that the upper boundary of the Lower *expansa* Zone has not yet been reached at that level. It is shortly followed by poorly preserved, squashed, widely evolute *Nanoclymenia* that suggest an UD V-A1 age. *Bi. aculeatus aculeatus*, the marker of the Middle *expansa* Zone, enters somewhat higher, just above a nodule layer with *Nodosoclymenia*. There is no evidence for any significant deepening that could correlate with the base of the Lower *expansa* Zone and the main transgressive and hypoxic event clearly took place just below the top of that zone.

At the active Effenberg Quarry both *Annulata* Events (UD IV-A) are also well exposed and are followed by a rather homogenous alternation of greenish marls and nodular limestones. *Bi. stabilis* M2 indicates the Lower *expansa* Zone within this succession but, again, there is no associated deepening. The Dasberg Event is developed as a sharp and sudden turn to black shales with the pelagic bivalve *Guerichia*, just above a green marl with last *Pernoceras*, a genus that indicates UD IV, and above a limestone with *Po. experplexus*. As at Oese, *Po.*

*styriacus* ranges at least into the second limestone above the black shale unit and co-occurs with a fragmentary *Nanoclymenia spiratissima*, a typical Dasbergian (UD V-A1) clymenid. As at Oese, the black shale event occurred at the end of the Lower *expansa* Zone. *Bi. spinulicostatus* and *Bi. aculeatus aculeatus* enter in subsequent limestones that fall in the Middle *expansa* Zone. A second dark shale unit suggests a small transgressive interval higher up in the Middle *expansa* Zone but still below the *Ornatoclymenia* Sandstone (UD V-B), first recognized locally by KORN & LUPPOLD (1987). The thin sandstone unit represents a regressive phase ca. in the middle of the Middle *expansa* Zone.

In the basinal facies of the Maider Basin, at Mrakib (see BECKER et al. 2002), the two *Annulata* Events (UD IV-A) are easily recognizable as red shale units since the pyrite of black shales weathers to hematite under arid conditions. The higher Upper *Annulata* Shale of KORN (1999) in fact represents a younger transgressive interval at the top of UD IV-B (BECKER in WEBSTER et al. 2006) and this phase may or may not correlate with the base of the Lower *expansa* Zone. Currently the base of the regional *Sporadoceras orbiculare* Zone (UD IV-C) is not yet correlated precisely with the conodont succession since the Maider succession is very argillaceous and has very few conodonts. The upper part of the *orbiculare* Zone shows shallowing episodes, leading to the limestone deposition of the successive *Procymaclymenia pudica* (with *Pa. gracilis expansa*), *Sp. orbiculare* (with *Platyclymenia subnautilina*, *Protactoclymenia ventriosa* and *giganta*, as well as first *Alpinites*) and *Protoxyclymenia wendti* Beds (which still includes the UD IV marker *Prionoceras frechi*), followed by a marked red, haematitic/sideritic crust above the last *Platyclymenia* faunas, which indicates a short sedimentary break. There is a thin, orange-weathering black shale and deepening between the *pudica* and *orbiculare* Beds. The Dasberg Event is expressed by a return to greenish weathering shales with pyritic faunas, notably with *Endosiphonites muensteri*, *Nanoclymenia spiratissima*, and *Kosmoclymenia lamellosa* (all UD V-A1 markers), but dominated by *Erfoudites ungeri rotundolobatus*, and with last rare *Prionoceras divisum* as a surprising UD IV survivor. The base of V-A2 (*Gonoclymenia subcarinata* Zone) can be recognized by the entry of poorly preserved

*Cymaclymenia* cf. *striata* higher up in a thick shale succession. The return to more condensed and very fossiliferous nodular limestones with abundant *Gonoclymenia*, *Cymaclymenia*, *Kosmoclymenia*, and *Muessenbiaergia* indicates a shallowing low in UD V-B that may correlate with the regressive phase of the Rhenish *Ornatoclymenia* Sandstone. But *Ornatoclymenia* is not known from Morocco.

In the northern Tafilalt, at Bou Tchrafine, the Dasberg Event is expressed as an unfossiliferous green shale that separated haematite-rich solid limestones with *Sp. orbiculare* (UD IV-C) from limestones with *Endosiphonites muensteri* and *Gonoclymenia subcarinata* (UD V-A1/2; BECKER & HOUSE 2000).

In the eastern Tafilalt, at Ouidane Chebbi NW, the succession is similar to Bou Tchrafine, but thicker and more argillaceous due to a slightly deeper setting, transitional to the Tafilalt Basin in the SE. There is a minor T-R cycle low in UD IV-C and a shallowing at its local top, culminating in the massive *Sp. orbiculare* Bed that yielded *Bi. stabilis* M2 and M3 as well as *Clydagnathus* cf. *ormistoni* (Lower *expansa* Zone). It seems that the topmost UD IV-C is missing in an unconformity at the top of the prominent unit. The transgressive Dasberg Event Interval consists of red shale with ammonoids (*Nanoclymenia nana*, *Endosiphonites muensteri* and *binodosus*, *Erfoudites*) preserved as isolated red nodules in the upper part. A rather continuous nodule layer just above yielded *Bi. aculeatus aculeatus* and, therefore, direct evidence of the Middle *expansa* Zone. The return to reddish nodular limestones with poorly preserved *Gonoclymenia* and to more solid limestone with well-preserved *Muess. diversa*, *Gonio. subcarinata*, and *Gonio. speciosa* indicates regressive trends in the UD V-A2 and V-B.

In the southern Tafilalt we investigated several sections along strike of the northern and southern limb of the Amessoui Syncline (compare KORN et al. 2000). The Dasberg Event interval is missing in unconformities below the widely quarried *Gonoclymenia* Limestone (upper UD V-B with *Gonio. speciosa*) along the northern limb (Takhbit, El Atrous). Along the southern limb, most of the upper Hembergian (UD IV) is missing above a solid succession of crinoidal limestones and limestone breccias that yielded conodont faunas with a shallow-water

biofacies signature. At the Jebel Ouauoufilal a single *Sporadoceras angustisellatum* and conodonts (*Scaphignathus velifer*, *Po. semicostatus*) give an UD III-B/C (Uppermost *marginifera* to Lower *trachytera* Zones) age. Above an unconformity, the *orbiculare* Bed is locally preserved and yielded, as elsewhere, conodonts of the Lower *expansa* Zone (*Bi. stabilis* M2, *Pa. gracilis* aff. *expansa*). The transgressive Dasberg Event led to a sudden change to deeply weathered shales with extremely rich pyritic (secondarily haematitic) fauna: dominant *Erfoudites*, *Endosiphonites muensteri*, *binodosus*, *ornatus*, n. sp., *Kosmoclymenia lamellosa*, *Cyrtoclymenia angustiseptata*, *Falcicyclomenia* n. sp. (Becker et al. 2002), *Bellaclaymenia* n. sp., *Sporadoceras orbiculare*, *Discoclaymenia cucullata*. Rare *Prionoceras divisum* and *Prionoceras* n. sp. are mixed with this typical UD V-A1 fauna. There is no evidence of marker ammonoids of UD V-A2, such as *Gonioclymenia* or *Cymaclymenia*; it seems that this level is missing or unfossiliferous. There is a regressive phase below the quarried marker limestone with *Gonio. speciosa* (upper UD V-B).

Westwards, the succession of Oum el Jerane is characterized by a more condensed facies with a development of the Dasberg Event Interval as thin-bedded, extremely fossiliferous black cephalopod limestone sitting directly on lower Hembergian crinoidal limestone with brachiopods. The ammonoid fauna is dominated by *Erfoudites*, *Endosiphonites muensteri*, *Kosmoclymenia lamellosa*, a new and oldest *Muessenbiaergia*, and *Discoclaymenia cucullata*. As eastwards, *Prionoceras divisum* occurs as a minor short-term survivor. This *Endosiphonites* Limestone yielded *Bi. aculeatus aculeatus*, and *aculeatus anteposicornis* in direct association

The evidence can be summarized as follows:

- In the Rhenish Massif, Franconia (TRAGELEHN & HARTENFELS in prep.), Carnic Alps (PERRI & SPALETTA 1998), and SE Morocco, *Pa. gracilis expansa* is not a reliable biostratigraphic marker. The Lower *expansa* Zone is currently recognized with the help of alternative zonal markers, for example *Bi. stabilis* M2.
- German and Moroccan sections, probably also the Montagne Noire (preliminary observations) show no evidence of a

with last *Clyd.* cf. *ormistoni*. The latter record extends the range of Famennian clydagnathids into the basal Dasbergian and into the Middle *expansa* Zone. There is no record of UD V-A2 in subsequent green shales and the overlying *Gonioclymenia* Limestone (still Middle *expansa* Zone) represents already the upper part of UD V-B.

The conodont succession of Malpasso on the Italian side of the Carnic Alps has last been reviewed by PERRI & SPALETTA (1998). The lithofacies is rather uniform and consists of micritic, light grey limestone, without simple lithological evidence of sea-level changes. The Dasberg Event level is indicated as an eutrophication interval by the sudden onset of rich ammonoid faunas in otherwise poorly fossiliferous micrites. Our Bed 6k, below sample 7 of PERRI & SPALETTA (1998), which was dated as Middle *expansa* Zone, yielded a typical UD V-A1 assemblage with *Endosiphonites* sp., *Nanoclymenia* sp., *Nodosoclymenia* sp., *Kosmoclymenia lamellosa*, *Rectimitoceras lineare*, *Rectimitoceras* cf. *disciforme*, and *Procymaclymenia pudica*. Associated conodonts have *Bi. stabilis* M2, *Po. experplexus*, *Pa. gracilis* aff. *expansa*, *Pa. gracilis manca*, and *Branmehla bohlenana*, which suggest the upper part of the Lower *expansa* Zone. The limited Carnic Alp data confirm that the *Endosiphonites* level (UD V-A1) enters near the top of the Lower *expansa* Zone and that it ranges into the lower part of the Middle *expansa* Zone. The faunal list of KORN (1998) suggests that the *Gonioclymenia* Zone (UD V-A2, with *Cymaclymenia* and *Progonioclymenia*) follows soon in the condensed section but our limited collections do not include corresponding marker ammonoids.

significant deepening near the base of the Lower *expansa* Zone.

- The main part of the Lower *expansa* Zone correlates with the upper third of the *Platyclymenia* Stufe (roughly with UD IV-C). This was long known and published for Thuringia by Brüggge (1973).
- The transgressive and hypoxic Dasberg Event is not isochronous in different basins. In the Rhenish Massif and Carnic Alps it falls in the top of the Lower *expansa* Zone (in the top range of *Po. styriacus*) but Tafalalt event beds clearly fall already in the basal Middle *expansa* Zone.

- The main ammonoid extinction at the top of UD IV-C falls within the upper part of the Lower *expansa* Zone but a few forms survived for a short time and still can be found within the event interval, but not in the subsequent post-event phase.
- Similarly, some conodont taxa (e.g., Famennian *Clydagnathus*, *Branmehla bohlenana*) have longer (younger) ranges than previously thought, at least into the basal Middle *expansa* Zone.
- The base of the Lower *expansa* Zone is not a suitable bio-, event or sequence stratigraphic level for global substage definition.
- The regionally diachronous nature of the Dasberg Event and unreliable entry of *Bi. aculeatus* makes the base of the Middle *expansa* Zone also unsuitable for chronostratigraphy.
- The Upper Famennian is best defined by the entry of *Po. styriacus* at the base of the *postera* Zone and just above the global Upper *Annulata* Event.

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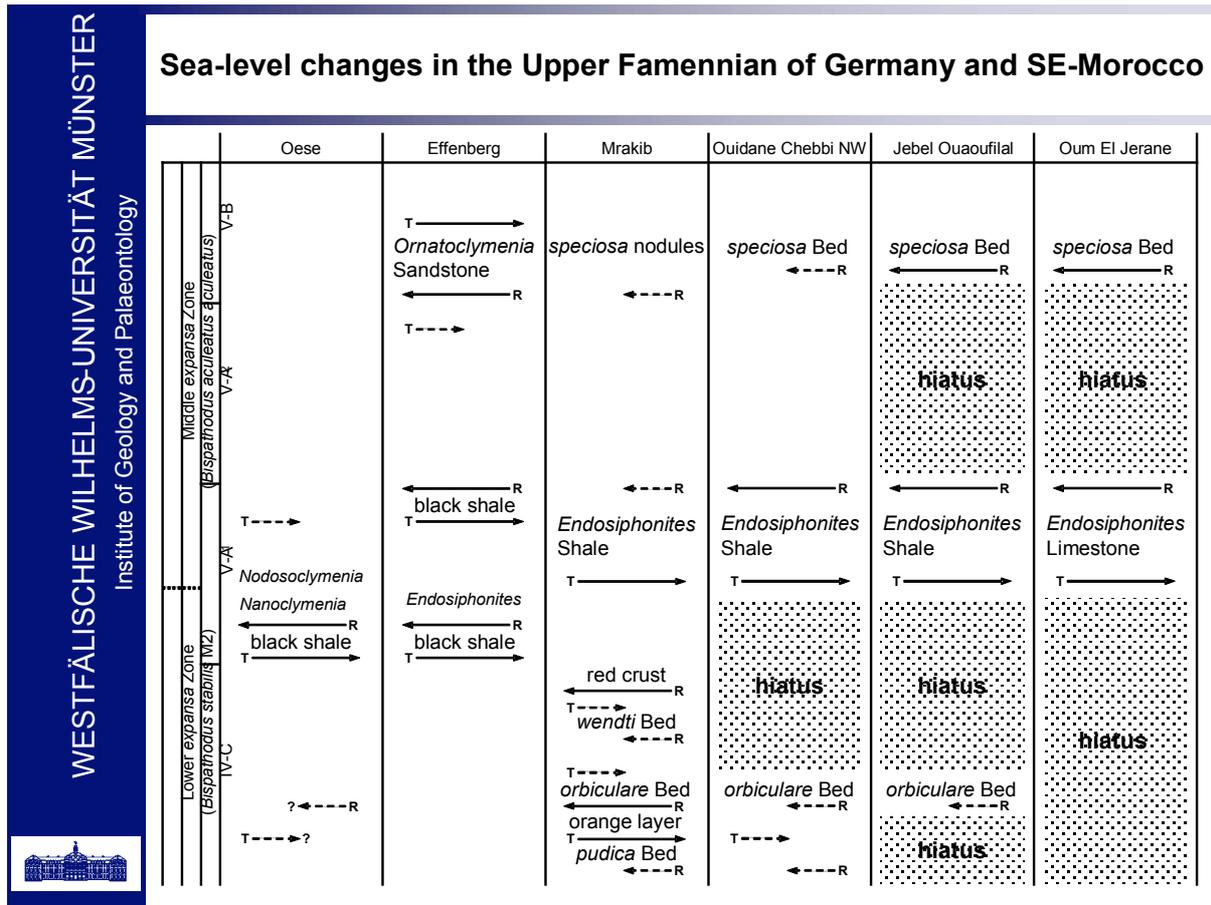


Fig. 1

TM J.E. A. MARSHALL

chronostrat		conodont zonations		ammonoid gonozones	key	stufen	anoxia	global events	miospores		
Carb.	Bav.	<i>sulcata/kuhnei</i>									
FAMENNIAN	WOCKLUMIAN	<i>praesulcata</i>	Upper	<i>Stockumites</i>	VI-F	WOCKLUMERIA	[ ]	→	VI		
			Middle	<i>Postclymenia</i>	VI-E				LN		
			Lower	<i>Wocklumeria</i>	VI-D				→	HANGENBERG	
				<i>Parawocklumeria</i>	VI-C					← regression → transgression	LE
				<i>Effenbergia</i>	VI-B						LL
				<i>Linguacyclomenia</i>	VI-A						VH
	DASBERGIAN	<i>expansa</i>	Upper	<i>Kalloclymenia</i>	V-C	CLYMENIA	[ ]	→	Vco		
			Middle	<i>Ormatoclymenia</i>	V-B				DASBERG		
			Lower	<i>Goniclymenia</i>	V-A				ANNULATA		
	HEMBERGIAN	<i>postera</i>	Upper	<i>Protoclymenia</i>	IV-B	PROLOBITES-PLATYCLYMENIA	[ ]	→		GF	
			Lower	<i>Prionoceras</i>	IV-A						
	NEHDENIAN	<i>marginifera</i>	Upper	<i>Prolobites</i>	III-C	CHEILOCERAS	[ ]	→	GH		
				Lower	<i>Pseudoclymenia</i>					III-B	
			Uppermost	<i>Pemoceras</i>	III-A						
		Upper	<i>Dimeroceras</i>	II-I	(ENKEBERG)						
			<i>Posttomoceras</i>	II-H							
		Lower	<i>Maenoceras</i>	II-G	← CONDROZ						
			<i>Acrimoceras</i>	II-F							
		<i>rhomboides</i>	Upper	<i>Paratomoceras</i>	II-E					(NEHDEN)	
			Lower	<i>Praemroceras</i>	II-E						
<i>crepida</i>		Uppermost	<i>Paratorleyoceras</i>	II-D	→						
	Upper	<i>Ch. (Cheiloceras)</i>	II-C								
	Middle	<i>Ch. (Compactoceras)</i>	II-B								
<i>triangularis</i>	Upper	<i>Phoenixites</i>	II-A	→							
	Middle										
	Lower										
FRASNIAN	ADOREIAN	<i>linguiformis</i>	<i>Crickites</i>	I-L	MANTICOCERAS	[ ]	→	UPPER KELLWASSER			
		13	<i>"rhenana"</i>	Upper				<i>Archoceras</i>	I-K	LOWER KELLWASSER	
				Lower				<i>Neomanticoceras</i>	I-J	SEMICHATOVAE	
		11	<i>jamieae</i>					<i>Playfordites</i>	I-I	BASAL RHINESTREET	
		9/10	<i>"hassi"</i>	Upper				<i>Beloceras</i>	I-H	→	MIDDLESEX
		7/8		Lower				<i>Mesobeloceras</i>	I-G		
		6	<i>punctata</i>					<i>Napiesites</i>	I-F	→	GENUNDEWA
								<i>Prochorites</i>	I-F		
		5		<i>Probeloceras</i>				I-E	→	FRASNE	
			<i>Sandbergeroceras</i>	I-D							
		4	<i>transitans</i>	<i>Timanites</i>				I-C			
		2/3	<i>falsiovatis</i>					<i>Koenenites</i>	I-B		
		1						<i>Neopharciceras</i>	I-A		

Document submitted to  
IUGS Subcommission on Devonian  
Stratigraphy Meeting in Eureka, Nevada, 17  
September 2007

**REITERATION OF PROPOSAL FOR  
THE ONLY TWO FAMENNIAN  
SUBSTAGE BOUNDARIES  
THAT ARE GLOBALLY  
RECOGNIZABLE AND COINCIDENT  
WITH MAJOR TRANSGRESSIONS**

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**Introduction:** The bases of the Early (Lower) *marginifera* Zone and Early (Lower) *expansa* Zone were first proposed as Substage boundaries for a three-fold subdivision of the Famennian at the SDS Meeting in Rochester, New York, on 21 July 1997 (Ziegler & Sandberg, 1997). During the past ten years, however, considerable debate has ensued over Famennian Substage boundary positions, whereas the simultaneously proposed Frasnian Substage boundaries were recently accepted by a unanimous vote of the SDS. Recent balloting suggests that Subcommission members are tending to accept inferior conodont-based Substage bases, which are difficult to recognize in most of North America, and to add an Uppermost Famennian Substage, the base of which cannot be precisely defined in terms of conodont zones. To reintroduce the plea for acceptance of the best conodont-based boundaries that subdivide Famennian time into three approximately equal parts, it seems appropriate to quote directly from the original proposal. Except for new radiometric dating (Kaufmann, 2006), which increases the length of the Famennian to 14.6 m.y. and hence the average length of Famennian conodont zones by a factor of 50%, the following statement (Ziegler & Sandberg, 1997) is as scientifically logical today as it was when originally proposed:

“If subdivision of the Frasnian and Famennian Stages is to be achieved, the most appropriate boundaries should be based on conodonts and on the start of conodont zones that can be widely recognized not only by their zonal indicators, but also by their accompanying faunas. Such widely recognized zones are

invariably related to major eustatic rises, as shown on the Devonian sealevel curve (Johnson, Klapper, and Sandberg, 1985). It seems appropriate to subdivide the Famennian Stage, which has a generally accepted duration of ~10 m.y., into three parts (see accompanying chart). The two globally most recognizable zones are the Early *marginifera* Zone and the Early *expansa* Zone. Such a tripartite subdivision would assign 9 zones having a duration of 4.0 m.y. to the Lower (Early) Famennian, 7 zones having a duration of 3.5 m.y. to the Middle Famennian, and 6 zones having a duration of 2.5 m.y. to the Late Famennian. The only equally recognizable zonal boundary, which might be substituted for the start of the Early *marginifera* Zone, is the start of the Latest *crepida* Zone.”

**Early (Lower) *marginifera* Zone:** This zone coincides with the start of the first major transgression that interrupted the long Famennian upper T-R cycle IIe regression (Fig. 1). It is easily recognized in the stratigraphic record because it is signaled by first occurrences not only of the zonal name-giver but also of several other taxa that serve as zonal proxies (Sandberg and Ziegler, 1973). Moreover, the Early *marginifera* Zone is commonly introduced by conodont-rich lag deposits. These have such abundant faunas that the zone is one of only two Devonian zones that yield sufficient conodonts for the zonal source of reworking to be readily identified among conodont faunas of the Lower Carboniferous (*isosticha*-Upper *crenulata* to Lower *typicus* Zone) Tripon Pass Limestone and correlatives from Nevada to Idaho. These formations and correlatives were deposited as calciturbidites and debris flows in submarine carbonate fans (Poole and Sandberg, 1991), derived from erosion of older units on the advancing Antler forebulge (Sandberg et al., 2001). The only other Famennian zone that can be so easily recognized as having been reworked into these deposits is the Early (Lower) *expansa* Zone.

The widespread global distribution of the Untere [Lower] *marginifera* Zone in comparison to other Famennian Zones was first emphasized in the monumental Devonian conodont study of Ziegler (1962). Ziegler (1971) showed that this zone introduced 14 new taxa, far more than any other Famennian

Zone. Elsewhere in the United States, the Early (Lower) *marginifera* Zone is signaled by diverse, abundant conodont faunas in the Northern Midcontinent area in Indiana (Sandberg et al., 1994) and Michigan (Gutschick and Sandberg, 1991).

The only other conodont zone mentioned by Ziegler and Sandberg (1997) as a possible alternative lower boundary for a Middle Famennian Substage in a tripartite subdivision of the Famennian was the Latest (Uppermost) *crepida* Zone. However, this zone was discounted because it would not subdivide the Famennian into three parts of approximately equal length. Further arguing against this position is the location of this zone at the maximum, not at the start of the lower T-R cycle IIe transgression. Moreover, the conodont signal for this zone is inferior to that of the Early (Lower) *marginifera* Zone, because it is based mainly on the introduction of a single subspecies of *Palmatolepis glabra*, with some of its other subspecies aiding in zonal recognition. Nevertheless, three of nine SDS Titular Members recently cast ballots in favor of this zone, probably in response to the advocacy of this zone in order to achieve an approximately equal length, four-fold Famennian subdivision (Streel et al., 2005, in SDS Newsletter 21, with missing figures added in SDS Newsletter 22, p. 13–16).

**North American erosional episode:** This mid-Famennian episode of exposure and erosion of the North American continent, interrupted by a few palimpsest onlap beds, largely eroded soon after deposition, extends from the Late (Upper) *marginifera* Zone to the Late (Upper) *postera* Zone, corresponding to the highest, regressive part of T-R cycle IIe (Johnson et al., 1985). Consequently, any Substage boundaries, such as the Upper Famennian Substage boundary at the start of the Latest (Uppermost) *marginifera* Zone, proposed by Streel et al. (2005), will not be usable in North America. A similar erosional episode, encompassing the Early *trachytera* to Late *postera* Zones, occurs in Australia (G. Klapper, personal commun., Aug. 14, 2007). The following paragraphs discuss the few isolated deposits remaining as a record of the erosional episode.

In North America, the Late *marginifera* Zone is documented unequivocally only by the

occurrence of the zonal index subspecies, *Palmatolepis marginifera utahensis*, in the highest part of the lower member of the Pilot Shale, which is preserved beneath the mid-Famennian unconformity, in the Confusion Range, Utah (Sandberg and Ziegler, 1973; Ziegler and Sandberg, 1984). I have also identified this zone with less certainty at the top of the “False Birdbear” unit at the top of the Jefferson Formation in central Idaho (in Johnson et al., 1985), and in an unnamed 1-m-thick bed in central Sonora, Mexico.

The Latest (Uppermost) *marginifera* Zone has not been unequivocally recognized, to the best of my knowledge, anywhere in North America. However, a conodont fauna broadly dated as Latest (Uppermost) *marginifera* Zone to Late (Upper) *postera* Zone is best documented by the occurrence of *Alternognathus regularis* in the upper part of the Trident Member of the Three Forks Formation in Montana (Ziegler and Sandberg, 1984, as illustrated by Beinert et al., 1971, from locality 3). At several localities, moreover, the Trident contains the ammonoid genus *Platyclymenia*, which generally indicates the same age range. The Trident Member is also present in eastern Idaho (Sartenaer and Sandberg, 1974) and at several localities in western Montana. Probable coeval units with limited geographic distribution in Utah are the “contact ledge” at the top of the Beirdneau Formation in the Bear River Range and an unnamed unit at one locality in the Dugway Range (Sandberg, 1979). *Platyclymenia* has also been recognized at a single locality in the Piñon Range, Nevada, and in roof pendants of the Sierra Nevada batholith in California. *Alternognathus regularis* and *A. beulensis*, which has the same Latest (Uppermost) *marginifera* Zone to Late (Upper) *postera* Zone age range, are also recorded from mixed, reworked conodont faunas in the Maple Mill Shale in Iowa (Beinert et al., 1971) and the Saverton Shale and Holts Summit Formation in Missouri. Such isolated, imprecisely dated occurrences emphasize the futility of recognizing an Upper Famennian Substage in North America at the position advocated by Streel et al. (2005).

The record of precisely datable occurrences of the Early (Lower) and Late (Upper) *trachytera* Zones is, to the best of my knowledge, nonexistent in North America. In all my years of Devonian conodont studies, I have seen a

single specimen of *Scaphignathus velifer velifer* on the bedding surface of the Chattanooga Shale in West Virginia and a single specimen of *S. velifer leptus* in one sample from the Parting Formation in Colorado. The only samples that are in a stratigraphic position that might represent one of these zones contain mainly the long-ranging conodont *Polygnathus tigrinus* and come from the peritidal to supratidal lower Crystal Pass Formation in Nevada and the lower member of the Pinyon Peak Limestone in Utah.

The record of the Early (Lower) and Late (Upper) *postera* Zones is only slightly better. Samples that probably are assignable to the Early *postera* Zone occur in the upper part of the shallow-water Lost Burro Formation in southern Nevada and eastern Californian. A sample from the highest part of the Squares Tunnel Formation in the Inyo Mountains, California, definitely represents one of these zones (Stevens et al., 1996). This latter sample contains the early form of *Palmatolepis perlobata postera*, younger forms of which occur in the Early (Lower) *expansa* Zone. The Late *postera* Zone is definitely recognized in a stratigraphic sequence below the Early *expansa* Zone in the lower member of the Pinyon Peak Limestone in the Star Range, Utah, and in the Parting Formation at East Glenwood Canyon, Colorado (Sandberg and Dreesen, 1984).

**Early (Lower) *expansa* Zone:** This zone, which marks the start of T-R Cycle Iif, is undoubtedly the best-documented Famennian conodont zone, if not the best-documented conodont zone in the entire Devonian. In the western United States alone, it now has been identified in more than a hundred samples from more than 40 localities. The zone served as the basis for first recognizing geographically distributed conodont biofacies of a single conodont zone from continental rise and slope to offshore neritic bank and restricted lagoon paleotectonic settings (Sandberg, 1976). It is the only Devonian zone that can be recognized from extremely deep and extremely shallow settings that have no diagnostic specimens in common. In fact, five distinct biofacies have been recognized within the shallowest setting (Sandberg and Dreesen, 1984). The widespread distribution of this zone and all then-known localities in more than ten stratigraphic units were depicted on a map showing

paleobiogeographic lithofacies and a paleoenvironmental reconstruction (Sandberg et al., 1989, fig. 17). Conodont faunas from almost all settings have been illustrated by Beinert et al. (1971), Sandberg and Ziegler (1979), and Sandberg and Dreesen (1984). Diverse Early *expansa* Zone faunas are so abundant that they are readily identified where reworked into Mississippian calciturbites, such as those in the Tripon Pass Limestone in Nevada or McGowan Creek Formation in Idaho. Because of their large size and excellent preservation, some of these reworked conodonts in the latter were used by Sandberg and Ziegler (1979) to illustrate characteristic zonal taxa.

The comments of Chairman Thomas Becker (SDS Newsletter 22, p. 9) cast doubt on the timing of the T-R Iif transgression and more specifically on the dating of the Early *expansa* Zone in North America. His remarks, quoted in their entirety from SDS Newsletter 22, page 9, are as follows:

“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.”

The latter misleading remarks cannot go without comment. *Polygnathus styriacus* is a rarely occurring, geographically restricted species, which is virtually unknown in North America. This is one of the reasons why the former *styriacus* Zone was replaced by Ziegler and Sandberg (1984), who barely mentioned *Polygnathus styriacus* in the text. Their only reference to this species was the entry of early, atypical forms in the Lower *postera* Zone. Sandberg and Ziegler (1984) did not include typical forms of *Pol. styriacus* in the associated faunas of the Upper *postera* and Lower *expansa* Zones. Documenting its rarity, my collection 71-NABB-27 from the Early *expansa* Zone in the classic Ballberg Quarry section, Germany, counts only 9 specimens of

*Pol. styriacus* among 871 conodont platform elements; thus it constitutes only 1% of the fauna. Furthermore, my sample 71-NABB-26 from the Early *postera* Zone in this same quarry records only one (1) specimen of the early form of *Pol. styriacus* among 234 platform elements; this is only 0.4%. In the western United States, I have recorded occurrences only of early, atypical *Pol. styriacus* at three localities. The single known occurrence of characteristic *Pol. styriacus* in all of North America is from a stratigraphic leak in the Llano area, Texas (Seddon, 1970). This rare occurrence is explained because Devonian rocks were eroded from Africa and redeposited during the younger continental collision between North Africa and North America. Furthermore, the suggestion that the oldest part of the Early *expansa* Zone is not represented is refuted by the occurrence of the Late *postera*-Early *expansa* Zone boundary, fortuitously preserved at one locality in Utah.

Because of its widespread recognition through many paleotectonic settings, the Early *expansa* Zone constitutes the best candidate of all Devonian conodont zones for providing a correlation between oceanic-basin and continental faunas and floras. For these multiple reasons the Early (Lower) *expansa* Zone constitutes the best position for the base of the Upper Famennian Subzone.

**Middle and Late (Upper) *expansa* Zones:** The basal IIF transgression comprises three closely timed phases: the Early *expansa* Zone eustatic rise; the Dasberg Event, probably close to the start of the Middle *expansa* Zone; and the Strunian Event, which in Belgium begins close to the start of the Late *expansa* Zone. The distribution of the Middle and Late *expansa* Zones are so similar that they were mapped as a single depositional complex (Sandberg et al., 1989, fig. 18), which has a widespread distribution similar to that of the Early *expansa* Zone. At several localities in Wyoming, beds of the Middle *expansa* Zone directly overlie those of the Early *expansa* Zone and are distinguished by the introduction of *Bispathodus aculeatus aculeatus*, *B. aculeatus anteposicornis*, and *B. costatus* Morphotype 2. Some of these faunas, formerly dated as Lower *Spathognathodus costatus* Zone, were illustrated by Klapper (1966) and listed by Sandberg and Klapper (1967).

At Flux Canyon in the Stansbury Mountains, Utah (Sandberg and Gutschick, 1979), carbonate beds yielding abundant conodont faunas of the Early and Middle *expansa* Zone are separated only by a sandstone bed, ~7 m thick. The Middle *expansa* Zone beds in the lower part of the Fitchville Formation there and in an unnamed unit in southern Arizona contain large (commonly up to 20 cm long) clisiophyllid and caninoid corals that belong to the Etroeungt fauna. However, beds of the Early *expansa* Zone in the upper member of the Pinyon Peak Limestone at Flux Canyon, in the Dyer Dolomite at East Glenwood Canyon in Colorado (Sandberg and Poole, 1977; Sandberg and Dreesen, 1984), and in the Percha Shale throughout southwestern New Mexico and southeastern Arizona, contain abundant, diverse brachiopod faunas. Some brachiopods in these faunas are very large and thus are reminiscent of the Etroeungt fauna. For example, a specimen of *Paurorhyncha endlichii* collected at East Glenwood Canyon measures 7 cm in length, 6 cm in width, and 5 cm in height. Consequently the Etroeungt is interpreted to begin earlier in the western United States than in Belgium, initially with brachiopods in the Early *expansa* Zone and later with the addition of corals in the Middle *expansa* Zone.

The transition between the Late *expansa* Zone and the Early *praesulcata* Zone is documented within a few centimeters by excellent conodonts faunas in an unbroken sequence within the Leatham Formation at Porcupine Dam in the Bear River Range, Utah (Sandberg and Gutschick, 1979). These ages are extremely important to North American and global event stratigraphy. Within the Leatham Formation, they date its algal-brachiopod biostrome as Late *expansa* Zone and the overlying regressive bypass siltstone as beginning in the Early *praesulcata* Zone. These units continue westward as the upper part of the Leatham (middle) Member of the Pilot Shale and northward as the upper part of the Sappington Member of the Three Forks Formation (Sandberg et al., 1989, figs. 18 and 19). The algal-brachiopod biostrome forms a narrow offshore bank that originally was depositionally continuous from southern Nevada to northern Montana during the stillstand at the maximum of the T-R cycle IIF transgression, the exact timing of the middle Etroeungt Formation in Belgium (Sandberg, *in*

Casier et al., 2004). The biota of this bank has been treated comprehensively by R.C. Gutschick, J. Rodriguez, and their co-workers (e.g., Gutschick et al., 1976; Gutschick and Rodriguez, 1979). The overlying regressive siltstone unit in Montana was dated as the *Siphonodella praesulcata* Fauna (now *praesulcata* Zone) and shown to contain the *Hymenozonotriletes lepidophytus* (now *Retispora lepidophyta*) by Sandberg et al. (1972).

**Strunian:** There is no doubt that the Strunian, represented by the Etroeungt Limestone at the top of the Devonian in Belgium (Streel et al., 2006), is an important biostratigraphic unit because of its distinctive megafauna, microfauna, and microflora, which are so readily distinguishable from those of underlying Devonian and overlying Mississippian units. The Strunian has been proposed to define the fourth and highest Uppermost Famennian Substage (Streel et al., 2005). Serious questions, the answer to which argue against its acceptance, are: (1) Is the Strunian too close in time to the start of the T-R cycle IIf Early *expansa* Zone eustatic rise, which is probably the best-defined candidate for a Famennian Substage boundary? (2) Can the type Strunian be adequately defined on the basis of the sparse conodont zonal record in Belgium as starting with the Late *expansa* Zone? (3) Should the Late *expansa* Zone be based on the pelagic species *Bispathodus ultimus*? (4) Is the Strunian a diachronous unit beginning globally at times ranging from the Early to the Late *expansa* Zone?

(1) The answer is yes. The Strunian in Belgium is indeed very close in timing (Fig. 1) and represents the maximum of a single transgression that occurred in three pulses during the 4<sup>th</sup> Famennian interglacial warming episode (Sandberg et al., 2002). At most, the Etroeungt Limestone can be dated as only two conodont zones younger than the start of the T-R cycle IIf transgression.

(2) The answer is no. The dating of the start of the Strunian hinges on a single specimen of *Bispathodus ultimus*, reported by Dreesen and Thorez (1994), whereas the conodont fauna reported by Sandberg (*in Casier et al., 2004*) and unequivocally dated as Late *expansa* Zone is from 3.6–3.8 m below the top of the Etroeungt Limestone. The record of *B. ultimus*

in this fauna consists of five large left elements and six large right elements. Large right elements are needed to recognize this species because left elements are shared with *Bispathodus costatus*, which originates in the Middle *expansa* Zone (Ziegler and Sandberg, 1984). Furthermore, small left and right elements may be indistinguishable from *B. spinulicostatus*, which also originates in the Middle *expansa* Zone and which occurs in the Epinette Formation (Sandberg, *in Casier et al., 2004*). To date my request to be loaned the critical, supposedly stratigraphically lower specimen of *B. ultimus* or to be supplied a photograph or drawing thereof has gone unanswered.

(3) The answer is indubitably yes! Surprisingly, Streel et al. (2005, p. 18) stated: “Defining the base of the Late *expansa* Zone in pelagic facies is questionable.” This remark suggests a fundamental misunderstanding of the basis for the standard Late Devonian conodont zonation. Ziegler and Sandberg (1988, p. 261) clearly pointed out the need for using pelagic taxa:

“The Late Devonian and Early Carboniferous standard conodont zonations are based on phylogenetic successions of species of pelagic genera such as *Palmatolepis* and *Siphonodella*. Their basic unit generally is the phylogenetic zone, which is timed from the first occurrence of an ancestral species to the first occurrence of a directly descendant species. Use of pelagic genera, as opposed to neritic or nearshore genera, has three advantages in constructing a standard zonation. First, pelagic genera can evolve and be distributed worldwide within a time interval so short (<20,000 years) that it appears to be synchronous in the geologic record. Second, pelagic genera are less affected by physico-chemical influences such as eustatic falls that might terminate or geographically isolate shallower water genera. Only extremely high rises or rapid, severe eustatic rises and falls associated with mass extinctions may have had a genetic effect on pelagic genera. Third, pelagic genera evolve more rapidly and produce a finer time scale than do shallower water genera, which have been the basis for interrelated alternative zonations. For example, the palmatolepid-based Late Devonian standard zonation comprises 28 units, whereas the alternative neritic icriodid

zonation comprises only 9 units for the same time interval.”

(4) The answer is probably yes. The preceding section demonstrated that an Etroeungt-like fauna of large brachiopods originated in the Early *expansa* Zone in the western United States. Even if this is not regarded as a strong argument, the appearance of an Etroeungt coral fauna in the Middle *expansa* Zone in Utah and Arizona provides strong evidence that globally the Strunian is indeed a diachronous faunal and floral unit.

Specific replies to comments made by Strel (2007) regarding the 2006 SDS submission by Sandberg (2007):

(1) The first sentence is a serious misquotation by Strel (2007); the original wording was taken out of context and “The” was added. Strel misquoted: “The Upper *expansa* Zone has no scientific utility....” The actual opening sentence in Sandberg (2007) reads: “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.” Through this misquotation, Strel (2007) implies that the author disparages his own extensive conodont studies. Certainly, *Bispathodus ultimus* is a rarely occurring species and the zone can be recognized from other species in the absence of this zonal index species in the western United States. However, the point raised by Sandberg (2007) and adequately answered in preceding sections is: Does the proposed Uppermost Devonian Substage actually begin at the base of the Upper *expansa* Zone, not only in Belgium but globally?

(2) As already stated, the identification of *Bispathodus ultimus* high in the Etroeungt Limestone in the classic Anseremme section is well documented, whereas the identification of its lower, not basal, occurrence (Dreesen and Thorez, 1994) is subject to question. Moreover, the exact position of this occurrence (sample AN 5 in their table 5 and fig. 16) in relation to the section of Casier et al. (2004) and to the position of Sandberg sample 71-BEL-11 cannot be deciphered from the correlation lines shown by Strel (2007, fig. 1). Incidentally, Dreesen and Thorez (1994, p. 178) erroneously stated that: “*Bispathodus ultimus* starts at the end of the Late *expansa*

Zone...” Not recognizing it as the defining species for the beginning of this zone, they dated the Strunian as latest Late *expansa* Zone to earliest Late *praesulcata* Zone. These errors cast further doubt on their sample positions and zonal determinations in the Anseremme section.

(3) No further comment on recent taxonomy of calcareous foraminiferans.

(4) As already discussed, the upper part of the Etroeungt Limestone is datable as Late *expansa* Zone. The unanswered question is whether the base is high Middle or early Late *expansa* Zone.

(5) This comment need not be answered because it is not factual but only an inference, as indicated by the wording: “...should start much below...”

(6) The Etroeungt fauna cannot be “a transitional fauna between Devonian and Carboniferous faunas” because it is a Lazarus fauna. Not only did it appear with no known immediate ancestors, emanating from an unknown refuge, it just as abruptly disappeared during the Middle *praesulcata* Zone Event. Among corals related to the Etroeungt corals in North America, *Tabulophyllum* did not reappear until the Early Mississippian (latest Kinderhookian to Osagean) and *Caninia* did not reappear until the Late Mississippian (Chesterian).

(7) No further comment, except perhaps that the Fontin Event is the same as the Dasberg Event.

(8) In this comment regarding the Upper and Uppermost Famennian being part of the same eustatic event, Strel mistakenly states: “This is wrong being based on incomplete analysis of the literature.” In reality, it is based on more than 50 years of research on the Devonian in both North America and Western Europe, particularly in Germany and Belgium, and on the T-R IIF transgression as shown by Johnson et al. (1985) and in Figure 1 (herein). The three phases of this single eustatic event were explained in a preceding section.

**Acknowledgment:** CM Gilbert Klapper substantially improved this document through his thorough review.

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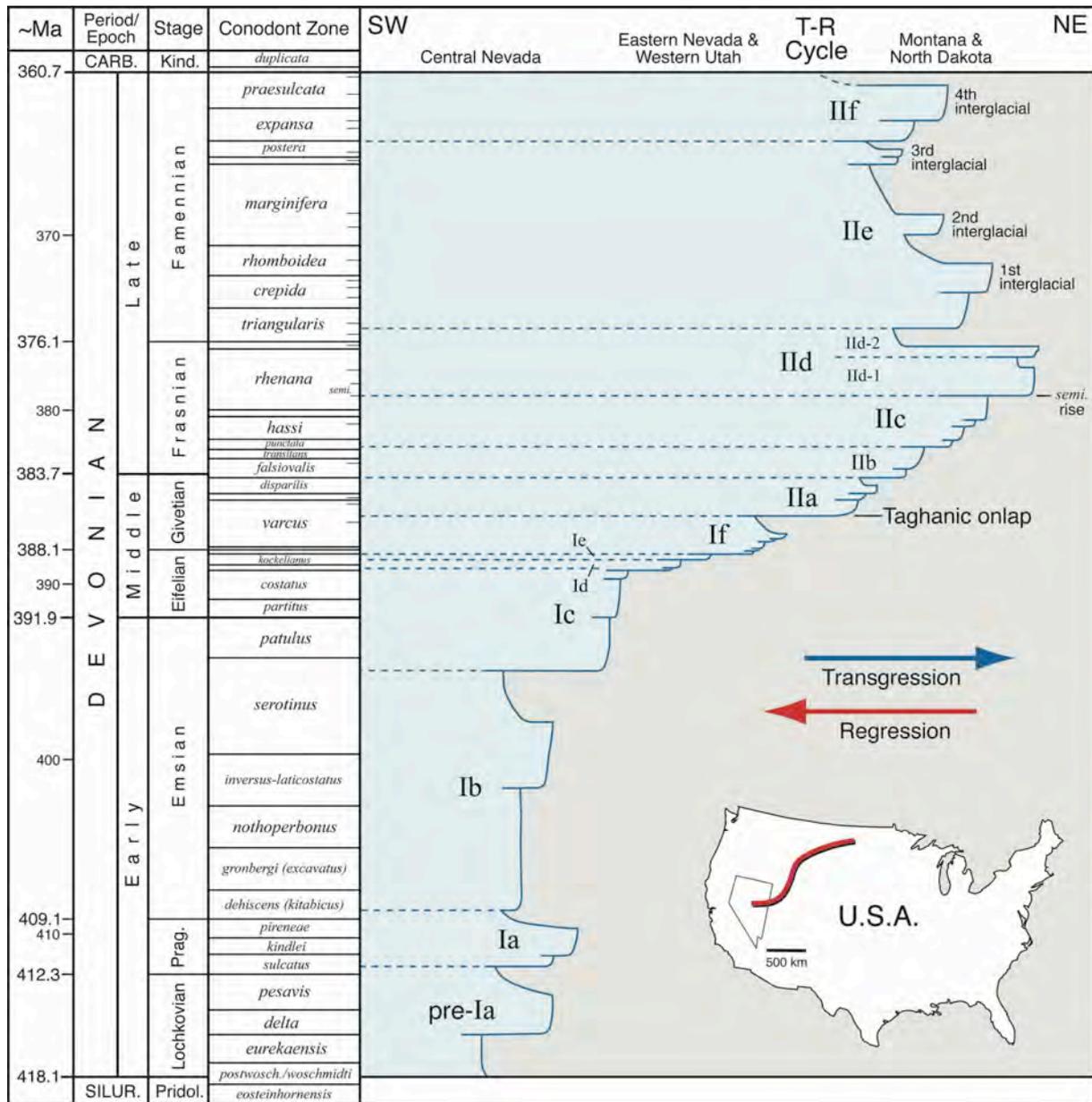
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Morrow & Sandberg, Figure 1

Figure 1: Devonian sea-level curve (Johnson et al., 1985) adapted to fit revised radiometric time scale (Kaufmann, 2006). Note that although problems exist with conodont zonal length across the Eifelian-Givetian Stage boundary and in the early Frasnian, the lengths of Famennian conodont zones nicely fit the new 14.6-m.y. radiometric length. Note the positions of two Substage boundaries advocated herein: the Early marginifera Zone coincides with a major transgression interrupting the long generally regressive upper T-R IIe cycle and the Early expansa Zone coincides with the start of the T-R IIf cycle. The Strunian, characterized by the Etroengt fauna, is represented by the highest phase of the 4th interglacial episode within this generally transgressive cycle. The Etroengt fauna dies out with the regression induced by global cooling in the Middle praesulcata Zone. (Figure from Morrow & Sandberg, in press)

## SHOULD THE DEVONIAN/CARBONIFEROUS BOUNDARY BE REDEFINED?

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The base of the Carboniferous System is defined by the First Occurrence of the conodont species *Siphonodella sulcata*, within the *Si. praesulcata* – *Si. sulcata* lineage (Paproth & Streel, 1984). The GSSP has been chosen in the La Serre Section (Montagne Noire, France), at the base of Bed 89. However, recent studies on the section (Kaiser subm.) have evidenced several problems, both of the stratotype section and of the index taxon, that should be considered before a new definition of the boundary can be proposed.

The La Serre section was assumed to be the best section where the evolutionary lineage *Si. praesulcata*-*Si. sulcata* was well evident. Flajs & Feist (1988) published a biometric study of the two taxa, demonstrating that there is a wide overlap between the definitions of the two species and transitional forms are very common. Unfortunately their collection looks to be lost, since only figured siphonodellids and protognathodids (almost complete well preserved specimens) are deposited at the Senckenberg Museum in Frankfurt a.M., but nobody knows the whereabouts of the other associated conodonts.

Recently, Kaiser (2005, in prep.; also Kaiser et al. 2006 and Kaiser & Becker 2007) resampled the section and found *Si. sulcata* starting from Bed 84top. In addition she found a lot of broken elements, together with some reworked specimens from older levels. No evidence of the evolutionary lineage is present in her material, as suggested also by Ziegler & Sandberg (1996) in their comment on the original material of Flajs & Feist.

Ji & Ziegler (1993, p. 21) remarked that the “La Serre section is a rather poor section, which is not in accord with the rules for definition of a boundary of that importance”.

The transition between *Si. praesulcata* and *Si. sulcata* is not always evident, since there are no sections (as far as we know) where it can be observed. Furthermore, the two taxa show a great variability and several specimens appear to be transitional between them; consequently, in many cases the attribution of a specimen to one or to the other species is subjective. Therefore the position of the boundary may depend on personal interpretations.

Furthermore, due to changing depositional environments, in some places (i.e. the Carnic Alps) *Siphonodella sulcata* is absent at the D/C boundary transition, and the boundary should be drawn on the basis of other taxa.

We should not forget a few “unusual” occurrences of *Si. sulcata* together with several taxa which range is restricted to the Devonian (i.e.: Sardinia, Corradini et al., 2003, p.232; Corradini, 2006).

According with these considerations, there are two possible options:

**Option 1:** maintain La Serre section as stratotype, lowering the GSSP to the base of Bed 84top. This would be the easy way, if we want to avoid a major revision, but it is not a scientifically satisfying solution, especially since siphonodellids are very rare in the lower and upper parts of Bed 84.

**Option 2:** consider a redefinition of the boundary, then define a new GSSP, either at La Serre or elsewhere. Also the opportunity to maintain the boundary defined within a different evolutionary lineage, or simply the first occurrence of a different taxon, should be considered. There are two genera of conodonts that should be evaluated in order to find the better index taxon for the D/C boundary:

**2.1: *Siphonodella*.** A taxonomic revision of the early siphonodellids is necessary, in order to define unequivocally what is and what is not *Si. sulcata* and choose a neotype for the species, since the holotype is lost. Furthermore, we have to consider the early occurrences of *Si. sulcata* and/or the fact that *Si. sulcata* (or relatives) in some places do not occur at the present day boundary level.

**2.2: *Protognathodus*:** the D/C boundary can be drawn with the biostratigraphically significant protognathodid fauna instead of the problematic siphonodellid fauna conventionally used, even if in some areas (i.e.: the Carnic Alps) the protognathodids are

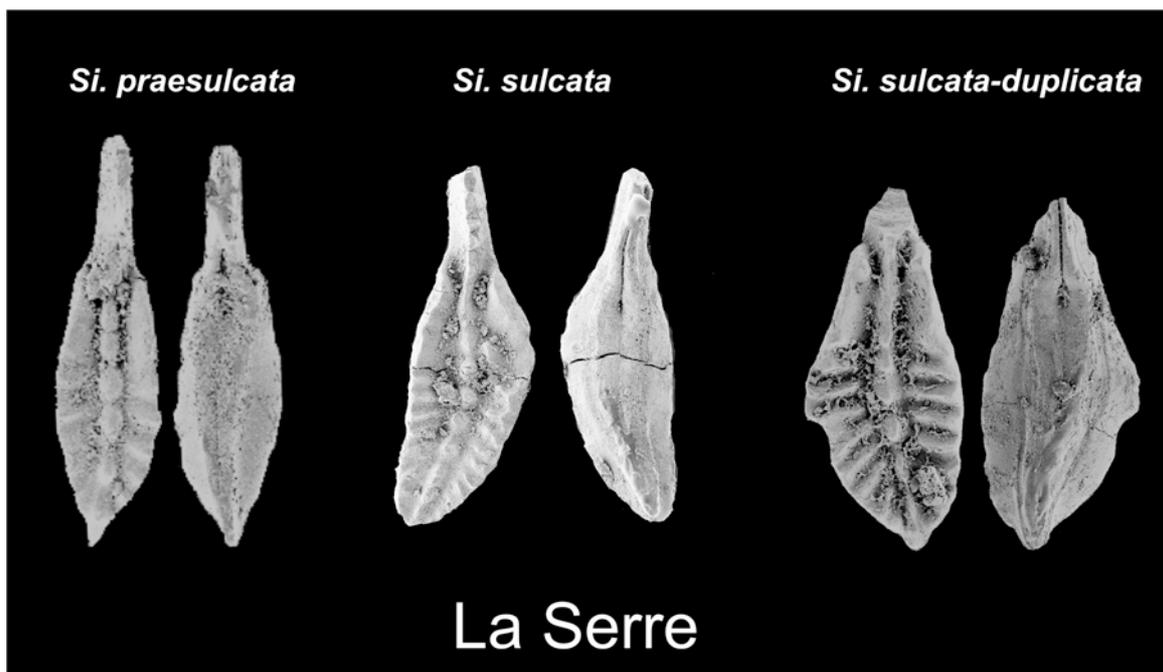
not abundant. There are two possible placing for the boundary:

*2.2.1:* at the entry of *Protognathodus kockeli*. The disadvantage of these would be that the boundary would be placed directly above a major facies break (the main Hangenberg Regression), and that several typical Devonian taxa would receive a basal Carboniferous range.

*2.2.2:* at the first occurrence of *Protognathodus kuehni*. It would be a boundary chronostratigraphically close to the present one, but a revision of *Pr. kuehni* is recommendable in order to avoid possible misdetermination of *Pr. kockeli*-*Pr. kuehni* transitional forms.

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**DOCUMENT SUBMITTED TO THE SDS  
MEETING IN THE USA, NEVADA,  
SEPTEMBER 2007**

Evgeny A YOLKIN, Nadezhda G. IZOKH, Maya V. ERINA, Olga T. OBUT

There was a long way to a result to select “Base of dehiscens Zone” as the principal level for the base of the Emsian (SDS Newsletter No. 4, June 1987, p. 3). On the 17<sup>th</sup> Field and Business SDS Meeting (Calgary, Canada, 1987) “it was suggested by SDS members that a further study be made of the sections where there is an overlap of *P. pireneae* and *P. dehiscens* ranges in order to establish the stratotype of the lower Emsian boundary. The Zinzilban section is one of them. In 1987 additional samples were collected from the boundary interval. New data show the necessity to distinguish the mentioned species more accurately. There is the reason to suppose that the adult specimens of *P. pireneae* could be defined as *P. dehiscens* (SDS Newsletter No. 6, p. 4).

On the 18<sup>th</sup> Field and Business SDS Meeting (Rennes, France, 1988) it was noted “Pragian-Emsian (boundary)!. This has been one of the principal focuses of two recent field meetings (Czechoslovakia, 1986, Spain-France, 1988) but is our most difficult stage definition because there is no traditional boundary (or there are two incompatible traditions). We have agreed that the boundary should be within the range of overlap of *Polygnathus pireneae* and *P. dehiscens* (conodonts) if a suitable stratotype can be found. Motions to this effect were passed at both the 1987 and 1988 meetings” (SDS Newsletter No 7, January 1989, p. 6).

“Although a globally useful GSSP had been proposed for the base of the Pragian in the vicinity of Prague in Bohemia, sequences in that area about the Pragian-Emsian boundary had proved unsatisfactory for proposal as a GSSP based on pelagic faunas especially with regard to conodonts, which has especial use internationally. Though data and submission for potential candidate sections for a GSSP for the base of the Emsian were canvassed, only one submission was forthcoming. This clearly shows the superior nature of the Zinzilban sections. The type section was visited by the SDS in 1978 and subsequently by a special

party. It was included in field trips of the International Geological Congress, Moscow 1984 as Excursion 100, “The Middle Palaeozoic of the Southern Tien Shan” (from proposal for the GSSP for Pragian-Emsian boundary: Newsletter No 10, p. 63.) [at Beijing, 1996, IUGS accepted the Emsian GSSP]

After that time the Spanish-German team (Nacho Valenzuela – Peter Carls and others) propose to come back to traditional Emsian boundaries and its volume that actually are still uncertain. Such approach was declined by previous SDS members.

The main present day Emsian problems, apart from the taxonomic discussions around *Polygnathus kitabicus* and *Pol. dehiscens*, there are different concepts of *Pol. excavatus*, *Pol. gronbergi* and *Pol. nothoperbonus* as well as different understanding of conodont taxa and zonation for a whole lower Emsian. Ruth Mawson, leader of the Emsian Working Group, writes (see SDS Newsletter No. 20, p. 2): “It seems that the Working Party must really begin its work from the beginning. There is no use whatsoever in trying to sort out a possible level for the division of the Emsian into two substages and to suggest names for possible substages until the conodont zones for the Emsian are stabilized. With the publication of Bardashev et al. (2002) there is the need for the Emsian Working Group to consider the repercussions of this paper and how it may or may not affect the zonation of the Emsian”.

We already tried our points of views on different topics representing our interpretation of some Barrandian sections (see Yolkin’s comments in SDS Newsletter No 17, p. 7-9): “Below I shall try to show most possible position of the lower Emsian GSSP in Barrandian section as well as to align three substage units of South Tien Shan with corresponding intervals of the Pragian-Zlichovian succession using available conodont data from Barrandian sections, the complete polygnathid lineage from Central Asia and sedimentary event levels as well.

1. The basal Emsian GSSP is situated in South Tien Shan just above (35 cm) of the anoxic Zinzilban (*kitabicus*) Event (Yolkin et al., 1994a) This sharp T-R level divides two thick Madmon and Khodga-Kurgan formations (Kim

et al., 1978, 1984). It is recognizable in many regions, particularly in Siberia, Urals, Central Asia. This event could be traced to the Barrandian to a certain level with a gap, above the top of the Koneprusy Limestone in the Zlaty kun quarries. In both Barandian and South Tien Shan region, below it, there are massive reef limestones with very similar benthic fauna. A start of wide Zinzilban transgression could be aligned also with base of the Reporyje Limestone in the Stydle vody Quarry. Most likely their red colour is caused by the post-Koneprusy erosion of the adjacent areas. These conclusions are supported by the finding of the *Pol. kitabicus*? [it could be real *Pol. kitabicus*!] just above the Reporyje Limestone (Chlupac, 1998, Fig. 4).

In this context there are very interesting the MSEC data from Morocco (Crick & Elwood, 1997, 1998). They demonstrate a presence of the only sharp MSEC level located between the bases of Pragian and Dalejan. These are the "Zlichov event I" in the Jbel Issemour section (Crick & Ellwood, 1997, figs. 10-11) and "Pragian/Emsian boundary prior to 1997 decision" in the Anti-Atlas composite reference section (Crick & Ellwood, 1998, figs. 2-3). I would like to say that these MSEC events precisely correspond to the Zinzilban (*kitabicus*) Event (Yolkin et al., 1994a) and the basal Emsian GSSP (Yolkin et al., 1994b, 1997). This chronostratigraphic level is sharply expressed also in the most Devonian sections of the former USSR and coincides with the most sharp changes in the benthic associations. This was the reason to consider it in the USSR as the Lower/Middle Devonian boundary. I would like to point out that this level was usually aligned (now I can say erroneously) with the base of Zlichovian (see Nalivkin D.V., Rzhonsnitskaya M.A. & Markovsky B.P. (eds), 1973. Stratigraphy of the USSR. Devonian System. Book 1 and 2.- Moscow, "Nedra", 519 p. and 379 p.). A long time, up to recent days, it was traditional Lower/Middle Devonian boundary for all regions of the USSR to coincide with the bases of the *Favosites regularissimus* Zone of Central Asia (=Zinzilban Horizon), Novaya Zemlya, Taimyr and Salair, Kireev Formation of the Gorny Altai, Vechernyaya Formation of NE Russia, Takata Formation of the Russian Platform and others. Keeping in mind these circumstances it would be excellent if Rex Crick and Brooks Elwood could go to Kitab Reserve to collect

samples for the Magnetosusceptibility studies around the basal Emsian GSSP. It is possible also to examine here the Silurian/Devonian boundary, Lochkovian-Pragian interval and three well-expressed Emsian sedimentary (eustatic) cycles.

2. The Zlichovian-Dalejan boundary is well expressed in many excellently exposed and studied Barrandian sections. Nevertheless, in some of them it should be clarified, for example in the "U Kaplicky" Quarry (Chlupac et al., 1980, p. 163-164, Fig. 9, Pl. 21). Findings of polygnathids in this section are of the prime interest. They are identified as *Polygnathus dehiscens* and *Polygnathus gronbergi*. Unfortunately, only one side, lower or upper view of individual specimens, is illustrated. That is why re-identifications are difficult. Nevertheless, I certainly see here an overlap of the ranges of *Polygnathus excavatus* (ibidem, Pl. 21, figs. 10, 11, 13) and *Polygnathus nothoperbonus* (ibidem, Pl. 21, figs. 9, 18, 21). A presence here the latter species is supported, in particular by the note in explanations for Pl. 21: "Note flat or shallow basal cavity at posterior end in figs. 8, 9, 14, 15, 16". In this case the base of the Dalejan should be shifted down to the upper boundary of the Kaplicka "Coral horizon". The entry of *Pol. nothoperbonus* corresponds to the appearance of *Pol. laticostatus* (Yolkin & Izokh, 1998) i.e. to the level considered as a version of the Lower Daleian boundary.

3. Polygnathids are also recovered from two samples (number 5 and 8) that were collected just below the Pragian-Zlichovian boundary in its stratotype exposed in the "U Kaplichy" Quarry (Chlupac, 1998). The *Polygnathus dehiscens* is identified in both samples but illustrated only from sample 5 (Chlupac et al., 1980, Pl. 21, figs. 2-3, 4). Despite of incomplete documentation by photos, these two specimens could be re-identified as most likely *Polygnathus excavatus gronbergi*. It means that the original Pragian-Zlichovian boundary could be traced to a level within the *excavatus* Zone or the Norbonak Horizon of the Kitab Reserve area (Yolkin et al., 1994 b). This position for the considered boundary is too high because in this case the whole Zlichovian will embrace only a part of the *excavatus* Zone. Thus, if we shall try to clarify the lower Zlichovian boundary in the Barrandian sections, that is needed according

to Chlupac's opinion (1998), we should go down along the Pragian succession. The most appropriate section for such clarification is exposed in the Stydle Vody Quarry (Chlupac, 1998, Figs. 3 and 4). The best position for the Zlichovian base in this sections is the base of the upper interval of the Dvorce-Procop Limestone. Just below this boundary in considered succession, platy limestones with graptolite shale interbeds are located. The same deepening event is fixed at the top of Zinzilban Horizon where it corresponds to an appearance of siliceous shales with many graptolite remains. So, the interval from this position of the lower Zlichovian boundary to the base of the Reporyje Limestone certainly could be an equivalent of the Zinzilban Horizon. Thus, there are quite good alignments

between the Emsian successions from the Barrandian and Kitab Reserve in the Central Asia."

Now we invite again all SDS society to work together. Only this way might led to positive results in reasonable time. We should like to have close contacts with Spanish, German, Czech, Australian workers as well as with people from other countries.

P.S. The base of the upper Emsian problem is not so heavy as for the lower Emsian boundary. In the Kitab Reserve participants of next SDS Field Meeting will examine good data on conodonts, dactyloconaroids, ammonoids as well as diverse benthic fauna.

## NEW REPORTS

**Comments on “Reiteration of proposal for the only two Famennian Substage boundaries that are globally recognizable and coincident with major transgressions, by C.A. Sandberg, document submitted to Eureka meeting, Nevada, September 2007 (cited below as Sandberg, 2008)”.**

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I shall comment briefly: (A) the introduction part and (B) the discussion about the Lower *marginifera* Zone and the North American erosional episode, and will subsequently (C) develop the discussion about the *expansa* zones. Most of the texts given here between “” are wording taken from Sandberg (2008). *Texts in italic refer to “specific replies” by Sandberg (2008) to comments made by StreeL (2007) on the note of Sandberg (2007).*

**(A) The need of four Famennian substages, a SDS decision not to be longer challenged.**

Without entering into a discussion on the topic for which of the new radiometric datings are really the most accurate, I nevertheless think that most geologists accept nowadays that the duration of the Famennian Stage is up to twice as long as the Frasnian Stage (Kaufman 2006, fig. 1). Therefore subdividing both stages symmetrically into three parts lacks any justification, even for those who still believe that conodont zones represent equal duration of time. On another hand it is not because most of the Famennian conodont zones give “inferior conodont-based” limits that one must restrict the number of substages and ignore that the Famennian, more than the Frasnian, encloses many marine events and climatic changes which have to be taken into account. One has also to consider every potential conodont stratigraphic levels which can be correlated with available evolution-based macrofossils zonation or workable accurate zonation of microfossils allowing correlation with neritic facies or even continental facies like miospores.

Moreover, the main reason to propose a subdivision into four substages was not their duration but a need to take into account a long

standing concept of an uppermost part of the Famennian, sometimes incorporated in the next Tournaisian Stage, and named “Strunian” or “Etroeungt” in very widespread regions. The obvious attempt by Sandberg (2008) to recuperate this former argument by lowering the “Etroeungt concept” to a much too old stratigraphic level will be discussed in (C).

Last but not least, recent balloting does not suggest that Subcommission members are “tending” to add an Uppermost Famennian Stage. The subdivision of the Famennian into four substages has been decided (see Minutes of the SDS business meeting, Rabat 2004, SDS Newsletter 21, 2005), and should not be challenged for some time so that subsequent works, which need stability, will not again be delayed.

**(B) The definition of three Famennian substages below the Etroeungt level.**

The bases of the suggested Middle and Late Famennian substages (in a fourfold Famennian concept) proposed at the Florence meeting (StreeL 2005), are mainly a problem to be discussed between conodont and ammonoid specialists because the miospore zonation is clearly of regional importance at these levels. The lowest-one (the Middle Famennian base at the base of the Uppermost *crepida* Zone) corresponds to good miospore markers known mainly in the equatorial North Euramerican realm. The highest-one (the Late Famennian base at the base of the Uppermost *marginifera* Zone) is known in the same equatorial realm and only in the arid zone of the tropical South Euramerican realm (StreeL & Marshall 2006).

One must realize however how important is “the North American erosional episode” and remark also that a main argument of Sandberg (2008) to emphasize the Lower *marginifera* Zone as the best choice to characterize a Middle Famennian base (in a threefold Famennian concept) is the abundance of conodont specimens (not species !) allowing identification of reworked material into the Lower Carboniferous. The same “argument” is also used for the base of the Lower *expansa* Zone, see below (C). It may cast more doubt about the continuity of the North American conodont succession compared to the West European one. “Isolated and imprecisely dated occurrences” emphasize maybe “the futility” of recognizing, in North America, some well established conodont zones in Western Europe.

### **(C) The definition of the Uppermost Famennian Substage at the Etroeungt level.**

#### **The base of the Lower versus Upper *expansa* Zones ?**

One might feel concerned by the fact that, among more than a hundred samples, from more than 40 localities of Lower *expansa* Zone identified by Sandberg (2008), the Upper *postera*-Lower *expansa* zones boundary is only “fortuitously” preserved at one locality in Utah. The Lower *expansa* is not recorded in the “Strunian” type regions of Northern France and Eastern Belgium. It certainly does not correspond to a major transgression in these countries. On the contrary, the Fontin event (an equivalent of the Dasberg Event in western Germany ?), dated Middle *expansa* with *Bispathodus aculeatus plumulus* (Rhodes, Austin & Druce, 1969), *Bispathodus costatus* (Branson, 1934), *Polygnathus streeli* (Dreesen, Dusar & Groessens, 1976) and *Pelekysgnathus inclinatus* Thomas, 1949 (Dreesen *et al.* 1993), is well identified in the Ourthe Valley (Dreesen & Jux 1995, Maziane *et al.* 1999, Strel 1999, and level 3, Fig. 1). Moreover the succeeding Epinette event (level 5, fig. 1) is even more conspicuous. Therefore one can wonder whether the event 16 of Sandberg *et al.*, 2002 (starting ? = level 2 of Fig. 1) is not mainly controlled by the rising Antler orogeny (Strel & Marshall 2006). The next 5<sup>th</sup> (? = level 3, Fig. 1) and 6<sup>th</sup> (? = level 5, Fig. 1) transgressions of Sandberg *et al.* (1989) are indeed less and less conspicuous than the Fontin and Epinette transgressions. It would probably explain much of the North American erosional episode and why the North American conodont succession and its correlation with the different events in Western Europe are so poorly understood (Strel & Marshall 2006, table 2). Anyway it invalidates for Western and probably Eastern Europe the assertion (Sandberg 2008: Strunian, serious question 1) that the Lower *expansa* base would be the best choice to define an upper or uppermost Famennian base. We note, for instance, in Matyja (2008) that according to the recommendation of the SDS to place the bases of the four Famennian substages close to or at major eustatic events, the base of the Uppermost Famennian in Western Pomerania (Poland) would correspond to the base of the Upper *expansa* Zone.

*By the way, Fig. 1 clearly indicates that the Lower expansa Zone is indeed “an inference”*

*that it should start below the Fontin event making irrelevant the remark (Sandberg 2008: specific replies 5) to my former (2007) remark n°5.*

#### **Etroeungt faunas or Etroeungt Formation ?**

Also important is the confusion introduced by Sandberg (2008) when he uses the Etroeungt macrofaunas as arguments for proposing the diachronous character of the Strunian (Sandberg 2008: Strunian, serious question 4 and specific replies 1). The uppermost Famennian base has been selected very close to the most accepted base of the Etroeungt Fm, not to the base of any Etroeungt faunas. There are several tens of citations of “Etroeungt faunas” in the literature of the late Famennian. Poty (1986, p. 67) even mentioned the first occurrence of a “Strunian-type” coral fauna in a *rhomboidea – marginifera* zones equivalent! The “Etroeungt faunas” have been mostly considered as a transitional fauna between Devonian and Carboniferous faunas (Thorez *et al.* 2006, Strel *et al.* 2006, Nicollin & Brice 2004) *which makes irrelevant the comment made by Sandberg (2008: specific replies 6)*. Unfortunately Famennian coral faunas are almost entirely endemic. Corals found in other part of Eurasia usually belong to other taxa (Poty *et al.* 2006). Anyway, to lower the base of the neritic Strunian much lower than any lowest suggestion made before (Conil 1964) would reopen former long controversies in the type regions and previous USSR territories (Strel 1979).

#### **Other irrelevant arguments proposed by Sandberg (2008) against the choice of an Uppermost Famennian Substage (Strunian in neritic facies) starting near the base of the Etroeungt Fm. are answered below:**

Is the Strunian too close in time to the start of the T-R cycle IIf Early *expansa* Zone eustatic rise, which is probably the best-defined candidate for a Famennian Substage Boundary ? (Sandberg 2008: Strunian, serious question 1).

We have answered, above, to the second part of the question. Regarding the first part, one can agree indeed that the Etroeungt Limestone (even better, the base of the Etroeungt Fm) might be dated as only two conodont zones younger than the start of the T-R cycle IIf transgression but that does not imply that they are close in time! Several zones of

Foraminifers and Miospores, sharp change in climatic conditions (level 5, Fig. 1) and two important transgressions are present during this timespan (from level 2 to level 7 in Fig. 1), the length of which is unknown.

Can the type Strunian be adequately defined on the basis of the sparse conodont zonal record in Belgium as starting with the Late *expansa* Zone ? (Sandberg 2008: Strunian, serious question 2)

Focusing the answer on the Anseremme section only (a section with very poorly documented faunas and floras compared to others and a section that we did not use for that reason in Fig. 1) is to say the least, unfair. It discredits the competence of one of the last Famennian conodont specialist in Belgium who has worked and has published several papers with Sandberg himself during many years. Also reading these comments, one must really wonder whether the same situation which has arisen at the DC Boundary where the original concept of *Siphonodella praesulcata* has led to so many taxonomic problems, will also arise with the definition of *Bispathodus ultimus*? Fortunately we know from Ziegler & Sandberg (1984) that *B. ultimus* is “an easily identified species”.

Also, it demonstrates that my former remark “on incomplete analysis of the literature” contradicted by Sandberg (2008: specific replies 8) was nevertheless well founded. Not even a single comment is given by Sandberg

(2007, 2008) on the presence of *Bispathodus ultimus* known for a long time in the Chanxhe section and on the well documented Middle *expansa* fauna found together with *Retispora lepidophyta lepidophyta acme* Zone in the Refrath Borehole, all data also ignored when replying (Sandberg 2008: specific replies 2 and 4) to Streeel (2007) remarks n°2 and 4.

Should the Late *expansa* Zone be based on the pelagic species *Bispathodus ultimus* ? (Sandberg 2008: Strunian, serious question 3).

Beside the unnecessary long lesson on a so-called “fundamental misunderstanding of the basis for the standard conodont zonation”, everyone reading again our sentence “Defining the base of the Late *expansa* Zone in pelagic facies is questionable (Streeel *et al.* 2005, p. 18)”, would immediately understand its meaning by reading also the full text which followed. We wanted only to draw the attention to the necessity in pelagic facies to use other taxa than *Bispathodus ultimus* as did Sandberg himself (1979, p. 97) in North America. Also, there was no intention in Streeel (2007) to “disparage” Sandberg extensive conodont studies (Sandberg 2008: specific replies 2). We just wanted to indicate that the use of the Upper *expansa* Zone has a real scientific utility in several regions for instance in Western and Eastern Europe (Streeel 2002, Streeel *et al.* 2003, 2005)

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Abstract submitted to the Workshop  
“Terrestrialization influences on the Palaeozoic  
Geosphere-Biosphère” held in Paris (Museum  
National d’Histoire Naturelle) on 8 and 9  
October 2007.

### WEST GONDWANAN AND EURAMERICAN CLIMATE IMPACT ON FAMENNIAN 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 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) In Southern Euramerica, the Lower-Middle Famennian vegetation crisis (6 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 sub-polar Western Gondwana and may be therefore climatically control.

2) The Upper Famennian miospore zones are based on a succession of species of the genus *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 its diachronous character. Maybe, alternatively, 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 climatic versus correlation challenge (6 Myr). 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 Uppermost Famennian quick changing climate (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).

In Western Gondwana, 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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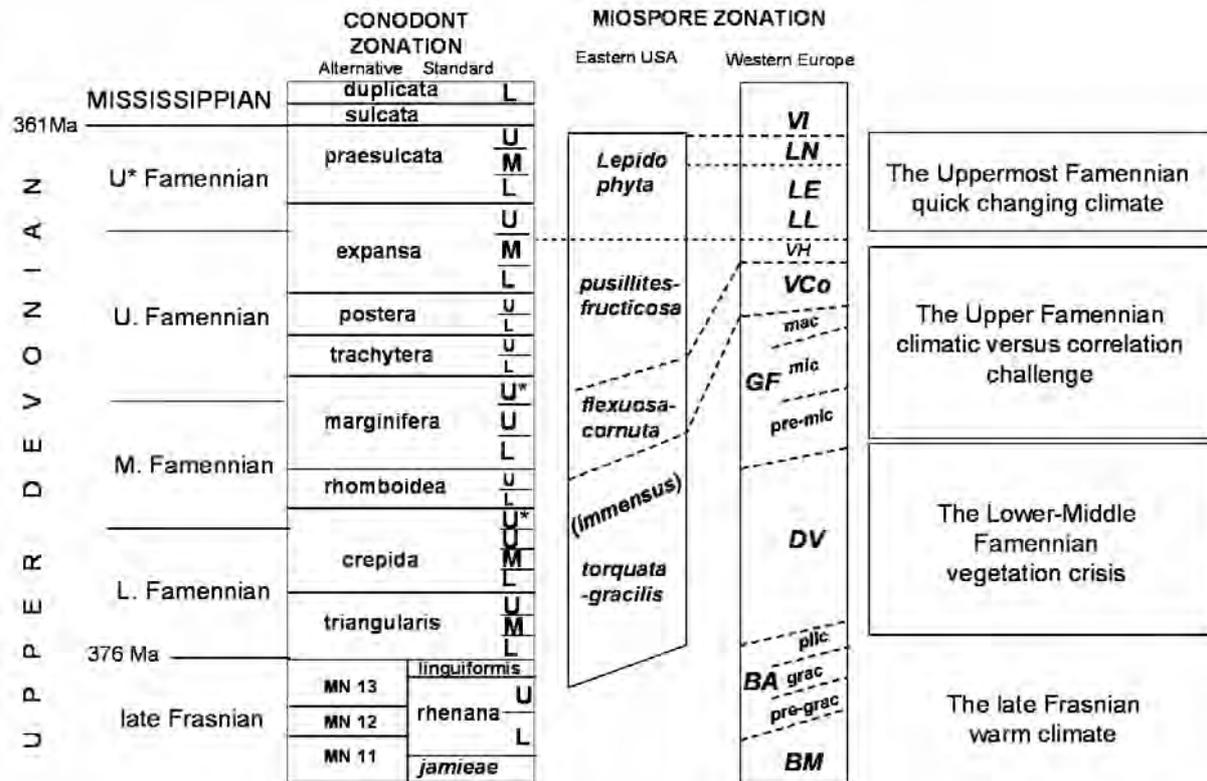


Fig. 1

Correlation of conodont and miospore stratigraphies

Relation between chronostratigraphy and conodont stratigraphy after Kaufmann 2006.

Famennian substages as proposed by Strel et al. 2000 and Strel 2005.

Miospore / conodont correlation in Eastern USA based on Richardson & Ahmed 1988, lithologic correlation after Kirchgasser 2000. Miospore correlation between Eastern USA and Western Europe mainly based on Richardson & Ahmed 1988.

The type Belgian lithostratigraphic data (Thorez et al. 2006) suggest that, in Kaufmann 2006, the Uppermost marginifera conodont Zone duration is probably too long and the Middle expansa conodont Zone, probably too short. Consequently, they have been here slightly modified.

The new names for late Frasnian- Lower Famennian miospore zones in Western Europe are defined in Strel 2008

## FAMENNIAN SUBSTAGE BOUNDARIES

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The actual problem of the Devonian stratigraphy at present is the substage division of the Famennian stage. At present there are variants of four- and three-membered substage divisions of the Famennian. The latter is supported by many specialist of the Devonian stratigraphy (Becker, 1998; Sandberg & Ziegler, 1998; Piecha & Schindler, 2000; Rzhonsnitskaya, 1998).

As is known, substages, as well as stratigraphic subdivisions of a higher rank, are defined on the basis of stages of biosphere development and event phenomena. The below proposed boundary of the Middle Famennian at the bottom of the conodont zone Uppermost *marginifera* is confined to the regressive pulse of the *marginifera* transgressive-regressive cycle (Johnson et al., 1985). The considered boundary is characterized by an essential reduction of variety of some groups of organisms, including conodontophorides, as a result of abiotic component of event Uppermost *marginifera* (see table). The latter consist of a fall of the sea level and displays a short-term sedimentation gap in a number of areas. In the central areas of the Russian plate it is marked at the base of the Lebedyan horizon, and in the territory of the Timan-Pechora province - at the bottom of the Ust' Pechora horizon. In the Urals this gap is not observed at this level. The biodiversity of some groups of organisms decreases. At the same time the considered level is characterized by some new taxons dominating among congener organisms during all the epoch. Among ammonoids it is the genus *Prolobites* and the first clymeniids, among brachiopods - Rhynchonellides (*Zigania ursa* etc.), and also ostracodes of the zonal complex *Fossirichterina intercostata* and *Phlyctiscapha*

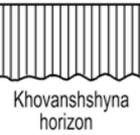
*lebedianica*. It allows to consider the given level as a natural boundary between Lower and Middle Famennian.

The proposal on the boundary of Middle and Upper Famennian of the base of *expansa* conodont zones is not original and within the last decade has been expressed by many geologists (Becker, 1998; Sandberg & Ziegler, 1998, etc.). This boundary is characterized by an eustatic rise of the ocean level and well grounded on paleontologically. Conodont association on this boundary, except *Palmatolepis gracilis expansa* is represented by the species *Pa. rugosa rugosa*, *Polygnathus experplexus*, *Pseudopolygnathus brevipen-natus*, *Bispathodus jugosus*, and others. The substage is the time of domination of clymeniids (House, 1978). The fauna of brachiopods is noticeably renewed (Rzhonsnitskaya, 1988). The rhynchonellide *Zigania* was replaced by *Dzieduszickia* and *Planovatiostrum*, *Trifidorostellum*, *Megalo-pterorhynchus*. *Spiriferides* (*Tarandros-pirifer*, *Volgospirifer*, etc.) became dominating since the middle of the upper substage, and *Sphenospira julii* (Dehee), appeared in the *praesulcata* phase, as zone for the top of the Famennian. The reality of the base of Lower *expansa* conodont zone as a lower boundary of the Upper Famennian is proven by the change of Middle Famennian associations of ostracodes by the representatives of the zone *Maternella hemisphaerica* - *Carboprimitia turgenevi*, being an important biostratigraphic marker of the given boundary (Tchizhova, 2004, 2005). Upward this association is replaced by association of zone *Richterina latior* - *Maternella hemisphaerica* - *Shishaella okeni*. The biostratigraphic interval suggested as the Upper Famennian, on the western slope of the Urals corresponds with the Kushelga and Lytva horizons, on the territory of the Timan-Pechora region with the Dzhebol superhorizon in the structure of Zelenets and Njumylga horizons and on the Russian plate with the Plavsk, Ozerki and Khovanshshyna horizons.

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Proposal of boundaries for substage of the Famennian Stage

Stage	Proposal of substage subdivision	Zonation on basic fossil				Correlation of stratigraphic chart								
		Conodonts		Ammonooides (Becker&House, 2000;Becker,2003) Generalization.	Brachyopods (Rzhonsnitskaya, 1988, 1998)	Ostracodes (Tshigova, 2003, 2005)	West slope Ural	Timan-Pechora area	Russian plate					
		Old chart	Actual chart											
Famennian	Upper	<i>Protognathodus unzoned</i>	<i>praesulcata</i>	U	<i>Kalloclymenia Wocklumeria</i>	<i>Sphenospira julii</i>	<i>R. latior-Maternella hemisphaerica-Shishaella okeni</i>	Lytva horizon	Dzhebol superhorizon	Njumylga horizon				
				M								Khovanshshyna horizon		
				L										
		<i>M.costatus</i>	<i>expansa</i>	U			<i>Clymenia</i>			<i>Dzieduszczia baschkirica-planovatrostrum planoovalis</i>	<i>Maternella hemisphaetica-Carboprimitia turgenevi</i>		Kushelga horizon	Zelenets horizon
				M										
				L										
	<i>L.costatus</i>													
	<i>U.styriacus</i>													
	Middle	<i>M.styriacus</i>	<i>postera</i>	U	<i>Prolobites-Platyclymenia</i>	<i>Zigania ursae-Cyrtospirifer lebedjanicus</i>	<i>Kuzminaella venusta-Kloedenellitina triceratina</i>	Murzakaevo horizon	Ust' Pechora horizon	Optukna horizon				
				L										
		<i>U.velifer</i>	<i>trachytera</i>	U			<i>Fossirichterina intercostata-Phlyctiscapha lebedianica</i>			Lebedjan horizon				
				L										
		<i>L.velifer</i>		Ums										
	Lower	<i>U.marginifera</i>	<i>marginifera</i>	U	<i>Cheiloceras</i>	<i>Mesoplicia meisteri-Cyrtospirifer tchernyschewi</i>	<i>Rabienites decorus</i>	Makarovo horizon	Elets horizon	Elets horizon				
				L							<i>Nehdentomis nehdensis-Serenida plavskensis</i>			
		<i>U.rhomboidea</i>	<i>rhomboidea</i>	U			<i>Cyrtospirifer rjau-sakensis- Zilimia polonica</i>			<i>Nehdentomis nehdensis-Ungerella sigmoidale-Serenida zadonica</i>		Zadonsk horizon		
				L										
		<i>U.crepida</i>		Ums										
		<i>M.crepida</i>	<i>crepida</i>	U						Zadonsk horizon				
				M										
		<i>L.crepida</i>		L										
		<i>U.triangularis</i>		U						Volgograd horizon				
	<i>M.triangularis</i>	<i>triangularis</i>	M											
			L											
<i>L.triangularis</i>		L												

## INTEGRATED STRATIGRAPHY OF THE LOWER DEVONIAN IN THE BARRANDIAN AREA, CZECH REPUBLIC: AN INTRODUCTION OF THE PROJECT, PRELIMINARY DATA

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### Introduction

The purpose of this short note is to introduce mainly the present stage of Lochkovian data processing. The preliminary data were published in abstract book of the field meeting IGCP 499 held in San Juan (Slavík *et al.*, 2007). herein, the conodont data are slightly modified according to more recent results and detailed correlation between sections. This study is a part of a larger project embracing the 'Integrated stratigraphy of the Lower Devonian in the Barrandian area'. The project was started in 2006 and its aim is to fill 'blank spots' of the early Devonian stratigraphy in this stratotype area and thus enhance the capacity of this key region for the global stratigraphic correlation. This strategy consists of two steps. Firstly, the biostratigraphic framework of increased complexity, accuracy and inter-regional value must be developed. Secondly, this biostratigraphy must be completed by detailed magnetic-susceptibility, gamma-ray spectrometric and geochemical (MS-GRS-CH) 'logging of outcrops' to increase the prospective robustness of high-resolution correlation methods.

We noticed, that general demand for 'fresh' stratigraphic data goes up, because of many pending problems in Early Devonian stratigraphy. The major complications are in coverage and processing (quality) of the data. – 1. Great faunal differences (owing to different facies and other paleoenvironmental constraints) caused difficulties of the global conodont zonations, particularly in the Lochkovian and Pragian stages, where major discrepancies can be found. 2. The GSSP of

the S/D boundary is not yet supported by usable conodont data. 3. Demonstrable linkage between conodont, graptolite, dacroconarid and other biostratigraphic data is not universally sufficient due to present poor knowledge about their distribution. 4. Unsuitable placement of the Pragian/Emsian boundary GSSP made the global correlation of the GSSP-defined boundary extremely difficult. 5. There is ambiguity at the Lochkovian/Pragian boundary stratotype. 6. Insufficient knowledge of high-resolution physical and chemical records from the entire thicknesses of the Lower Devonian sedimentary sequences worldwide.

### Stratigraphic potential of the Barrandian – past and present

The Lower Devonian carbonate rhythmites in outcrops SW of Prague are mostly sediments of deeper parts of marine slopes and basins. The continuity of successions was only rarely disturbed by significant hiatuses, and medium sedimentation rates prevailed (~20 m/Ma). The predominant rocks are limestones of varied facies characteristics; pelagic, hemipelagic, and calciturbidite depositional systems alternate with skeletal accumulations that spread around local palaeohighs. The abundance of planktonic, widely correlatable faunas in combination with considerably reduced detrital input is indicative of significant influence of oceanic conditions. It is favorable for biostratigraphic and lithological correlations of the Lochkovian to Emsian sediments of the Barrandian area with many other peri-Gondwanan regions, and also with more distant areas of the world (e.g. Arctic Canada or South China – the same typical successions in lithologies, dispersal of dacroconarids and with connection by long migration paths of corals, brachiopods or trilobites). This correlation potential dates the second half of the 19th century (J. Barrande), but is equally demonstrable by the most recent papers by I. Chlupáč and several tens of other authors. Among the unusually large number of investigated faunas and even floral elements, an outstanding contribution was made by B. Bouček, who introduced the most significant dacroconarid species with relevant zones. This potential was further enhanced by numerous studies on trilobites, brachiopods, bivalves, gastropods and cephalopods, and

especially graptolites, chitinozoans and conodonts as typical stratigraphically relevant faunas. Considerably detailed elaboration of the MS–GRS–CH sections is in advanced stage with a potential to significantly contribute the HR stratigraphy in this area.

### Further aspects of the methods and targets

General knowledge and level of elaboration of the Lower Devonian in global scale is relatively high, but large vacancies in knowledge still persist. For inter-disciplinary communication, precise correlation tools are absolutely necessary. For this, we need a reliable correlation and a functional global stratigraphy. Geological and palaeoenvironmental/biological conditions were, however, frequently unsuitable for preservation of detailed biostratigraphic information, e.g., the dearth of guiding taxa caused by palaeoecological or other objective restrictions. Especially, when using only a single data source for stratigraphic correlation, a possibility of distortion of information (e.g., perturbation in physical data processing, different taxonomical approach, possible human factor failure, etc.) cannot be neglected. Accordingly, employment of several Fundamental tool for biostratigraphic correlation in the Early Devonian is the conodont stratigraphy. Disregarding the formalisms of conodont zonations, conodonts may have relative dating potential of exceptionally high resolution (up to 100 ka). In order to supplement the biostratigraphic data obtained from the stratigraphic sections (distribution of conodonts supplied with information from other faunal groups, e.g., dacroconarids, etc.) we searched for other underpinning instruments. Since its introduction, the internationally most applied approach that promises to refine the 'official' biostratigraphic scales with 10 to 100 times higher resolution, is the magnetic-susceptibility and gamma-ray spectrometric (MS–GRS) logging of outcrops. Such an orientation provides a good opportunity to follow the first studies of this type launched in the Barrandian (Slavík *et al.*, 2000, Koptíková, 2004) mainly because the successions of these sediments were not disturbed through shedding of siliciclastic material from continental near-shore zones. On that account the carbonate sediments with embedded complex impurities of sedimentation background origin are able to

provide the MS–GRS–CH records of good quality. Therefore, the main objective of the project is the arrangement of biostratigraphic data in combination with these records into the main composite section through the Lower Devonian of the Barrandian in terms of integrated stratigraphy.

### The Lochkovian data from Požáry Quarries

Herein, we present conodont data from the lower part of the selected composite section supplemented with the GRS and MS logs. We have started our study in the Lochkovian successions of the Požáry Quarries (Figure 1). This locality lies approximately 1 km E of Řeporyje, WSW of Prague (GPS location: N 50°01.720; E 14°19.449), and it is also a renowned place for the stratigraphy, due to the GSSP for the base of the Přídolí Series (for detailed description see Kříž *et al.*, 1986). In detail, there are several quarries, outcrops and connecting tunnels on this place. The last years sampling program (P. Carls, L. Slavík and J.I. Valenzuela-Ríos) concentrated mainly on the Lochkovian interval between Požár 1 and Požár 2 quarries. This sampling revealed very good conditions in the Požáry Quarries as regards sufficiency of guiding conodont taxa. Therefore we started reinvestigation of this locality, and in total 70 conodont samples were taken also in Požár 3 (active quarry), where 77 m of Lochkovian beds form a succession of undisturbed continuity, with good conditions for current MS–GRS–CH studies. The lower boundary of the Lochkov formation is, however, covered. The combination of preliminary conodont data from the upper Lochkovian parts of two parallel Požáry sections, supplemented with MS–GRS curves, shows several specific patterns (Figure 1). Detailed biostratigraphic study and comparison of the MS–GRS logs showed that the Lochkovian section in Požár 3 is not entire but starts approximately 5 meters above the Silurian/Devonian boundary, that is well exposed in neighbouring section (Požár 1). In the Požár 3, *Ancyrodelloides transitans* was recorded at 47 m, and it nicely corresponds to the entry in neighboring section Požár 1. At 60 m, *Anc. limbacarinatus* enters together with *Anc. asymmetricus* and *Ancyrodelloides cf. trigonicus*. The entry of the latter concurs with the *trigonicus* appearance in Požár 1. A small discrepancy is seen only in the entries of the *Ancyrodelloides kutscheri* in both sections; it

may be caused by relatively scarce occurrence of this “experimental taxon”. A typical end-Lochkovian taxon *Mas. pandora* beta occurs at the very end of the Požár 3 section. Among stratigraphically important taxa also occur *Icriodus ang. alcolae*, *Pelekysgnathus elongatus*, *Wurmiella tuma* and *Pedavis brevicauda* (Figure 1).

The conodont faunas from the Požár Quarries include a number of index and other important guiding conodonts supporting the global Lochkovian correlation suggested by Valenzuela-Ríos and Murphy (1997) and Murphy and Valenzuela-Ríos (1999). They indicate, however, a large proportional discrepancy between suggested global zonation and the conodont record in the latest Lochkovian in the Barrandian area. The

unusually high occurrence of the supposedly ‘middle Lochkovian’ *Ancyrodelloides* group thus substantially reduces the upper part of the Lochkovian.

### Acknowledgements

The project has been supported by the Grant Agency AS CR (KJB300130613), with contributions by the IG AS CR general project (AV0Z30130516) and Alexander von Humboldt Foundation. It represents a contribution to IGCP 499: “DEVEC”.

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**THE IGCP PROJECT 499: SUMMARY  
OF MAJOR PAST ACHIEVEMENTS OF  
THE PROJECT AND MAJOR  
ACHIEVEMENTS IN 2007**

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**General scientific achievements in 2007**

The project made progress fully according to the initial project proposal, with a special focus on the following topics in 2007 (it should be mentioned that we didn't receive all reports until the deadline, therefore some individual reports and references may be missing):

*Evolution and of terrestrial and marine palaeoecosystems with respect to biotic and abiotic factors:*

One of the most important contributions comes from the working group of the **U.K.** The publication of the Kacak-Sandwick Fish Bed paper in the Geol. Soc. Volume 278 is an important milestone. This links a Mid Devonian climatic event using land and sea rock records and provides an underlying explanation from a perturbation in the Devonian Earth System. Furthermore, it has important implications for understanding Devonian extinctions. Another topic (**Belgium** working group) was the revision of cluster analysis of the Givetian-Frasnian ichthyofaunas worldwide. Furthermore, this working group started to investigate the co-

occurrence of pteraspidiforms with chelicerate arthropods (?eurypterids), and the problem of their possible palaeoenvironments.

Progress has also been made in the field of stratigraphy and correlation of very shallow water realms based on new palynological data, even from the **South American** working group, but also other working groups are involved. The published papers contribute to a better knowledge on the diastrophic and paleoclimatic events that generated unconformities, as well as basic stratigraphic correlation and evolution of palaeoecosystems in western Gondwana.

Representative trilobite-bearing sections have been investigated by some colleagues from the **French** working group in order to evaluate the Devonian trilobite paleobiodiversity, and to delineate assemblages of trilobites with similar taxonomic composition. The main result is that fluctuations in diversity reflect environmental changes and event-stratigraphic turnovers throughout the Devonian. Cooperation work continued on the chemostratigraphy and bioproductivity during Late Silurian/Early Devonian time in China and the correlation between marine and non-marine Late Silurian-Early Devonian sequence in China.

Also the **Russian** working group continued research on carbon and oxygen isotopes from Devonian of the Kuznetsk Basin in order to improve the knowledge on climate changes in that part of the Devonian world.

*Climate change and sea level changes in the Devonian:*

Progress has been made regarding the more detailed subdivision of Johnson et al.'s (1985) global sea level curve by the **American** working group and their collaborators and new results have been presented (e.g., Nevada meeting); e.g., in 1985, little was known of Emsian sea level history, and the Emsian was generally interpreted to be of a relatively short duration. Recent sequence stratigraphic studies and new geochronology portrays a different story.

The **Chinese** working group continued research on Silurian and early Devonian plants and vertebrates, with respect to their environment and climate changes. Some of the new materials may be useful to define the relationship between the North China Block and the Kazakhstan Block.

Investigation of palaeoecosystems in different key areas:

A new working group has been established in **Argentina** and results of recent research projects on deltaic systems will be published in the planned Geol. Soc. London volume on “Devonian Change: Case studies in palaeoecology and palaeoenvironment” in 2008. The **Baltic** working group started a project on “The Devonian System within the Baltic Sedimentary Basin” Additionally, a revised version of the Stratigraphy of the Devonian System in Lithuania has been established. The **German – Turkish** cooperation project (DEVEC-TR) has been successfully continued in 2007 by bilateral exchange of participants. The studies especially benefited from the inclusion of Turkish students and postdocs. For the sections in the Taurids, the biostratigraphic framework was improved; lithological (microfacies) and geochemical studies have been undertaken. The sections in the Pontids (NW Turkey) have been revisited in the field for additional sampling while biostratigraphic, microfacies and geochemical studies progressed. The actual results have been presented at the international meetings in Argentina and in Nevada, including a comparison of the results from both areas. A meeting in December forced plans for finalizing the projects through publication in international journals in 2008 and 2009.

The **Australian** report received recently and their results can be grouped loosely into four teams as follows:

**1. Events team:** John Talent, Ruth Mawson, Anita Andrew, David Whitford, George Wilson, with Chen Xiuqin (Nanjing), Jiri Fryda (Prague) and Lennart Jeppsson (Lund).

Another manuscript on the Lau Event in Gotland and the Broken River region of N Queensland is in an advanced state of preparation. The fifth and final monographic study of silicified brachiopods (four already published in *Palaeontographica*) from the main Garra Limestone sequences accumulated over the past 35 years by John Talent and Ruth Mawson was completed when George Wilson submitted his PhD thesis this year. Silicified gastropods from the same sequences are being monographed by Jiri Fryda (Czech Geological Survey). When this exercise is complete, a statistical analysis of these brachiopod-

gastropod faunas in association with data from other phyla will be undertaken to assess the impact of the *pesavis* Event on eastern Australian Devonian faunas.

Work continued on the Late Devonian Hongguleleng Formation of northwest Xinjiang, China, focused on conodonts, isotopes, macrofossils and sedimentology and determining which if any of the Late Devonian extinction events might be represented. Acid-leaching of the numerous conodont samples collected in 2005 and September 2007 by Chen Xiu-qin, John Talent, Ruth Mawson, et al. continues.

No progress was made in 2007 on the Klouk (latest Pridoli–earliest Lochkovian) Event in the Jack Group, the supposed Choteč (earliest Eifelian) and Kačak (late Eifelian) events in the various tracts of Chinaman Creek Limestone, and of the Taghanic Event (mid-Givetian) in the Spanner Limestone.

**2. Yarrol Team:** Paul Blake, Alex Cook, Ruth Mawson, Matthew Ng, Henry Shannon and John Talent.

Work on the Yarrol Basin faunas proceeded slowly in 2007. A coral-conodont paper on the Mt Etna area, north of Rockhampton, is being developed. Ruth Mawson and John Talent continue with identification and documentation of conodont faunas from the, autochthonous and allochthonous carbonate occurrences in the Yarrol Tract, primarily to chronologically underpin Paul Blake’s work on the Silurian–Late Devonian coral faunas.

**3. The Southeastern Australia Team:** Ruth Mawson, David Mathieson, John Talent, Peter Molloy, Andrew Simpson, Zerina Johanson, and Gabor Foldvary.

A monograph (Mathieson, Mawson & Talent) on Pragian conodonts from limestone occurrences in the Bourke-Cobar-Nymagee region and from bores in the Darling Basin of far western New South Wales is in an advanced stage of preparation. A manuscript on the silicified faunas (mainly brachiopods and corals) obtained on various occasions (including 2006) from the Booth Limestone is nearing completion. In early 2007 Zerina Johanson, relocated to the Museum of Natural History in London. She continues her interest in the lacustrine fish remains from limestone nodules in the Fairy Formation (Pragian) in the Snowy River Volcanics west of Buchan, Victoria, a locality discovered many years ago

by John Talent. A paper on a new genus of onychodont was published in 2007.

**4. Fish.** Fish workers from Australia have been especially active during the past year. The following fish reports have been submitted for IGCP 499. Other reports may be found in the annual report for IGCP 491.

**4.1 Carole Burrow** (now an Honorary Research Fellow with the Queensland Museum) continues collaborating with Sylvain Desbiens (Quebec), Sue Turner (QM), and Randall Miller (New Brunswick Museum) on the Early Devonian fish faunas of the Gaspé Peninsula, Canada, with Mike Newman (Wales), Bob Davidson (Scotland) and Jan den Blaauwen (the Netherlands) on taxonomy and distribution of Scottish Early-Middle Devonian acanthodians, with Sue Turner and Gavin Young (ANU) on the ?late Early Devonian shark *Mcmurdodus*, with John Long (Museum of Victoria) and Kate Trinajstic (University of Western Australia) on Middle - Late Devonian acanthodians of Antarctica, and also with John, Mike Coates (Chicago) and Michal Ginter (Warsaw) on the Gogo shark. She continues to work on the histology and morphology of rich Early Devonian microvertebrate assemblages from central west NSW (poster presentations in 2007 included one on possible stem osteichthyans from these limestones at the Uppsala Early Vertebrates/Lower Vertebrates Symposium, and another on postcranial exo-endoskeleton interfaces in early vertebrates at CAVEPS) and on Mike Murphy's collection of Late Silurian-Early Devonian acanthodians of the western USA. New projects include a description of the acanthodian taxa from the Emsian of Zinzilban, Uzbekistan in collaboration with Alexander Ivanov (St Petersburg) and Olga Rodina (Novosibirsk), and further work on the distribution of *Machaeracanthus* spp. in Europe, in collaboration with several German collectors and workers.

**4.2 Zerina Johanson** has relocated to the Museum of Natural History in London. She has continued work on some of the fish material obtained by acid-leaching of carbonate nodules from the Early Devonian Fairy Formation (mid-Pragian) of eastern Victoria. With Jean Joss (Macquarie) she combined neontological (from the living lungfish, *Neoceratodus forsteri*) and palaeontological data to comment on the putative Devonian larval lungfish,

*Palaeospondylus* (in press). With Jean Joss, John Long and Macquarie student Felicity Evans, she is making a comparison of the morphology and development of the axial skeleton of *Neoceratodus* with comparable skeletons of *Barwickia* and *Howidipterus*.

**4.3 Sue Turner** (Queensland Museum) continues work on the earliest shark teeth with Randall Miller (New Brunswick Museum), and on other microvertebrate faunas with Carole Burrow (see above). Full descriptions of *Doliodus problematicus* and *Protodus jexi* from the Lower Devonian Atholville beds are in preparation. With Dale Sparling (Minnesota) and Paul Mayer (University of Milwaukee) she is describing Middle Devonian shark faunas from Ohio and Wisconsin. With Vachik Hairepetian she is describing Late Devonian (early Famennian) thelodont and shark remains from Hodt, Iran. The thelodont part of the Handbook of Paleoiichthyology Pt 1 Agnatha, co-authored with Tiuu Märss and Valya Karatajute-Talimaa appeared recently

**5. Plants.** Geoff Playford continues to produce elegant, comprehensive monographs on palynology, mainly Devonian, from around the globe. In 2005, a Macquarie-Montpellier group commenced collection and study of Devonian-Carboniferous woods from northern Queensland. A further Broken River-Burdekin Basin expedition is scheduled for mid-2007. A doctoral thesis by Anne-Laure Decombeix (Montpellier) on woods from 'Dotswood' and the Montgomery Dam (Broken River) area was completed this year. One result of this Devonian-Carboniferous macroplant initiative was a publication on a Tournaisian permineralised flora and trilobites from Ruxton, northern Queensland (Galtier et al. 2007). A paper is in preparation on stromatolitic encasement of logs in the Springsure area of Queensland.

#### **Fieldwork and meetings:**

##### Field work in Morocco (Dra valley, March 14 – 25, 2007)

In Morocco a new project has been started on a special time interval in the uppermost Emsian with respect to trilobite-rich successions in order to investigate their palaeoenvironment and taphonomy as well as their palaeoecology. This project runs in cooperation with American, Moroccan, and German colleagues

and was sponsored by National Geographic Society (20.000 US\$).

Field workshop San Juan, Argentina, May 14 – 22, 2007

The Devonian of San Juan and Mendoza Precordillera, and the San Rafael Block are of special interest for the project due to the palaeogeographic and biostratigraphic importance in the Devonian Malvinokaffric Realm, but also in the tectono-sedimentary evolution of the Precordillera terrane. About 30 geoscientists from Argentina, Bulgaria, Czech Republic, Germany, and Turkey attended the workshop and field meeting. The scientific session included 14 oral and poster presentations with a special focus on different palaeoenvironmental settings, sedimentology and biodiversity of Devonian strata in Argentina and elsewhere. An 120-page abstract volume and a field guide book was published. A meeting report has been published recently in Episodes (30/2).

**SDS / IGCP 499 field workshop Eureka, Nevada, USA, September 9 – 14, 2007**

As in previous years, a joint meeting of IGCP 499 and the Subcommission on Devonian Stratigraphy (SDS) was held in Eureka, Nevada. The successful conference and field trip brought together about 60 scientists from all over the world; 40 oral and 12 poster contributions which covered the whole array of Devonian topics were presented. Among those, papers dealing with land-sea transitional

settings, sea-level changes and/or cyclic sedimentation, regional sedimentology and stratigraphy were also represented. The attendees from Belgium, Canada, Czech Republic, France, Germany, Italy, Poland, Russia, Spain, Turkey, were provided with an abstract volume and a perfectly arranged field trip guide book.

Other activities:

Project reports have been given in many meetings and workshops and have also been published in several journals (e.g. Episodes) and newsletters. Based on the co-operation programme with Turkey, and a good collaboration with the University in San Juan, Argentina, PhD students are involved in the project and they received funding to participate in the IGCP meetings in 2007. In 2008 a PhD student from China will probably stay two months at the Forschungsinstitut Senckenberg for training purposes on microfossils.

Regarding outreach activities we have improved our main websites (English and German version) and we have also linked our website with other “geo-sites”. We are pleased to report that the planned touring exhibition on IGCP projects in conjunction with IYPE is sponsored by the German Science Foundation (DFG) and will receive a fund of 43.000,- US\$.

**Forthcoming meetings 2008:**

In the last year the following conferences and workshops are planned (more information is available at our website: <http://www.senckenberg.de/igcp-499>):

- IGCP 499 meeting in Tripoli, Libya, April 23.-30, 2008
- Workshop in the framework of the IGCP German/Turkish cooperation (DEVEC-TR); Ankara, May 2008
- IGCP 499 symposium (HPF-08) at IGC, Oslo, August 06.-14, 2008
- Joint field meeting with SDS on “Global alignments of Lower Devonian Carbonate and Clastic Sequences; revision and re-sampling of Zinzilban Emsian GSSP, August 25 – September 03, 2008, Kitab State Geological Reserve, Uzbekistan.
- Joint final meeting IGCP 499 / IGCP 497 on “From Gondwana and Laurussia to Pangaea: Dynamics of Oceans and Supercontinents”, September 04 – October 10, 2008, Frankfurt, Germany  
It is planned to organize a 6 day post-conference excursion (cross section Rheno-Herzynian Zone, Rhenish Massif, Avalonia, Laurussia) Mid-German Crystalline Zone (suture of Rheic Ocean), Saxo-Thuringian Zone (Bohemian Massif, Cadomia, Gondwana). More information will be given in the second circular.  
Electronic registration is available!!

**Deadlines:**

Return of Preliminary Registration:  
October 31, 2007  
Definite Registration Form Abstract  
December 31, 2007  
Submission of Abstracts  
January 31, 2008

- Workshop in the framework of the IGCP German/Turkish cooperation (DEVEC-TR); Ankara, May 2008
- IGCP 499 symposium (HPF-08) at IGC, Oslo, August 06.-14, 2008

**Deadlines:**

Abstract submission February, 29, 2008

- Joint field meeting with SDS on “Global alignments of Lower Devonian Carbonate and Clastic Sequences; revision and re-sampling of Zinzilban Emsian GSSP, August 25 – September 03, 2008, Kitab State Geological Reserve, Uzbekistan.

**Deadlines:**

Registration: February, 15, 2008 via Secretary in Tashkent and Novosibirsk  
Personal data for invitation letter: March, 15, 2008  
Abstract submission: April 10, 2008

- Joint final meeting IGCP 499 / IGCP 497 on “From Gondwana and Laurussia to Pangaea: Dynamics of Oceans and Supercontinents”, September 04 – October 10, 2008, Frankfurt, Germany  
It is planned to organize a 6 day post-conference excursion (cross section Rheno-Herzynian Zone, Rhenish Massif, Avalonia, Laurussia) Mid-German Crystalline Zone (suture of Rheic Ocean), Saxo-Thuringian Zone (Bohemian Massif, Cadomia, Gondwana). More information will be given in the second circular.  
Electronic registration is available!!

**Deadlines:**

Deadline for Titles of Oral and Poster presentations: Thursday 15 May, 2008  
Deadline for Abstracts: Thursday 15 May, 2008  
Deadline for Early Registration: Monday 30 July, 2008  
Manuscript submission at Meeting  
More information will be given in the second circular (February/March 2008)

**List of important publications:  
(excluding references reported in Membership News)**

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Algeo TJ, Maynard JB, Trace metals as a guide to watermass conditions in ancient anoxic marine environments. *Geospheres*, submitted Sept. 2007.

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Burrow C J, Turner S, Desbiens S, Miller RF Early Devonian putative gyracanthid acanthodians from eastern Canada. *Canadian Journal of Earth Sciences* (in press)

Cavalazzi B (2007) Chemotrophic filamentous microfossils from the Hollard Mound (Devonian, Morocco) as investigated by focused ion beam. *Astrobiology* 7(2), 402-415 (online reference doi:10.1089/ast.2005.0398).

Cavalazzi B, Barbieri R, Ori GG (2007) Chemosynthetic microbialites in the Devonian *kess* mounds (Anti-Atlas, Morocco). *Sedimentary Geology* 200, 73-88 (online reference doi:10.1016/j.sedgeo.2007.03.002).

Corradini C (2007) Calcarei a Clymenie. In: Carta Geologica d'Italia 1:50000 – Catalogo delle Formazioni; fascicolo VI – Unità tradizionali e/o storiche. *Quaderni*, s.III, 7, 298-301.

Corradini C (2007) Scisti a Graptoliti. In: Carta Geologica d'Italia 1:50000 – Catalogo delle Formazioni; fascicolo VI – Unità tradizionali e/o storiche. *Quaderni*, s.III, 7, 293-297.

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Hubert B, Zapalski MK, Nicollin JP, Mistiaen B, Brice D (2007) Selected benthic faunas from the Devonian of the Ardennes: An estimation of palaeobiodiversity. *Acta Geologica Polonica*. 57 (2): 223-262.

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Hüneke H (2007) Pelagic carbonate ooze reworked by bottom currents during Devonian approach of the continents Gondwana and Laurussia. In: Viana AR, Rebesco M, (Eds), Economic and Palaeoceanographic Significance of Contourite Deposits. *Geological Society London, Special Publication*, 276: 299–328.

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di Pasquo MM (2007) State of the art of the Devonian palynological records in the northern Argentina, southern Bolivia and northwestern Paraguay. Field Meeting of the IGCP 499-UNESCO "Devonian Land-Sea Interaction: Evolution of Ecosystems and Climate" (DEVEC, San Juan 2007). *Serie Correlación Geológica, INSUGEO, Universidad Nacional de Tucumán, Special Issue*. 70-73.

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Venturini C, Spalletta C, Vai GB, Pondrelli M, Delzotto S, Fontana C, Longo Salvador G, Carulli GB (2007) Note illustrative al Foglio 031 Ampezzo, Carta geologica d'Italia alla scala 1:50,000; APAT (Servizio Geologico d'Italia), 240 pp., in press.

## SDS PUBLICATIONS

### Geological Quarterly 51 (4)

#### Special Issue: **Recent approaches to Devonian conodont zonation**

- P. BULTYNCK - Limitations on the application of the Devonian standard conodont zonation
- Z.S. ABOUSSALAM and R.T. BECKER - New upper Givetian to basal Frasnian conodont faunas from the Tafilalt (Anti-Atlas, Southern Morocco)
- S. GOUWY, J. HAYDUKIEWICZ and P. BULTYNCK - Conodont based graphic correlation of upper Givetian-Frasnian sections of the Eastern Anti-Atlas (Morocco)
- E.M. BENFRIKA, P. BULTYNCK and A. EL HASSANI - Upper Silurian to Middle Devonian conodont faunas from the Rabat-Tiflet area (northwestern Moroccan Meseta)
- I. BONCHEVA, V. SACHANSKI, I. LAKOVA and M. YANEVA - Facies transition and biostratigraphic correlation of the Upper Silurian and Lower Devonian in West Bulgaria
- K. NARKIEWICZ and P. Bultynck - Conodont biostratigraphy of shallow marine Givetian deposits from the Radom-Lublin area, SE Poland
- C.G. MILLER - Growth in early species of the conodont *Ancyrodella* and implications for correlation of the Middle- Upper Devonian boundary
- H. GHOLAMALIAN- Conodont biostratigraphy of the Frasnian-Famennian boundary in the Esfahan and Tabas areas, Central Iran (This paper was not presented at the ICOS I Devonian session but meets the aims of the present issue)
- M. NARKIEWICZ - On the road to Philadelphia, the joy of being indexed, and publication cloning: reflexions of a past Editor-in-chief



# SECOND CIRCULAR

## FIELD WORKSHOP 2008 OF THE IGCP 499-UNESCO “DEVONIAN LAND-SEA INTERACTION: EVOLUTION OF ECOSYSTEMS AND CLIMATE” (DEVEC)



**Tripoli, Libya**

**April, 23-30, 2008**



### LEADERS OF THE PROJECT

Dr. Peter Königshof (\*), Dr. Jurga Lazauskiene (\*\*), Dr. Eberhard Schindler (\*), PD Dr. Volker Wilde (\*) and Prof. Dr. M. Namik Yalçin(\*\*\*)

\*Forschungsinstitut und Naturmuseum Senckenberg, Germany, \*\* Geological Survey of Lithuania, Department of Lithostratigraphy and Tectonics, Lithuania, \*\*\* Istanbul University, Engineering Faculty, Department of Geological Engineering, Turkey



**senckenberg**  
forschungsinstitut und naturmuseum



## **FIELD WORKSHOP 2008 OF THE IGCP 499-UNESCO “DEVONIAN LAND-SEA INTERACTION: EVOLUTION OF ECOSYSTEMS AND CLIMATE” (DEVEC)**

**Tripoli, Libya, April, 23-30, 2008**



The scientific sessions for the FIELD MEETING OF THE IGCP 499 “DEVONIAN LAND-SEA INTERACTION: EVOLUTION OF ECOSYSTEMS AND CLIMATES” (DEVEC), will be held in Tripoli City. The scientific session and the field meeting are scheduled to take place between April 23-30, 2008. The purpose of this workshop is to provide participants with an overview of important Devonian sections particularly in the south western part of the country. The field trip will target the exposed Palaeozoic sections in the Awaynat Wanin area in the Ghadames Basin which is one of three major Palaeozoic basins in Libya. It is located in the north western part of the country and extends west to Tunisia and Algeria.

During Palaeozoic times, the North African platform was divided into several basins and arches. The basins were slowly subsiding whereas the arches were periodically eroded during uplift or eustatic sea-level drops. The sedimentological framework of these intra-cratonic basins were controlled by very low sedimentation rates resulting from the erosion of the tectonic arches. Furthermore, the climatic conditions changed when Gondwana moved northwards, favouring the development of carbonaceous deposits during Late Devonian times.

The Devonian formations (Tadrart, Ouan Kasa, Awaynat Wanin and Tahara Formations) of western Libya predominantly consist of siliciclastic sediments which show a thickness of more than 1082 m. This succession contains Pragian (Early Devonian) to Strunian (Late Devonian) rocks and overlies Llandoveryan (Early Silurian) shales along the Caledonian unconformity (Massa, 1998). The Devonian formations of western Libya contain some of the largest oil reservoirs in North Africa (Eschard, 2003). Most of the known fields are the results of stratigraphic rather than structural traps and require detailed sedimentologic and stratigraphic studies to improve the potential for further exploration activities.

The Devonian formations in the Awaynat Wanin area are characterized by sandstones, claystones and shales. Within these formations a few discrete carbonate beds occur in the subsurface of the Ghadames Basin. Nine facies associations were identified in the field representing a broad range of depositional environments from proximal fluvial to offshore marine shelf (Ben Rahuma *et al.*, 2007).

Devonian successions in the Awaynat Wanin area are subdivided into a complex stack of six 30 to 80 m thick, unconformity-bounded, transgressive-regressive sequences. The sequences exhibit from base to top superimposed retrogradational and progradational trends. The retrogradational trend comprises a fluvial-tidal complex grading upward into shoreface and offshore shelf marine shales without any evidence of significant tidal or wave refinement. The maximum flooding surface is represented by offshore shale. The progradational trend grades upward from the offshore shale into shoreface sandstones deeply truncated by fluvial cross-bedded sandstones of the overlying sequence (Ben Rahuma *et al.*, 2007).

The superimposed sequences are, however, often incomplete. The lower part of the section (Early Devonian) contains large amounts of fluvial and tidal sediments with subordinate shoreface and offshore marine deposits deeply truncated by fluvial incisions. The upper part (Middle to Late Devonian) of the section contains a large amount of shoreface and offshore marine deposits with rare fluvial sediments (Ben Rahuma *et al.*, 2007).

Along strike east-west regional correlation of the outcrops with the subsurface in the Ghadames Basin show little changes in the sedimentary facies except for the Frasnian-Famennian shoreface sandstones that wedge out into deep marine offshore shales. North westward, along a dip section, correlation shows an overall thinning of the sandstone units and thickening and deepening of the shaley units. Some important beds can be used as marker beds for stratigraphic correlations between the subsurface in the north and the outcrops in the south (Ben Rahuma *et al.*, 2007). The Emgayet Eifelian shales in the subsurface, which represent an important seal rock for the Early Devonian reservoirs, correlates with the lower shale unit of Awaynat Wanin I Formation in the outcrops. The Frasnian shale and limestone (Awaynat Wanin B Formation) in the subsurface correlates to the maximum flooding surface observed in the lower part of Awaynat Wanin IV Formation in the field. The latter which is recognized worldwide (Sutcliffe, 2000), is a secondary hydrocarbon source rock in the south western part of Ghadamis Basin (Belhaj, 1996; Echikh, 1998).

The field workshop will be a good opportunity to examine the outcrops from the Ghadames Basin and compare them to other sequences which have been investigated in the framework of the IGCP 499 project.

## ORGANIZING COMMITTEE

**Chair:** Dr. Bourima A. Belgasem, General Manager, Libyan Petroleum Institute (LPI), P.O. Box: 6431, Tripoli; Tel: (+218) 21 480022-26; Fax: (+218) 21 4830031; [www.lpilibya.org](http://www.lpilibya.org); [info@lpilibya.org](mailto:info@lpilibya.org).

**Coordinators:** Dr. Ali D. El-Mehdawi, Arabian Gulf Oil Company (AGOCO), Geology Department, P.O. Box: 263, Benghazi, Libya, [amehdawi@yahoo.com](mailto:amehdawi@yahoo.com), Mobile: (+218) 91 376 0 436, Tel: (+218) 61 22 28931, Fax: (+218) 61 22 29 006

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**Technical program coordinators of the Field Trip:** Mr. Milad Ben-Rahuma, Libyan Petroleum Institute (LPI), Geology Department, Tripoli, Libya; [mmbenrahuma@hotmail.com](mailto:mmbenrahuma@hotmail.com)

Dr. Jean-Noël Proust, Head of Sedimentology Department, Geosciences Rennes, University of Rennes, France; [Jean-Noel.Proust@univ-rennes1.fr](mailto:Jean-Noel.Proust@univ-rennes1.fr)

**Treasurer & social events coordinator:** Mukhtar Al Ansari, Fezzan Tours, Alejmaa Alarabi Bank, Tripoli-Libya, Branch Dat Il-Imad Complex Tower, Tower N0.1, Ground Floor Tripoli-Libya. SWIFT BIC: EJABLYLX, ACCOUNT NO.: 2905, COMPANY: FEZZAN OIL SERVICES

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Tel: +218 21 33 39 815, Fax: +218 21 33 43 209, Fax to Email service: +49 721 151 215 458

## SCIENTIFIC COMMITTEE

Prof. Ahmed El-Hawat, Garyounis University, Earth Science Department; [ashawat@ltnet.net](mailto:ashawat@ltnet.net)

Dr. Dr. Jean-Noël Proust, Head of sedimentology Department, Geosciences Rennes, University of Rennes, University of Rennes 1, France; [Jean-Noel.Proust@univ-rennes1.fr](mailto:Jean-Noel.Proust@univ-rennes1.fr)

Dr. Ibrahim Mreheel, Petrobras, Libyan Branch; [Mriheel@yahoo.com](mailto:Mriheel@yahoo.com)

Dr. Ali. D. El-Mehdawi, AGOCO, Geology Department; [amehdawi@yahoo.com](mailto:amehdawi@yahoo.com)

Mr. Milad Ben-Rahuma, Libyan Petroleum Institute, Geology Department;  
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#### SPONSORS

Libyan Petroleum Institute (LPI), Libya  
Forschungsinstitut und Naturmuseum Senckenberg, Germany  
UNESCO/IUGS

#### THE VENUE

**The technical sessions of the workshop will be held in the Libyan Petroleum Institute (LPI) Halls, Km7, Gergarish Road, Tripoli, Libya on 23<sup>rd</sup> April, 2008. Tripoli's international airport is only 30 minutes from the city centre and about 40 minutes to the meeting place. All necessary presentation facilities will be provided, such as overhead transparency projector, 35-mm slide projector and data show (using PowerPoint).**

#### REGISTRATION FEES

Conference only: LYD 350

Conference & Excursion: LYD 1550

#### PAYMENT

Alejmaa Alarabi Bank,  
Branch Dat Il-Imad Complex Tower,  
Tower N0.1, Ground Floor  
Tripoli-Libya,

SWIFT BIC: EJABLYLX,

ACCOUNT NO.: 2905,

COMPANY: FEZZAN OIL SERVIC

\* Please after payment send a message to the coordinator Dr. Ali El Mehdawi, [amehdawi@yahoo.com](mailto:amehdawi@yahoo.com) and Mr. Mukhtar Al Ansari (treasure) confirming your money transfer: by fax 00218 21 33 43 209, [info@fezzantours.com](mailto:info@fezzantours.com).

#### TRAVEL AND ACCOMMODATION

The registration fee for participants includes: attendance to the scientific sessions only or scientific sessions and field trip with lunches, volume or CD of short papers, ice breaking party and coffee or tea breaks twice.

For those paying full fee (1550 LYD) will be eligible for accommodation, travel during their stay period from April 23-30, 2008 and participation in the social programme. The accommodation in Tripoli will be at the 4 star Addear Hotel in double or single rooms; Tel: (+218) 21 334 3021/2; Fax: (+218) 444 4653. Transportation from Tripoli airport to the hotel will be provided for those arriving on international flights on Tuesday, April 22, 2008 (please send your booking confirmation to the coordinators). Transportation services will be also provided from the hotel to the meeting place and vice versa.

**DEADLINES**

Final Registration	February 28, 2008
Final Payment	March 15, 2008
Abstracts	February 28, 2008
Full Text	March 30, 2008

**INSTRUCTION TO PRESENTERS**

**Conference Language:** English

**Oral Presentation**

The technical Committee of the workshop will consider all abstracts submitted to the organizing Committee before the end of February 2008. Authors will be notified immediately after this date.

The paper should be in a format of an extended abstract and is limited to 4 pages (A4) in length and should consist of text and figures

The title should be in capital letters and centred. After three lines, type the authors(s) name and affiliation. In the case of multi-author abstracts indicate the speaker with an asterisk, otherwise the corresponding author will be deemed to be the speaker. Leave three lines before starting the text. Please proofread your abstract carefully as the content of the abstract are your responsibility.

Each participant will be able to contribute one or two oral or poster presentation. Contribution in excess of expected number may be accepted as poster by the organizing committee.

Oral presentations are scheduled for 20 minutes (15 + 5) each including time for discussion and/or questions.

**Poster Presentation**

The poster should consist of a single sheet and display space should not exceed 100 cm wide x 120 cm high.

**PROVISIONAL PROGRAMME****April 22, Tuesday**

- Arrival and registration.

**April 23, Wednesday**

- Reception of participants at the Libyan Petroleum Institute (LPI), Tripoli.
- Registration.
- Morning scientific sessions.
- Lunch
- Afternoon scientific sessions and posters presentation.

**April 24, Thursday to April 28, Tuesday**

- Field Excursion.

**April 29, Tuesday**

- Social programme, visit to Leptis Magna.

**April 30, Wednesday**

- Departure.

**FIELD EXCURSION INTERNARY**

The field trip to the Awaynat Wanin Area of southern Ghadamis Basin, west of Libya, will be guided by Milad M. Ben Rahuma and Jean-Noel Proust, with a focus on the Devonian succession. In the course of five days participants will have the opportunity to examine the vertical and lateral facies change and sequence stratigraphic architecture of the Devonian succession in excellent exposures.



Field trip organisers will provide participants with complete logistical service through a professional company. This will include transport by 4x4 vehicles (one car for three participants), camp accommodation facilities (single tents, sleeping bags, blankets, mattress, etc), and provide healthy cold and hot meals during breakfast, lunch and dinner. Satellite Telephone and GPS for desert navigation and security will be provided. The camp will be powered by an electrical generator.

The itinerary of the field excursion will be as follows:

#### **Day one: April 24, 2008**

1. Participants meeting at the hotel front door in Tripoli around from 7.30 to 8 a.m. Departure at 8 a.m. and drive 300 km's south on paved roads to Al-Qaryat village north of Al-Hamada area.
2. Desert drive south ( $\pm 240$  kms) through Al-Hamada to Awaynat Wanin area, making one stop for lunch.
3. Expected arrival at Awaynat Wanin between 19:00 to 20:00 p.m. where we will have our first camp.

#### **Day two: April 25, 2008**

##### *The Lower Devonian sediments (Pragian-Emsian)*

- Stop 1.** Starting at the first sequence boundary between the Upper Ordovician and the Lower Devonian section and where the Silurian section is missing.
- Stop 2.** Examination of a complete section of the Tadrart Fm. (Pragian).
- Stop 3.** Uppermost Ordovician Memouniat Fm. is over section and the Lower Devonian, Tadrart Fm.



**Lunch**

- Stop 4.** Uppermost part of the Tadrart Fm at the boundary with the lower section of Ouan Kasa Fm. (Emsian).
- Stop 5.** Upper Ouan Kasa Fm. (Emsian to Early Eifelian) and transition into the Awaynat Wanin I (Eifelian).

*Back to the base camp for an overnight stay.*

**Day three: April 26, 2008***The Middle to Upper Devonian (Eifelian-Givetian-Frasnian)*

- Stop 1.** Complete section through the Awaynat Wanin I Fm. and lower part of Awaynat Wanin II Fm. (Eifelian).
- Stop 2.** Full section of the Awaynat Wanin II Fm. (Givetian).
- Stop 3.** The channelized systems of the Awaynat Wanin II Fm. (Givetian).

*Back to the camp for an overnight stay.*

**Lunch**

- Stop 4.** Full section through the Awaynat Wanin III Fm and transition with the early Frasnian unconformity (Frasnian).
- Stop 5.** The thick shale succession through the Awaynat Wanin III and IV. Observation of the large concretions that underlain the major maximum flooding surface (Frasnian – Early Famennian).

*Back to the camp for an overnight stay.*

**Day Four: April 27, 2008***The Upper Devonian (Famennian)*

- Stop 1.** The Awaynat Wanin III and IV formations.
- Stop 2.** The complete section through the Tahara Fm (Strunian).

**Lunch**

- Stop 3.** Overview panorama of the Devonian which we will conclude and summarize the observations we have made during the trip.

*Back to the camp for an overnight stay.*

**Day Five: April 28, 2008**

*Drive back to Tripoli through Al Hamada desert by car.*




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## REGISTRATION FORM

**Name & Title:** .....

**Institution/Company:** .....

**Address:** .....

.....

**Post Code, Town:** ..... **State:** .....

**Telephone:** ..... **Fax:** .....

**E-mail:** .....

**Oral Presentation/Poster: Author(s), Title:**

.....



**Please** complete this form and return it before February 28, 2008 to one of the following addresses:

Dr. Ali D. El-Mehdawi  
 Arabian Gulf Oil Company (AGOCO),  
 Geology Department,  
 P.O. Box 263, Benghazi, Libya  
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[Peter.Koenigshof@senckenberg.de](mailto:Peter.Koenigshof@senckenberg.de)  
[www.senckenberg.de](http://www.senckenberg.de)

**VISA INFORMATION  
 REQUIRED FOR ENTRY INTO LIBYA**

*FULL NAME:* .....

*DATE OF BIRTH:* .....

*PLACE OF BIRTH:* .....

*NATIONALITY:* .....

*PREVIOUS NATIONALITY (IF ANY):* .....

*PASSPORT NUMBER:* .....

*DATE OF ISSUE:* .....

*EXPIRY DATE:* .....

*PLACE OF ISSUE:* .....

*RELIGION:* .....

*FATHER'S NAME:* .....

*MOTHER'S NAME:* .....

*SEX:* .....

*HOME ADDRESS:* .....

*MARITAL STATUS:* .....

*PROFESSION:* .....

DATE OF LAST ENTRY INTO LIBYA & DEPARTURE DATE:

.....

PURPOSE OF PREVIOUS VISIT TO LIBYA & NAME OF THE ORGANIZATION/COMPANY VISITED:

.....

PURPOSE OF PRESENT VISIT: .....

**EMAIL ADDRESS:** .....



#### STRATIGRAPHY

11 proposals submitted, all accepted:

##### General contributions to stratigraphy

Alexey S. Tesakov, Geir Birger Larssen

##### Accuracy in fossil zonation

David L. Bruton, J. Fredrik Bockelie

##### Magnetic stratigraphy: The template for the construction of

geologic time scales Fabio Speranza, Fabio Florindo

##### Correlation of Devonian terrestrial, neritic and pelagic strata

Thomas Becker et al. (ICS)

##### Geologic time scale 2008

Felix M. Gradstein, James G. Ogg, Mike Villeneuve (ICS)

##### Milestones in stratigraphy

Stan Finney, Felix M. Gradstein (ICS)

##### Pliocene-Pleistocene correlations and global change

Maria Bianca Cita, Brad Pillans (ICS)

##### Oligocene Series: A time of change in Earth and life history

Yuri Gladenkov, Noël Vandenberghe (ICS, ISPS)

##### Stratigraphic correlation of Neoproterozoic strata

James Gehling, Shuhai Xiao, Graham Shields (Neoproterozoic Subcommission)

##### Stratigraphic subdivisions of the Cretaceous system:

State of the art Isabella Premoli Silva, Finn Surlyk (IUGS

Subcommission on Cretaceous Stratigraphy)

##### The EARTHTIME project

S.A. Bowring, T.H. Torsvik



## INTERNATIONAL CONGRESS PALAEOZOIC CLIMATES August 25-29th, 2008 Lille, France



### FOCUS

Climate change is currently one of the most debated and discussed scientific topics. Ancient climate changes are extremely useful to understand the global changes that we live today. The scientific meeting on Palaeozoic Climates is focused not only on ancient climate and sea-level changes (Ordovician glaciation, end-Devonian extinction, Late Palaeozoic glaciation : greenhouse-icehouse transitions), but also on their modelisation, their understanding and their impact on the biodiversity.

The Congress will serve as Closing Meeting of the International Geoscience Programme (IGCP) n° 503 'Ordovician Palaeogeography and Palaeoclimate' and is co-sponsored by the IGCP n° 497 'The Rheic Ocean : its Origin, Evolution and Correlatives' and n° 499 'Devonian land-sea interaction : evolution of ecosystems and climate'.

### DATES

The congress will take place after the 33th International Geological Congress at Oslo and finish before the 12th IPC at Bonn.

**August 23-24 :** Pre-conference excursion : Lower Palaeozoic of Belgium and northern France (Brabant, Condroz, Ardennes)

**August 25-26 :** Lower Palaeozoic Climates, Sea-Levels and Biodiversity (Closing Session IGCP 503).

**August 27 :** Plenary Session : Palaeozoic Climates, with invited keynote speakers

**August 28-29 :** Upper Palaeozoic Climates, Sea-Levels and Biodiversity

**August 30-31 :** Post-conference excursion : Upper Palaeozoic of Belgium and northern France (Avesnois, Meuse Valley, Ardennes)

### VENUE

The meeting will take place in the city centre of Lille, scientific sessions will be organized at the *Fédération universitaire et polytechnique de Lille*, FUPL.

Lille, in northern France, can easily be reached from London (90 minutes), Paris (60 minutes) and Brussels (45 minutes) by high speed trains (Eurostar, TGV, Thalys).

### ORGANIZERS

Alain Blicq (USTL, CNRS, Lille)

Bruno Mistiaen (FUPL, Lille)

Thomas Servais (USTL, CNRS, Lille)

Nicolas Tribouillard (USTL, Lille)

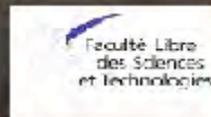
Jacques Vermeers (Univ. Gent)

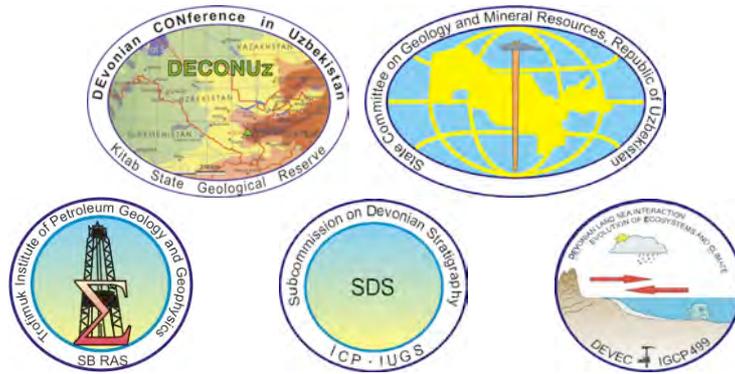
### PUBLICATIONS

Several international journals and book series will serve as congress proceedings, related to the different topics addressed in the various sessions.

For correspondance and further information:

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### International Conference

## “GLOBAL ALIGNMENTS OF LOWER DEVONIAN CARBONATE AND CLASTIC SEQUENCES”

*(SDS / IGCP Project 499 joint field meeting)*

**Kitab State Geological Reserve, Uzbekistan**

**August 25 – September 3, 2008**



### FIRST CIRCULAR

#### Organization

State Committee on Geology and Mineral Resources, Republic of Uzbekistan (SCGMR RUz.)

Kitab State Geological Reserve (KSGR)

Trofimuk Institute of Petroleum Geology and Geophysics, Russian Academy of Sciences,

Siberian Branch (IPGG SB RAS)  
 International Subcommission on Devonian Stratigraphy (SDS)  
 IGCP Project 499 – Devonian land-sea interaction: evolution of ecosystems and climate (DEVEC)

### Co-Sponsorship

National Committee of the Uzbekistan Geologists  
 Interdepartmental Stratigraphic Commission, Republic of Uzbekistan  
 Presidium of the Siberian Branch of Russian Academy of Sciences  
 National IGCP Committee of Russia

#### SDS and Project leaders

Becker, R. Thomas, Westfälische Wilhelms-University, Germany  
 Königshof, Peter, Forschungsinstitut und Naturmuseum Senckenberg, Germany  
 Lazauskiene Jurga, Geological Survey, Lithuania  
 Schindler Eberhard, Forschungsinstitut und Naturmuseum Senckenberg, Germany  
 Wilde Volker, Forschungsinstitut und Naturmuseum Senckenberg, Germany  
 Yalçın Namik, Istanbul University, Department of Geological Engineering, Istanbul

#### Topics emphasized in the conference and field trips

1. Cyclicity and sedimentary markers for intra- and interbasinal correlations
2. Successions of neritic/pelagic associations and their interrelations
3. Lineages of different fossil groups
4. Zonal scales and their alignments with regional and global chronostratigraphy
5. Global sedimentary and biotic events

### Organizing Committee

<i>Chairman:</i>	Mavlyanov N.G.	Chairmen (SCGMR RUz.)
<i>Vice-Chairmen:</i>	Turamuratov I.B. Kim A.I. Rakhmonov U.D.	Deputy Chairmen (SCGMR RUz.) Head, Department of Stratigraphy, “Regional Geology” (SCGMR RUz.) Director (KSGR)
	Sennikov N.V. Yolkin E.A. Becker R. Thomas Königshof, Peter	Deputy Director (IPGG SB RAS) Principal Research Scientist (IPGG SB RAS) Chairman (SDS), Münster IGCP 499 (DEVEC)
<i>Secretary:</i>	Meshchankina N.A. Tsmeirik E. Obut O.T.	Head of Field team, Department of Stratigraphy, “Regional Geology” (SCGMR RUz.) Leading Research Scientist (KSGR) Senior Research Scientist (IPGG SB RAS)
<i>Members:</i>	Kamagurov G.E. Kim Irina A. Karimova F.C. Erina M.V. Bakharev N.K. zokh N.G.	Head, Department of Geology, “Regionalgeology” (SCGMR RUz.) Head of Field team, Department of Stratigraphy, “Regional Geology” (SCGMR RUz.) Geologist, Department of Stratigraphy, “Regional Geology” (SCGMR RUz.) Leading Geologist, Department of Stratigraphy, “Regional Geology” (SCGMR RUz.) Deputy Director (IPGG SB RAS) Senior Research Scientist (IPGG SB RAS)

Salimova F.A.	Geologist, Department of Stratigraphy, “Regional Geology” (SCGMR RUz.)
Aliev T.	Leading Research Scientist (KSGR)
Zhuraev A.Zh.	Head, Division of researches in geology, “Goskomgeologia”, Republic of Uzbekistan
Dzhabarov R.A.	Deputy Director, Centre for nonferrous and noble metals
Umurzakov R.K.	Head, State Geological organization «Kashkadar’ya GRE»

### **Indoor session**

The technical sessions will be held in the Kitab State Geological Reserve on the 2nd September 2008.

Oral presentations are scheduled for 20 minutes (15 + 5) each including time for discussion. The conference room will be equipped with 35-mm slide & overhead transparency projectors and Microsoft PowerPoint presentations. Poster presentations are possible as well. Standard poster boards (120 cm height x 100 cm width) will be available. Scientific session could be organized like evening discussions, in the conference hall or under walnut and plane trees.

**Languages - official languages of the Conference are English and Russian (oral presentations are preferable in English).**

### Abstracts

Short communications or expanded abstracts should be submitted before 10<sup>th</sup> April 2008 in English or Russian. They should not exceed four A4 pages, including line drawing illustrations and references. Text should be written using 10p Times New Roman font (office address and references - 9p Times New Roman font), single-spaced, the margins should be 2 cm at top and right, 2.7 cm at bottom and 2.5 cm left. Submissions should be sent by e-mail as attachment files: text as RTF format, illustrations as TIFF, JPG or CDR (CORELDRAW.9) format. The expanded abstracts volume will be available at the meeting.

### **Abstract example**

#### **HANGENBERG EVENT AT THE DEVONIAN–CARBONIFEROUS BOUNDARY IN THE MT. ZERMULA AREA, CARNIC ALPS, ITALY**

**M. C. Perri, C. Spalletta**

*Dipartimento di Scienze della Terra e Geologico Ambientali,  
Università di Bologna, Via Zamboni 67,  
I-40126 Bologna, Italia*

Conodont biostratigraphic analysis in the Mt. Zermula area has indicated that a black shale horizon in the Upper Devonian–Lower Carboniferous limestone succession probably reflects the Hangenberg Event (Perri and Spalletta, 2001a)....

### **References**

Perri M.C., Spalletta C. (2001a). Hangenberg Event al limite Devoniano/Carbonifero al Monte Zermula, Alpi Carniche, Italia. In: M.C. Perri (Ed.), Giornate di Paleontologia 2001, Giornale di Geologia, 62 Supplemento. P. 31–40.

- Walliser O.H. (1984a). Pleading for a natural D/C boundary // Courier Forschungsinstitut Senckenberg, 67. P. 241–246.
- Walliser O.H. (1984b). Geologic processes and global events // Terra Cognita. P. 17–20.
- Walliser O.H. (1996). Global event in the Devonian and Carboniferous. In: O.H. Walliser (Ed.), Global events and event stratigraphy. P. 225–250. Springer Verlag, Berlin.

### **Itinerary of 2008 SDS / IGCP 499 field meeting**

The field meeting will be held in the Kitab State Geological Reserve between 25 August and 1st September 2008 for an examination of the base Emsian GSSP and of bedded/massive/reef limestone sequences from the Upper Silurian to Middle Devonian, which are characterized by diverse benthic and pelagic faunas. These sequences were revealed for the first time by A.I. Kim and N.M. Larin in 1957. They were visited by the chairmen of the Interdepartmental Stratigraphic Committee of the USSR in 1964 together with A.I. Kim, M.V. Erina, and E.A. Yolkin. It was decided at that time to demonstrate them to Soviet Devonian workers during a special excursion as complete and well exposed sections within USSR of the Upper Silurian – Middle Devonian. Such excursion was organized in 1966. Then these sections were studied in details mainly by biostratigraphers from Uzbekistan and Novosibirsk as well as from other places of the USSR. Results of these investigations were demonstrated to SDS members in 1978. During this excursion Prof. W. Ziegler and other leaders of the SDS proposed to organize here a special geological reserve, that was established in 1979 by the special decision of the Government of the Uz. SSR. Later participants of the IGC in Moscow (1984) examined these sections as well and several All-Union paleontological and geological conferences were organized there. The 2008 meeting will allow SDS and IGCP 499 members as well as other Devonian specialists to examine the fine successions of the Kitab Reserve in order to clarify questions of Lower Devonian chronostratigraphy (especially of Emsian stage/substage definitions) and of high-resolution correlation between different fossil groups and facies settings.

**First day** (25.08.08.) Arrival (airport Samarkand, further by bus to the camp of the Kitab State Geological Reserve).

**Second day** (26.08.08.) 1) Viewing of the geography and geology of KSGR camp vicinity (from camp point);

2) examination of Upper Silurian (bedded dolomites and dolomitic limestones) and lower part of Lower Devonian (mainly massive limestones) sequences exposed along the Obisafit Gorge. Focus on the S/D boundary. Fossils: stromatoporoids, tabulate and rugose corals, brachiopods, conodonts and others.

**Third day** (27.08.08.) Examination of type exposures of Madmone Formation [=Bursykhirman and Kushnova superhorizons] (mainly massive limestones, Lochkovian and Pragian in age) along Zinzilban Gorge. Focus on Lochkovian/Pragian boundary and Pragian conodont association. Fossils: quite diverse benthic groups and important conodont succession.

**Forth day** (28.08.08.) **A.** Examination of exposures of the lower part of Khodzha-Kurgan Formation [=lower part of Kitab Suprahorizon or Zinzilban and Norbonak horizons] (mainly thin-bedded limestones, Early Emsian in age) along Zinzilban Gorge. Focus on Pragian/Emsian boundary. Fossils: diverse benthic groups (brachiopods, corals, trilobites, crinoids and other), good lineages of conodonts and dacryoconarids, numerous findings of graptolites).

**B.** Examination of Pragian/Emsian transition at the Bursykhirman Mount, including specific conodont taxa; viewing of sceneries of complete sequence from Upper Ordovician to Middle Devonian.

**Fifth day** (29.08.08.) Exposures of Madmon Formation along Khodzha-Kurgan Gorge (just for looking); examination of the upper part of Lower Emsian (Norbonak Horizon) and lower part of Upper Emsian (Dzhaus Horizon) that are represented mainly by thin-bedded limestones. Focus on Daleje (*nothoperbonus*) Event and findings of key conodont, ammonoid and dacroconarid taxa. Fossils: diverse benthic and pelagic fauna.

**Sixth day** (30.08.08.) Examination of Upper Emsian and Eifelian (bedded limestones, sometimes with clear features of turbiditic sedimentation) along Khodzha-Kurgan Gorge. Focus on conodont and dacroconarid lineages. Fossils: benthic and pelagic taxa.

**Seventh day** (31.08.08.) Collecting of fossils from any parts of Zinzilban, Khodzha-Kurgan and Obisafit gorges sections or examination of the Upper Devonian/Lower Carboniferous transition in cherty bedded limestone/terrigenous facies (Akbasai Formation) with abundant conodonts (Kule section near Reserve station).

**Eighth day** (01.09.08.) Cultural program, Shakhrisyabs: monuments of the Middle Ages.

**Ninth day** (02.09.08.) Indoor session. Official meetings of SDS and IGCP 499.

**Tenth day** (03.09.08.) Departure.

### **Transport**

Route: to Samarkand by air and further to KGSR via Kitab by bus, 4 WD vehicles inside KSGR.

### **Accommodation**

Shared rooms for 30 participants plus tents.

### **Food**

Breakfast and dinner in dining room of the Reserve station, usual field lunch.

### **Costs (in Euros)**

Registration fee 100 Euro

It will cover the following:

Ice-breaker party

Field Excursion Guidebook

Conference contributions book

Transport from Samarkand to Reserve station

Coffee or tea breaks

The Conference dinner

Accommodation, meals and transport within Reserve station costs will be about 450 Euro (preliminary estimation).

### **Medical Care**

The participants should have health insurance for the journey. All foreign participants are required to bring with them health insurance contracts, for the whole time of the trip and from an insurance company that provides an international insurance policy program. Further and specific information should be provided by your travel company. There will be first aid in Samarkand and at Kitab and Reserve station as well. You should take along all necessary medicine.

### **Climate and clothes**

Pleasant oriental autumn with moderate temperatures (20-25°C). Clothes and footwear are usual for any mountainous areas.

### **Travel and visa information**

The Organizing Committee requires about 1 month for the preparation of the official Invitation Letter to obtain a VISA and time for posting it by surface mail. Therefore, the participants are asked to send

by Fax until 15th March 2008 their personal data, a copy of passport pages with full name, date and place of birth, passport number, place of issue and expiry date, nationality, as well as - by e-mail - information concerning your country and permanent region of residence, full home and office addresses, place of employment and position speciality, science degree, previously visits to Uzbekistan.

The Organizing Committee advises to send all required information to Secretaries Natalya A. Meshchankina and Olga T. Obut by e-mail.

### **Deadlines**

Registration (form included here) – 15th February 2008 via secretaries in Tashkent and Novosibirsk.

Personal data for the Invitation Letter – 15st March 2008.

Abstract submission – 10th April 2008.

**The Second circular** with clarification main topics will be sent in March/April to those who will respond to the First circular.

### **Correspondence**

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Conference information is available on Websites: [Tashkent and Novosibirsk]

Registration form

**International Conference****“GLOBAL ALIGNMENTS OF THE LOWER DEVONIAN  
CARBONATE AND CLASTIC SEQUENCES”***(SDS / IGCP Project 499 joint field meeting)***Kitab State Geological Reserve, Uzbekistan****August 25 – September 3, 2008***(Please complete and return by 15th February, 2008 by E-Mail to two addresses:*E-mail: [meshankina@yahoo.com](mailto:meshankina@yahoo.com)[ObutOT@ipgg.nsc.ru](mailto:ObutOT@ipgg.nsc.ru)

First name: ..... Family Name: .....  
 Sex: (M/F) .....  
 Institution: .....  
 Address: ..... City: .....  
 State/Province: ..... Country: ..... Postal code .....  
 Phone: ..... Fax: ..... E-mail: .....

**Please indicate your participation:***in conference*

possibly	<input type="checkbox"/>	probably	<input type="checkbox"/>	certainly	<input type="checkbox"/>
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*in field excursion*

possibly	<input type="checkbox"/>	probably	<input type="checkbox"/>	certainly	<input type="checkbox"/>
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**I will submit:**

Oral presentation	<input type="checkbox"/>
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Author(s) and title(s): .....

*For your oral presentation please specify your requirements:*

PowerPoint presentation	<input type="checkbox"/>	slide projector	<input type="checkbox"/>	overhead projector	<input type="checkbox"/>
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Poster	<input type="checkbox"/>
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Author(s) and title(s): .....

**Official invitation needed:**

yes	<input type="checkbox"/>	no	<input type="checkbox"/>
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**I intend to be accompanied:**

yes	<input type="checkbox"/>	no	<input type="checkbox"/>
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Date

**Final Meeting of IGCP 497 and IGCP 499**  
*From Gondwana and Laurussia to Pangaea: Dynamics of Oceans and Supercontinents*



We are pleased to announce the conference

**"From Gondwana and Laurussia to Pangaea: Dynamics of Oceans and Supercontinents"**

**20<sup>th</sup> International Senckenberg-Conference & 2<sup>nd</sup> Geinitz-Conference**

as a joint meeting of the IGCP 497 "The Rheic Ocean: "Its Origin, Evolution and Correlatives" and IGCP 499 *Devonian Land-sea interactions: evolution of ecosystems and climate*" (DEVEC). The conference will be hosted by the Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt am Main (Senckenbergische Naturforschende Gesellschaft, SNG), and the Museum für Mineralogie und Geologie (Staatliche Naturhistorische Sammlungen Dresden).

The IGCP is a cooperative enterprise of UNESCO and the International Union of Geological Sciences (IUGS) and has been stimulating comparative studies in the Earth Sciences since 1972. After three decades of successful work, the "International Geological Correlation Programme" continued, as "International Geoscience Programme". To date, results have been made by a huge number of scientists around the world with about 500 projects.

IGCP provides several thousands of scientists from about 150 countries with a multi-discipline platform to exchange knowledge and methodology on geological problems of global importance. Special focus is given to projects related to a safer environment, the relationship between natural geological factors and health problems, biodiversity, climate change, mineral and groundwater resources extraction. IGCP promotes collaborative projects with a special emphasis on the benefit provided to society, capacity-building and the advancement and sharing of knowledge between developed and developing nations.

**Organisers**

Peter Königshof, Ulf Linnemann, Rainer Brocke, Mandy Hofmann, Eberhard Schindler, Jens Ulrich, Volker Wilde

**Scientific Advisory Committee**

**Erdin Bozkurt** Middle East Technical University, Ankara, Turkey · **Peter Königshof, Rainer Brocke, Eberhard Schindler, Volker Wilde** Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt, Germany · **Petr Kraft** Charles University, Prague, Czech Republic · **Jurga Lazauskiene** Geological Survey, Vilnius, Lithuania · **Ulf Linnemann, Mandy Hofmann, Jens Ulrich** Museum für Mineralogie und Geologie, Dresden, Germany · **Richard Damian Nance** Ohio University, Athens, USA · **Robin Strachan** University of Portsmouth, UK · **Francisco Pereira** Universidade de Evora, Portugal · **Maarten de Wit** University of Cape Town, Rondebosch, South Africa · **Namik Yalçin** Istanbul University Faculty of Engineering, Turkey

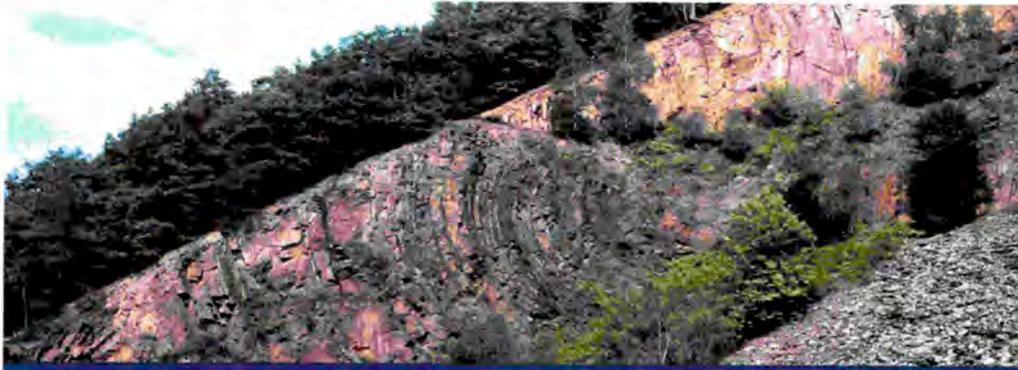
**Early Registration ❖❖❖ October 01, 2007**

**Conference Programme**

The conference will comprise oral lectures, poster sessions, and a public lecture. Those participants who want to see specific Senckenberg collections and /or want to have a guided tour through the Senckenberg Natural History Museum are asked for early information prior to the conference. If you are interested receiving the Second Circular please sent an e-mail to [peter.koenigshof@senckenberg.de](mailto:peter.koenigshof@senckenberg.de) and / or by fax: **+49 (69) 97075-1120**.

2008	Tuesday September 30	Wednesday October 1	Thursday October 2	Friday October 3	Saturday October 4 to Friday 10 October
<b>Morning</b>	Arrival	· Opening ceremony · Scientific sessions · Poster sessions	· Scientific sessions · Poster sessions	Scientific sessions Poster sessions	· Post conference excursion
<b>Afternoon</b>	Arrival	· Scientific sessions · Poster sessions	· Scientific sessions · Poster sessions	· Scientific sessions · Poster sessions · Awards	
<b>Evening</b>	Ice breaker	Public lecture	Reception		

The conference language is English.





**Scientific sessions**

Scientific sessions are related to the following topics: Palaeogeography and Supercontinents during Late Precambrian and Palaeozoic times · Palaeobiodiversity and Palaeoecology · Past climate and sea-level changes · Neritic-pelagic correlation · Land-Sea interactions · Diversification of early terrestrial eco-systems · Palaeozoic orogenic processes at the northern margin of Gondwana · Birth of the Rheic Ocean: Avalonian-Cadomian orogenic processes and Early Palaeozoic rifting at the northern Gondwanan margin · Closure of the Rheic Ocean: Palaeozoic drift and the Alleghenian-Variscan orogenic processes during the Pangea configuration · Geochronology, Isotope Geology, Palaeomag, and Provenance Analysis (Neoproterozoic and Palaeozoic).

**Publication**

It is the intention of the organizing committee to publish a proceedings volume. Details will be given in the second circular.

**Place and date**

The 20<sup>th</sup> International Senckenberg Conference and the 2<sup>nd</sup> Geinitz Conference will be held in Frankfurt am Main, Senckenberg Natural History Museum, Senckenberganlage 25, Frankfurt am Main, Germany from **September 30 – October 3, 2008**.

**Field Excursions**

It is planned to organize a 6 day post-conference excursion, **October 4–10, 2008**: cross section Rheno-Herzynian Zone (Rhenish Massif, Avalonia, Laurussia), Mid-German Crystalline Zone (suture of Rheic Ocean), Saxo-Thuringian Zone (Bohemian Massif, Cadomia, Gondwana). Start of the field trip – Frankfurt am Main; end of the field trip – Dresden. More information will be given in the second circular.

**Registration**

See enclosed registration form. **Early Registration deadline: October 01, 2007.**

**Financial assistance**

It is planned to receive funds to support student attendance. Information about application will be given in the Second Circular.

**Accommodation**

Frankfurt offers a broad variety of hotels. Please, contact the Tourismus + Congress GmbH, Frankfurt am Main, Kaiserstraße 56, 60329 Frankfurt am Main; phone: +49 (69) 21238800, fax: +49 (69) 2123880, e-mail: TCF-info@frankfurt-main.de, internet: <http://TCF.frankfurt-main.de>

**Webpages for registration and information**

[www.senckenberg.de](http://www.senckenberg.de) | [www.senckenberg.de/igcp-499](http://www.senckenberg.de/igcp-499) | [www.snsd.de/igcp497](http://www.snsd.de/igcp497)

**Registration Form** *Please* **fill in form and send it per fax to: +49 (69) 97075-1120**

Final meeting of IGCP 497 & IGCP 499: Frankfurt am Main, Germany, September 30 – October 10, 2008

Ms. or Mr.: ..... Title(s): .....

Name: ..... First name (s): .....

Institution: .....

Street & No.: ..... Postal (zip) code: .....

City: ..... Phone / Fax: .....

Country: ..... email: .....

I would like to attend the scientific sessions, please sent a second circular.  I would like to present a talk.

I am interested in the scientific collections of the museum.  I would like to present a poster.

I would like to participate on the field excursions (6 days), cross section from the Rhenish Massif (Laurussia, Avalonia) to the Bohemian Massif (Gondwana, Cadomia) via the Mid-German Crystalline Zone (suture of the Rheic Ocean).

Date: ..... Signature: .....

Excursion and accommodation form + information will be soon available at the conference webpage. <http://www.senckenberg.de>

## MEMBERSHIP NEWS

### TM R. T. BECKER & the Devonian Group at Münster

In 2007 research continued in Germany and Morocco, included field work in South China and co-operation with various other Devonian workers. Two Ms.Sc. thesis have been completed and several B.Sc. thesis were written or are currently in progress. Some may lead to future small publications. Since 2005, the position as acting institute director brought with it many administrative responsibilities but, fortunately, I could pass on this job in October, which gives a little bit more time for research now.

Participation in the Nevada/western Utah SDS Meeting and field trip was one of the highlights of the year. Rather unexpectedly it was possible to collect several mantidoceratids from the Utah Upper Frasnian. Despite the fact that their occurrence is long known (RUSH 1951), only Michael HOUSE (1962) has ever illustrated two specimens and the biogeographically significant species identity needs some more investigation/preparation.

In spring 2007 we took part in the large Dra Valley trilobite taphonomy project run by Carl BRETT, U.S. collaborators (Gordon BAIRD, Alex BARTHOLOMEW etc.), and the Senckenberg Group. We are responsible for the Upper Emsian ammonoid and conodont dating and managed to find some stratigraphically important new goniatites at the top of the *Hollardops* Limestone (first *Mimagoniatites* from the western Dra Valley) and from the base of the Bou Tserfine Member. There is a very rare globular early anarcestid that may solve the problem of "Emsian subanarcestids" that have been described elsewhere. The field trip was also used to continue the study of the Torkoz and Assa Eifelian, which is planned to result in two joint papers for the forthcoming "Palaeo x 3" volume that Carl will edit. During a long walk in Emsian beds I stumbled over a large limestone slab, which, to our greatest surprise, yielded the first Lower Emsian ammonoid of the western Dra Valley, ca. 500 km to the W of the known occurrence near Foum Zguid.

Field work in the Tafilalt focussed on more sampling of Upper Givetian and Frasnian beds,

as a preparation for our conodont study that has been published in the meantime in *Geological Quarterly* (ABOUSSALAM & BECKER 2007). We also checked the correlation of a *Sobolewia* n. sp. marker bed with the base of the future Middle Givetian at Jebel Amelane. A brief trip to the southern Maider allowed to measure the D/C boundary interval just SW of Fezzou, where rich *Gattendorfia* faunas can be collected.

During student field trips in the Rhenish Massif we found more slabs of *Mesobeloceras* and *Beloceras* Limestone in the eastern Sauerland; since the times of WEDEKIND similar Middle Frasnian cephalopod limestones have never been seen in outcrop. In the last Newsletter I did not report that the famous "Martenberg Klippe", carrying the dense numbering of W. ZIEGLER (shown in HOUSE & ZIEGLER 1977), has completely collapsed after heavy rain. Only the northern cliff part, where the sampling for the correlation of "standard" and Montagne Noire conodont zonation has been conducted, remains intact.

The joint paper with Royal MAPES on Uppermost Famennian ammonoids from the Woodford Shale of Oklahoma has been re-submitted after review and will appear in *Acta Geologica Polonica*. The joint summary (posthumously with Michael) of the Canning Basin Upper Devonian ammonoid zonation is in press in the *Bulletin of the Geological Survey of Western Australia* series (no. 145) that has been managed by Phil PLAYFORD and collaborators. The new Canning Basin maps that go with the volume have been printed several years ago. As a further result of co-operation with TM MA Xueping, a revision of *Desquamatia* brachiopods from the Bergisches Land will soon appear in the *Canadian Journal of Earth Science* volume in honour of Paul COPPER. Other current small projects include a revision of eastern Dra Valley Emsian/Eifelian ammonoid faunas (EBBIGHAUSEN et al. in prep.), Lower Carboniferous trilobites from southern Morocco (HAHN & BECKER in prep.), and the Frasnian crinoids from Oued Mzerreb (Dra Valley, WEBSTER & BECKER in prep.). Conodont samples taken from the Devonian of

Menorca in August, unfortunately, proved to be almost barren. Upper Devonian phacopids, including the first completely blind species from Upper Frasnian entomozoid shales of the northern Sauerland, will be given for investigation to Cathrine CRONIER. A manuscript on Middle Tournaisian Tafilalt faunas, with the oldest ceratitic goniatite, is almost finished. I hope to complete this year the first of a series of papers that will deal with the Pharcicerataceae. Also pending are manuscripts on new Uppermost Famennian ammonoids from Franconia (BECKER & TRAGELEHN in prep.) and on the ammonoid-conodont correlation in the Middle/Upper Famennian of the Nie Brickwork Quarry of the northern Sauerland (BECKER & PIECHA in prep.).

#### **Zhor Sarah ABOUSSALAM**

After the very enjoyable field trip with the American-German team in March, Sarah has very busily worked on Upper Givetian and Lower Frasnian conodonts from the Tafilalt, Montagne Noire, and eastern Rhenish Massif. She has tried to finish as much as possible before Julian Shahin was born on the 4<sup>th</sup> Decembre. Whilst the Tafilalt manuscript has been published at the end of the year (ABOUSSALAM & BECKER 2007), Montagne Noire and German manuscripts are still in preparation. Eifelian conodonts from the western Dra Valley have mostly been identified and will be included in the planned Middle Devonian "Palaeo x 3" volume. Some Tafilalt Eifelian samples, for example from the oldest *Pinacites* level, are important for regional correlations. Other conodont work allows a precise dating of Montagne Noire pericyclid faunas as topmost Tournaisian (BECKER & ABOUSSALAM in prep.).

#### **Sven HARTENFELS**

has continued his Ph.D. on the global *Annulata* and Dasberg Events. Results were presented at Eureka, by a SDS Document (BECKER & HARTENFELS, this vol.), and have been submitted as a manuscript to the Eureka proceedings volume (Palaeontographica Americana). We are still surprised that the Dasberg Event beds of Germany, Carnic Alps, and Morocco are not isochronous. As a next phase, all samples around the *Annulata* Events will be identified and some complementary sampling will take place in Morocco in March 2008. The planned joint voluminous

publication with H. TRAGELEHN on the Famennian of Schübelhammer (Köstenhof, Franconia) is still in preparation.

#### **Sandra Isabella KAISER**

joined the Münster Group in October 2007 but a better job offer persuaded her to change to Bonn university starting in February. Results of stable isotope stratigraphy from the *expansa* Zone to the top of the Lower Tournaisian eventually have been accepted for publication in the Geological Journal (KAISER et al. 2008 in press). A joint (KAISER, BECKER, SPALLETTA & STEUBER) manuscript dealing with conodont stratigraphy, biofacies, and extinctions around the D/C boundary has been submitted to Jeff OVER for inclusion in the Eureka proceedings volume. Currently the D/C boundary samples from Nanbiancun, Muhua, and Dapoushang are processed, which were taken during (KAISER, BECKER, WANG Chen-Yuan) joint field work in Guangxi and Guizhou after the 16<sup>th</sup> International Congress on the Carboniferous and Permian in Nanjing, at the end of June. Outcrop conditions, however, were rather poor. The Guizhou trip was supported by Ji Qiang and we hope that the new faunas are useful for the necessary revision of the D/C GSSP. Publication of the new La Serre conodont data and of Moroccan D/C boundary successions is in preparation. Together with Carlo CORRADINI, a siphonodellid revision is envisaged.

#### **Maren HÜBERS**

has successfully finished a M. Sc. on the relationships between shell growth and septal spacing in Middle and Upper Devonian ammonoids. Her voluminous empirical data give a clear correlation between both shell parameters and allow to identify forms that lived at or below ecological optima. It seems that Middle Devonian forms were still unable to pump their shells empty. Very rare pathological specimens survived times of interrupted septal secretion. A series of publications is planned but Maren will continue with a Ph.D. in palaeobotany.

#### **Jennifer REMKE**

also finished her M.Sc. on the palaeopathology of Upper Devonian to Lower Tournaisian ammonoids. Partly she found very high rates of sublethal shell injuries (higher than in the Mesozoic) and these correlate with shell morphology and supposed life styles. She

plans to continue her studies at the Free University of Berlin, where H. KEUPP is known as the “ammonoid doctor”.

#### **Stephan EICHHOLT**

wrote a B. Sc. on Sven's shark teeth from the Aguelmous Syncline of the southern Tafilalt, which previously yielded faunas. The new collections provide some more data on shark biofacies patterns.

#### **Tim GREIFFELT**

is currently completing a B. Sc. on agglutinating foraminifere tests from Sven's Famennian Sauerland sections at Oese and Effenberg. Building on classical work by EICKHOFF he is looking at distribution patterns and biofacies changes.

#### **Britta HUMBERG**

has started as B. Sc. on the enigmatic nautiloid *Hastula* and other orthocones from the

Givetian and Frasnian of the Dra Valley, looking at the taxonomy, palaeopathology, and palaeoecology.

#### **Anna-Marietta Garcia Garcia**

writes her B.Sc. on an euomphalid gastropod that is unusually abundant in the basinal ammonoid biofacies of the Maider Famennian. It is probably a new form.

#### **Stephan Helling**

is currently completing a B.Sc. on the youngest known (topmost Givetian) scutelluids from Morocco, which were found interbedded in biostromal phillipsastraeid-alveolitid limestones of the northern Maider. He will compare the material with Givetian Rhenish species.

#### **Agnes SKUPINSKI**

finished her Diplom Thesis on the initial Givetian reef biofacies (Massenkalk) in the Höhne Valley (northern Rhenish Massif).

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### TM Carlton E. BRETT, Cincinnati

Studies of sequence stratigraphy, paleoecology, and bioevents in the Lower to Middle Devonian of southwestern Morocco were expanded in 2007. Eberhard Schindler (Senckenberg) and I received a National Geographic Grant to document the taphonomy, stratigraphy, and paleoecology of world-famous Moroccan Lower Devonian *Hollardops* Member trilobite beds. We had an exceptionally interesting and successful trip to the vicinity of Assa, in southwestern Morocco in March, 2007. Fifteen people participated, former student Alex Bartholomew, now an assistant professor at SUNY New Paltz, and present UC PhD student Jay Zambito, as well as colleagues from New York, Germany, and Morocco. This international collaboration and synthesis of many specialties produced unexpected wealth of results. We have detailed data on nearly 1000 trilobites and have measured and correlated five sections of strata over nearly 70 kilometers. Abundant articulated trilobites occur at unusual orientations within many thin concretionary limestones in a rhythmically bedded shale-carbonate succession. Taphonomy indicates that these trilobite beds, in both limestones and shales represent mudflow-type obtrusion deposits; however, the features of the event beds were only well preserved in early-cemented carbonate beds. Fossil, rock and geochemical collections were retrieved and

shipped to laboratories at Cincinnati and Germany for further analyses. At present all samples from the main reference section at Bou Tserfine have been prepared for geochemistry. Preliminary studies of magnetic susceptibility of the *Hollardops* Member, in collaboration with Brooks Ellwood (Louisiana State University), suggest possible Milankovitch-band cyclicity of the concretionary limestones. Further time-series of carbon and sulfur concentrations will be used to test for periodicity. These preliminary results raise the intriguing possibility that diagenetic enhancement of event beds has produced recurrent Lagerstätten. Beyond our expectations, new sections were explored, resulting in discovery and excavation by Glenn Storrs (Cincinnati Museum Center), of a large (~1 meter) armored head of a new placoderm, and the discovery by George McIntosh (Rochester Museum and Science Center) of the first Devonian blastoids and edrioasteroids from northern Africa. Comparative stratigraphic study of the Eifelian Kacak bioevent interval near Torkoz vs. sections in eastern North America are underway with Thomas Becker and Sarah Aboussalam (University of Münster), and Gordon Baird (State University of New York, Fredonia).

Research with colleagues from Senckenberg Institute (Frankfurt, Germany), funded by the

Humboldt Foundation, is examining the sequence stratigraphy, microfacies, faunal changes, and palynofacies of the Middle Devonian succession in the Eifel region, the Sauerland, and Kellerwald areas. A large number of samples collected in 2006 have been processed and are currently under study. Palynological study of Middle Devonian shales, completed by Rainer Brocke in the Eifel region are elucidating onshore-offshore palynofacies; his preliminary results were presented at the 2007 SDS meeting in Eureka, Nevada.

Research with PhD student Jay Zambito and Gordon Baird (State University of New York, Fredonia) focused on the sequence stratigraphy of the Ithaca Formation and the paleoenvironmental setting of the Late Middle Devonian Taghanic bioevent and its aftermath, including so-called “recurrent Hamilton”

faunas. Jay succeeded in delineating and tracing several sequences, each commencing with a thin, shell-rich interval. The fully oxic, shell-rich facies of the upper Ithaca Shale show the incursion of a distinctive “Ithaca fauna”, whereas highstand dysoxic facies yield elements of the recurrent Hamilton fauna. Results of this study were presented at a field conference of the New York State Geological Association (Zambito et al., 2007).

Finally, work with Alex Bartholomew and Gordon Baird, was aimed at quantitative documentation of faunal gradients along a paleoramp in the Middle Devonian in the vicinity of Skaneateles Lake in central New York State. Results of this study were also featured at the New York State Geological Association (Brett et al., 2007).

### Papers Related to Devonian Research (2006-2007)

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- Bartholomew, A.J., and **Brett, C.E.**, 2007, Revised correlations and sequence stratigraphy of the Middle Devonian (Givetian) in Ohio, USA and Ontario, Canada: Implications for paleogeography, sedimentology, and paleoecology. In: R. T. Becker and Kirchgasser, W.T., eds. *Devonian Events and Correlations*. Geological Society, London, Special Publications 278:110-131.
- Brett, C.E., Bartholomew, A.J. and Baird, G.C., 2007, Biofacies recurrence in the Middle Devonian of New York State: An example with implications for habitat tracking. *Palaios* 22: 306-324.
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- Brett, C.E., Ferretti, A., Histon, K., and Schönlaub, H-P. 2007. Eustasy and basin dynamics of the Silurian of the Carnic Alps (Austria). *Acta Palaeontologica Sinica* v.46: 43-49..
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- DeSantis, M. K., and **Brett, C.E.**, 2007. Persistent depositional sequences and bioevents in the Eifelian (Early Middle Devonian) of eastern Laurentia: North American evidence of the Kacak Events? In: R. T. Becker and Kirchgasser, W.T., eds. *Devonian Events and Correlations*. Geological Society, London, Special Publications 278: 83-104.
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- Ver Straeten, C.A. and **Brett, C.E.**, 2006. Pragian to Eifelian strata (Middle Lower to Lower Middle Devonian), northern Appalachian basin—Stratigraphic nomenclatural changes. *Northeastern Geology and Environmental Sciences*, v. 28, p. 80-95.

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- Zambito, J., Baird, G.C., **Brett, C.E.**, and Bartholomew, A.J. 2007. Examination of the type Ithaca Formation: correlations with sections in western New York. In McRoberts, C. (ed.), *Field Trip Guidebook*, New York State Geological Association, 79<sup>th</sup> Annual Meeting, Cortland, NY. P. 153-176.

**CM Denise BRICE (Lille, France)**

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My research deals mainly with Devonian brachiopods (systematic, biostratigraphy, paleobiology). I am finishing a paper devoted to the study or revision of systematic position on some rhynchonellids of the lower Devonian from Algeria (Ougarta). Another paper in progress concerns new Givetian- Frasnian taxa from Ferques (Boulonnais-France) and Givetian from Givet area.

My principal topic in preparation concerns the establishment of a biozonation based on the distribution of the Middle-Upper Devonian rhynchonellid and spiriferids (after revision for

some taxa) guide genera and species and associations found on the most locations in northern border of Gondwana (in Iran and Afghanistan). These brachiopods are usually far more abundant in the fields as mega-fossils, especially in the shallow water facies, than conodonts or ammonoids. They can often be used as biochronologic tools and prime keys to Devonian correlation.

Another topic is the coordination and preparation with many collaborators of a memoir devoted to the Givetian of Givet accessible to the general public.

**Publications dealing with the Devonian (2005-2007)**

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- BLIECK A., BRICE D., COURVILLE PH., CRONIER C., DERYCKE CL. 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, évènements paléobiologiques, paléoenvironnements, paléobiogéographie. Géologie de la France, Paris. 1-2 : 21-27, 1 fig.
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- BRICE D., YAZDI M., TORABI H. & A. MALEKI (2006) - Devonian brachiopods from the Zefreh section (Central Iran). Annales de la Société Géologique du Nord, Lille. 12 (2ème série) : 141-155, 4 figs, pl. XI-XIII.
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- BRICE D., LEGRAND-BLAIN M., NICOLLIN J.-P. (2007) – Brachiopod faunal changes across the Devonian-Carboniferous boundary in NW Sahara (Morocco, Algeria) from BECKER T. R. & KIRCHGASSER W. T. (eds), Devonian Events and Correlations Geological Society, London. Special Publications, 278: 261-271, 4 figs.

**Abstracts and posters**

- BLIECK A., MISTIAEN B. & BRICE D. (2006) - 30ème anniversaire du G.F.P. (Groupe Français du Paléozoïque). Poster et abstract 21ème RST Dijon, Décembre 2006 : 256.
- BRICE D., MISTIAEN B., HUBERT B. & DE WEVER P. (2006) – GIVETIEN : Apogée du phénomène récifal. Le stratotype du Givétien à Givet : un site remarquable du patrimoine national. Poster et abstract 21ème RST Dijon, Décembre 2006 : 257.
- BRICE D., MISTIAEN B., NICOLLIN J.P. & LOONES CH. (2006) – Petrocrania, un cas de mimétisme chez les brachiopodes. Poster et abstract 21ème RST Dijon, Décembre 2006: 189.
- HUBERT H., MISTIAEN B. & BRICE D. (2006) – Deux sites dévoniens remarquables en Avesnois. Poster et abstract 21ème RST Dijon, Décembre 2006 : 262.
- MISTIAEN B., BRICE D., LOONES CH., BLIECK A. & DEMARQUE D. (2006) – La carrière du Grisot à Ferques (Boulonnais) : un site géologique remarquable. Poster et abstract 21ème RST Dijon, Décembre 2006 : 264.
- MISTIAEN B., ZAPALSKI M.K. & BRICE D. (2006) - Primary and secondary factors in substrate selection of aulopodid tabulates. Second International Palaeontological Congress, Beijing July 2006. Poster and abstract: 211.

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- HUBERT B., BRICE D., CRONIER C., MILHAU B., MISTIAEN B., NICOLLIN J.P. & ZAPALSKI M.K. (2007) - Distribution of stromatoporoids, tabulate corals, brachiopods, trilobites and ostracods around the Hanonet - Trois-Fontaines Formations boundary (Givet, N. France) - Affinities and paleogeographical implications. [Abstract]. 1st International Palaeobiogeography Symposium, Paris, 10-13 juillet 2007. Résumé: 49.

#### Guide-book

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- MISTIAEN B., HUBERT B. & BRICE D. (2006) - Le Massif Primaire de l'Avesnois « De l'acmé du phénomène récifal à sa disparition » APBG Juillet 2006 Excursion M5AVE. Complément. : 1-10, 10 fig.
- MISTIAEN B. & BRICE D. (2007) – Le Givetien de Ferques, Bas-Boulonnais (carrière du Grisot et du Banc Noir) – Société Stinkal – Livret guide excursion, Société géologique du Nord, 28 avril 2007. : 1-13, 8 fig., 3 pl.

### CM Rainer BROCKE, Frankfurt am Main

Research in the last years has been concentrated on Upper Silurian to Middle Devonian palynology in the Rheinisches Schiefergebirge (e.g., Eifel Mountains), Bohemia (Czech Republic), southeast and northwest Turkey, and since 2007 in Morocco. All activities are related to Senckenberg

research projects and are mostly in cooperation with different institutions and colleagues. They also include sedimentological, facies, stratigraphical and geochemical studies. Following selected references refer to these projects

#### Publications since 2004 related to the Devonian

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- BEK, J., BROCKE, R., DAŠKOVÁ, J. & FATKA, O. [eds] (2006): Palaeozoic Palynology in Space and Time – CIMP General Meeting 2006, September 2-6, 2006 - Prague, Czech Republic, Book of Abstracts: 1-67; Institute of Geology, Academy of Sciences, Prague.
- BROCKE, R., FATKA, O. & WILDE, V. 2006. Acritarchs and prasinophytes of the Silurian-Devonian GSSP (Klonk, Barrandian area, Czech Republic). Bulletin of Geosciences 81(1), 27-41.
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- BROCKE, R., RIEGEL, W., HARTKOPF-FRÖDER, C., BRETT, C.E., SCHINDLER, E. & WILDE, V. (2007): Palynology and Environment: A Case Study of the Eifelian-Givetian Transition in its Type Area (Eifel Hills, Gemany).- Subcommission on Devonian Stratigraphy and IGCP 499 Devonian Land Sea Interaction: Evolution of Ecosystems and Climate, Eureka, Nevada, 9-17 September 2007: 17.
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- HAUDE, R., BROCKE, R., HEINRICHS, T. & RIEGEL, W. (2007b): Silici-organische Objekte (Embryonen-Hüllen? / „Grünalgen“-Lamellen?) in unterdevonischen Echinodermen-Lagerstätten der argentinischen Präkordillere.- Wissenschaftliche Mitteilungen des Instituts für Geologie der TU Bergakademie Freiberg, 36: 49-50.
- SCHINDLER, E., BROCKE, R., HERTWECK, G., JANSEN, U., KÖNIGSHOF, P., PLODOWSKI, G., SCHULTKA, S., WEHRMANN, A. & WILDE, V. (2004): Coastal paleoenvironment: A Lower Devonian (Emsian) land-sea transition south of the Old Red Continent (Mosel Syncline, Rheinisches Schiefergebirge, Germany). – *Geological Society of America, Abstracts with Programs*, 36 (5): 165; Boulder.
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Development of the Devonian of NW Turkey.- In: Acenolaza, G., Vergel, M., Peralta, A. and Herbst, R. [eds]: Field meeting IGCP 499 (IUGS/UNESCO), San Juan, Argentina, Guidebook and abstracts: 84-86.

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## CM Pierre BULTYNCK (Brussels, Belgium)

I am happy to announce you that the special issue of Geological Quarterly

“ Recent approaches to Devonian conodont zonation “ resulting from the session on

Devonian conodont biostratigraphy held during ICOS I in Leicester, July 2006 is now available (vol. 51-4). It can also be found as PDF File on <http://gq.pgi.gov.pl>

### Contents are given under SDS publication

A manuscript on “Givetian and early Frasnian conodonts from the Compte section (Middle-Upper Devonian, Spanish Central Pyrenees)” presented as a talk at the ICOS I Devonian session in Leicester and submitted by J.-C. Liao and J.-C. Valenzuela- Rios could not be included in the present issue for a time related

editorial reason. It will be published in the first issue of Geological Quarterly 2008.

The *subterminus* conodont Fauna in cooperation with Katarzyna Narkiewicz: We are in the final stage of our study. A manuscript will be submitted in the course of 2008.

New (2006/2007) important Devonian **publications**:

CASIER, J.-G. & PRÉAT, A. 2007. Ostracod and lithofacies of the Middle/Upper Devonian boundary stratotype, (Puech de la Suque, Montagne Noire, France). *Bulletin de la Société géologique de France*, **178**, 4: 293-204.

## Tm Jean-Georges CASIER (Brussels)

During 2007, and in collaboration with A. El Hassani (Scientific Institute, Rabat) and A. Préat (University of Brussels), J.-G. Casier (Belgian royal Institute of natural Sciences) has finished a study of Middle and Upper Devonian ostracods from the Tafilalt (Morocco). That study concerns ostracods present from the upper part of the Eifelian to the base of the Famennian in the Djebel Mech Irdane, Bou Tchrafine and El Atrous sections. A paper has been submitted to the "Revue de Micropaléontologie".

classic reference section in the type region for the definition of the Frasnian stage. These two studies are in reality related to the world-wide perturbation in the earth-ocean system observed during the *punctata* Zone. Yans *et al.* (2007) have recently demonstrate an abrupt and high-amplitude negative carbon isotopic excursion in the *punctata* Zone, and the two above mentioned studies aim to establish if yes or no ostracods suffered from an allegedly Early-Middle Frasnian crisis in the type region. A paper on ostracods present in the Frasnian railway section has been submitted to the "Bulletin de l'Institut royal des Sciences naturelles de Belgique, Sciences de la Terre".

J. -G. Casier in collaboration with Ewa Olempska (Polish Academy of Sciences), has also finished the study of Middle Frasnian ostracods present in the famous Frasnian railway section. Now and also in collaboration with E. Olempska, J.-G. Casier works on ostracods from the Arche quarry, an other

During 2007, J.-G. Casier has also studied ostracods collected by P. Racheboeuf (West Bretagne University, France), in the Belén Formation at Pisacaviña (Altiplano,

Bolivia). Despite the poor state of preservation, but it is the case for all the Malvinokaffric ostracod fauna, 14 species are recognised at Pisacaviña. Their study shows that the "Neritic Malvinokaffric ecotype" introduced recently by Lethiers *et al.* (2001), is useless. The ostracod fauna of Pisacaviña belongs in reality to the world-wide recognised Eifelian

Mega-Assemblage, and they are more precisely indicative of a relatively deep poorly oxygenated environment.

#### Devonian related publications and abstracts 2006-2007.

- CASIER, J.-G. & PREAT, A., 2006. Ostracods and lithofacies close to the Eifelian-Givetian boundary (Devonian) at Aisemont (Namur Synclinorium, Belgium). *Bulletin de l'Institut royal des Sciences naturelles de Belgique, Sciences de la Terre*, **76**: 5-29.
- CASIER, J.-G., BERRA, I., OLEMPKA, E., SANDBERG, C. & PRÉAT, A., 2006. Ostracods and facies of the Early and Middle Frasnian at Devils Gate in Nevada: relationship to the Alamo Event. *Acta Palaeontologica Polonica*, **51**, 4: 813-828.
- GLUCHOWSKI, E., CASIER, J.-G. & OLEMPKA, E., 2006. Crinoid and ostracod succession within the Early-Middle Frasnian interval in the Wietrzna quarry, Holy Cross Mountains, Poland. *Acta Palaeontologica Polonica*, **51**, 4: 695-706.
- CASIER, J.-G., EL HASSANI, A. & PREAT, A., 2006. Ostracods and rock facies of the Eifelian-Givetian and Givetian/Frasnian boundary stratotypes. *Abstracts with Programs Geological Society of America Annual Meeting*, Philadelphia: 552
- CASIER, J.-G. & PREAT, A., 2007. Ostracod and lithofacies of the Middle/Upper Devonian boundary stratotype, (Puech de la Suque, Montagne Noire, France). *Bulletin de la Société géologique de France*, **178**, 4: 293-204.
- CASIER, J.-G., BERRA, I. & PRÉAT, A., 2007. Devonian ostracods from Devils Gate (Eureka, Nevada). *Program and Abstracts SDS and IGCP 499 Devonian Land Sea Interaction Joint Meeting, Eureka, Nevada*: 24-25.
- CASIER, J.-G. & PRÉAT, A., 2007. Comments on the Devonian/Carboniferous and Frasnian/Famennian boundary stratotype sections (La Serre and Coumiac, Montagne Noire, France). *Program and Abstracts SDS and IGCP 499 Devonian Land Sea Interaction Joint Meeting, Eureka, Nevada*: 26-27.

#### TM Ahmed EL HASSANI, SDS Vice-Chairman

Since early 2006 my research activity was relatively reduced following my nomination as Director of the Institut Scientifique (Mohammed V Agdal, University) Rabat and also my nomination as A Permanent Member of the Hassan II Academy of Sciences and Technologies (May, 2006).

Nevertheless, I concentrate my research task on Devonian in the Meseta and Dra Valley areas:

##### 1. Dra Valley:

In the frame of a National Geographic Program a Fieldwork was organized with a group of geologist (7 American's, 6 German's) on the Devonian of Dra Valley especially on Trilobites. This group was coordinated together by:

Prof. Ahmed El Hassani (Moroccan co-leader), Directeur Institut Scientifique, Université Mohammed V Agdal, Rabat

Dr. Carl Brett (US co-leader) Professor, Department of Geology University of Cincinnati, Cincinnati, Ohio 45221-0013 USA  
Dr. Eberhard Schindler (German co-leader) Researcher, Forschungsinstitut Senckenberg, Senckenberganlage 25 D - 60325 Frankfurt am Main, Germany.

Our investigations were concentrated on several tasks as follow:

- Tasks 1: Measure and sample for lithologies/conodont samples; begin on one side of gully; then check details on other side.
- Tasks 2: Identification of fossil bearing layers and preliminary documentation.
- Tasks 3: Detailed documentation of taphonomy and paleontology special limestone/shale couplets (for Hollardops Hill ideally spend half day (4 hours) at each level: = 2 couplets/day/team; x 4 days team 1; x 2 days for each other 2 teams = total of 16-20 couplets can be documented in detail).

- Tasks 4: Work with team 4; prepare sites for data collection; fossil collection and labeling.
- Tasks 5: with several points: a) Setting up and operation of coring drill; b) Drilling of core samples; c) Collection and boxing of drill cores; d) Collecting and labeling of lithologic samples; e) Photography of sections; video?; f) getting GPS data for sites

## 2. Moroccan Meseta:

I concentrate my research on a PhD Work with Dr Mohamed Raji (Casablanca University) in collaboration with Profs Benfrika and El Kamel (both from Casablanca University) on Conodont alteration within the Moroccan Meseta. This PhD was defended on July 2007.

These investigations relate to a detailed mapping considering alteration of conodonts (CAI) of the Silurian and Devonian in the West Moroccan Meseta. The results obtained show an increasing trend from west to east, which coincides with the same structural evolution of this region. Indeed, conodonts of the coastal block offering low alteration (1,5 to 3: diagenesis), the central part of the Meseta shows a significant alteration in connection with an epi-metamorphism and a heat flow associated with a syntectonic major magmatism, finally mixed CAI observed at the eastern part of central Morocco (Mirt area) suggest the effect of hydrothermal fluid flows.

## 3. Continuation of research with Brooks Ellwood:

With Brooks and other colleagues we try to publish our results on the Anti Atlas and also are looking now to investigate some sections in the High Atlas. A paper is now In Press: Brooks B. Ellwooda, Stephen L. Benoista, Jonathan Tomkina, Ahmed El Hassanib, Raimund Feiste, and Eberhard Schindlerd : High Resolution Correlation Using Graphic Correlation of Biostratigraphic and Magnetostratigraphic or Chemostratigraphic Data Sets: Illustrating the Method by Defining the Middle Devonian (Givetian) Magnetostratigraphy Susceptibility for Sections from France, Germany, Morocco and the United States

## 4. The MAPG Conference, Marrakech, October 2007.

My participation to the MAPG (Moroccan Association of Petroleum Geologists) is mainly devoted to the Paleozoic of Morocco and

especially the Devonian of the Moroccan Meseta. This participation was as :

- Member of the scientific committee,
- within the western Meseta in collaboration with Prof Tahiri,
- and Conveners to MAPG International meeting:

GS 19: Phanero- and Palaeozoic Evolution of the NW African, West European and NE American belts, Chair: A. Tahiri, F. Simancas, A. El Hassani

Excursion: A4 Devonian and Carboniferous carbonates and Permian clastics as potential reservoirs in the Meseta domain (Ahmed EL HASSANI & Abdelfatah TAHIRI).

### Objectives and content

The Paleozoic basement of the Atlantic coastal basins widely crops out in Western Meseta, particularly in the large Moroccan Central Massif which culminates at about 1200 m above sea level.

Picturesque landscapes, sheep and goats, open oak forests, and thermal springs (Oulmes) are typical.

From the point of view of oil and gas production, the parent rocks are mainly the Silurian-Devonian and Carboniferous shales, whereas potential reservoirs correspond to the Devonian and Carboniferous reefal limestones, and to the unconformable Permian sandstones. During the trip, emphasis will be put on the tectonic-sedimentary evolution of the Devonian-Carboniferous basin (platform deposits versus turbidites and olistostomes, synsedimentary thrusts...). The main folding phases of the Paleozoic orogen (from late Ordovician to Permian) and the corresponding structures will be illustrated along a NW-SE cross-section of the Central massif.

The D1 morning stops are mostly dedicated to the Upper Devonian-Lower Carboniferous synorogenic deposits. After lunch, the Oulmes granite and associated metamorphism, the adjoining Middle Devonian reefal limestones, and the Eovariscan unconformity (Upper Visean over Lower Devonian deposits) are examined.

The D2 morning program first illustrates the Upper Visean-Namurian turbiditic deposits, either proximal or distal, of the central Meseta basin. They are intruded by Variscan granites, and overlain by Quaternary basaltic flows. Then, the Late Devonian synsedimentary instability, the Eovariscan unconformity (Visean limestones over Ordovician

metapelites), and the allochthonous Devonian series (Famennian pelagic limestones) are particularly illustrated.

The last day (D3) program first allows the participants to study a Permian, pull-apart continental basin (clastic red beds, rhyolitic flows). Then, on the way to Marrakech, it is

pleasant to stop in front of the beautiful scenery of the High Atlas barrier. The final stops will illustrate the Ordovician and Permian deposits of the Eastern Jebilet synsedimentary nappes, close to Marrakech.

I will participate in two oral presentations:

El Mostafa Benfrika, Mohamed Raji, Piere Bultynck and Ahmed El Hassani: Contribution to Moroccan Palaeozoic Biostratigraphy by Microfossils Conodonts. Example: Devonian of Northwestern Meseta  
 Driss Fadli, Mohamed Bouabdelli, Yves Cailleux, Ahmed El Hassani, Mohamed El Wartiti, Christian Hoepffner, Fatima Kharbouch, Abdelfattah Tahiri and Mohamed Zahraoui: Geological map of the Moroccan Central Massif; a structural interpretation of the Hercynian Belt.

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- CASIER J.G., EL HASSANI A., & PREAT A, (2006-a).- Contribution à l'étude des ostracodes du Dévonien moyen et supérieur du Tafilalt (Maroc) ; Colloque sur les Ostracodes, Tétouan 2006.
- CASIER J.G., EL HASSANI A., & PRÉAT A., (2006-b).- Ostracods and rock facies of The Eifelian/Givetian and Givetian/Frasnian boundary stratotypes, Geological Society of America 2006 Philadelphia Annual Meeting.
- ELLWOOD B. B., GARCÍA-ALCALDE J. L., EL HASSANI A., HLADIL J., SOTO F. M., TRUYÓLS-MASSONI M., WEDDIGE K., KOPTIKOVA L. (2006).- Stratigraphy of the Middle Devonian boundary: Formal definition of the susceptibility magnetostratotype in Germany with comparisons to sections in the Czech Republic, Morocco and Spain, Tectonophysics 418 (2006) pp: 31-49.
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- KAISER, S., BECKER, RT & EL HASSANI, A. (2006-a).- Oberdevonische Conodonten- und Ammonoitenfaunen der Marokkanischen Meseta und ihre Bedeutung für regionale Korrelationen, Event Stratigraphie und synsedimentäre Tektonik am NW-Rand Gondwanas. German Palaeontological Society Meeting.
- KAISER, S., BECKER, RT & EL HASSANI, A. (2006-b). - Middle to Late Famennian successions at Ain Jemaa (Moroccan Meseta) – implications for regional correlation, event stratigraphy and synsedimentary tectonics of NW Gondwana. (Sous presse) Geological Society of London. (sous presse)
- SCHMITZA B., ELLWOOD B. B., PEUCKER-EHRENBRINK B., EL HASSANI A., BULTYNCK P. (2006).- Platinum group elements and 187Os/188Os in a purported impact ejecta layer near Eifelian-Givetian stage boundary, Middle Devonian, Elsevier Editorial System(tm) . Earth and Planetary Science Letters.
- ELLWOOD B. B., TOMKIN J., EL HASSANI A., FEIST R., SCHINDLER E. AND BULTYNCK P. (2006).- Magnetostratigraphy-Susceptibility Chron Zonation and Development of a Floating Point Time Scale for the Middle Devonian Givetian Stage. Paleogeography Paleoclimatology, Paleoecology (sous presse).

#### TM Nadezhda IZOKH (Novosibirsk, Russia)

During the year 2007 different activities of our team were connected with investigation of stratigraphy of the Devonian sequences from West Siberia and adjacent regions. Research group includes: N.K. Bakharev, N.G. Izokh, V.G. Khromykh, T.P. Kipriyanova, O.T. Obut, E.A. Yolkin, PhD student O.P. Izokh, master students T.A. Shcherbanenko and T.N. Toropova, student V.S. Surodina.

TM N.G. Izokh and CM O.T. Obut: We continue examination of Middle-Upper Devonian siliceous-terrigenous rocks on a presence of conodonts and radiolarians. First co-occurrences of them from the Upper Frasnian siliceous-terrigenous facies (U.rhenana- linguiformis conodont zones) of the Rudny Altai have been discovered. These findings allow to specify the stratigraphical distribution of the radiolarians, and later on to

align parallel radiolarian zonation with standard conodont zones (Obut et al., 2007).

CM E.A. Yolkin, CM N.K. Bakharev, TM N.G. Izokh: Special attention has been paid to investigation of the Givetian interval. Faunal associations including so-called "cheehiel" brachiopod assemblage, together with conodonts and ostracods of the Upper Givetian Mazalovskiy Kitat Horizon in the Kuznetsk Basin [Kolyvan'-Tomsk fold-thrust area] (South of West Siberia) have been analyzed. It was revealed that ostracod faunal list of this Horizon includes taxa ranged up from the Eifelian (Yolkin et al, 2007a).

CM E.A. Yolkin (Yolkin et al, 2007c) has summarized data on paleozoogeographical relations of the Early-Middle Devonian brachiopods from the 11 regions including Salair, Gorny Altai, Rudny Altai, Kazakhstan, East Urals, West Urals, Novaya Zemlya, Taimyr, Settedaban, Russian Far East, Mongolia. On the basis of the quantitative estimations the biogeographic zonation for the 8 time-slices have been proposed – early and late Lochkovian, Pragian, early and late Emsian, Eifelian, early and late Givetian.

CM E.A. Yolkin et al. (2007b) have proposed facial zonation for the territory of West-Siberia Geosyncline and adjacent area. Five Megazones (I-V) are established for the Late Devonian time. Former three (I-III) characterize sedimentary environments on western part of the Siberian Continent and to west from it. Megazone IV is represented by the shallow-water volcanic-sedimentary rocks of the Kazakhstan Continent that is framed by the early and middle Carboniferous sutures. Folded (island-arc) structures from the Eastern Urals are assigned to Megazone V.

PhD student O.P. Izokh carried out investigations of the carbon (organic and

inorganic) and oxygen isotope composition from the carbonates of the "Kosoy Utyos" F/F section of the Kuznetsk Basin [Kolyvan'-Tomsk fold-thrust area], as a part of compiling of the data basis. In comparison with other sections the considerable difference in absolute  $\delta^{13}\text{C}$  and  $\delta^{18}\text{O}$  values has been observed. At the Kuznetsk Basin  $\delta^{13}\text{C}$  curve the maximum  $\delta^{13}\text{C}$  values are 5,3‰, and the positive excursion displays shifts 4,5‰. Whereas other European, Chinese and Canadian sections are characterized by maximum values 3 – 4‰, and positive shifts 2 – 2,5‰ (O. Izokh, N. Izokh, 2007).

The International Conference "GLOBAL ALIGNMENTS OF LOWER DEVONIAN CARBONATE AND CLASTIC SEQUENCES" (SDS / IGCP Project 499 joint field meeting) to be held in the Kitab State Geological Reserve (Uzbekistan Republic) in 25 August – 3 September, 2008 was approved during the Subcommission on Devonian Stratigraphy and IGCP 499 business meetings in Eureka, USA (September, 2007). Organizing Committee warmly welcomes Devonian workers to participate in the meeting.

Field works in Novosibirsk, Kemerovo and SE Altai regions have been carried out in July-August 2007. The Lower to Upper Devonian sections have been examined. Sampling on microfauna (conodonts, ostracods, radiolarians), ammonoids, 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, student of NSU V.S. Surodina.

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- IZOKH, O.P. (2007): Peculiarities in variations of the isotope composition of oxygen, organic and inorganic carbon from the Upper Devonian section in North-Western Kuznetsk Basin. Abstract of the XVII Symposium on isotope geochemistry: 111. Moscow: Institute of Geochemistry and Analytical Chemistry. [In Russian]
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### CM G. Klapper

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My research continues on Middle and Upper Devonian (Frasnian and Famennian) conodont taxonomy and biostratigraphy.

#### Publications in 2007:

- Klapper, G., 2007, Frasnian (Upper Devonian) conodont succession at Horse Spring and correlative sections, Canning Basin, Western Australia: *Journal of Paleontology*, v. 81, p. 513-537.
- Klapper, G., 2007, Erratum: *Journal of Paleontology*, v. 81, p. 821.
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- Work, D. M., Mason, C. E., and Klapper, G., 2007, The Middle Devonian (Givetian) ammonoid *Pharciceras* from the New Albany Shale, Kentucky: *Journal of Paleontology*, v. 81, p. 1510-1515.

### Cm Elga MARK-KURIK (Tallinn, Estonia)

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The greatest event of the year 2007 for fossil fish workers was the 11th International Symposium on Early Vertebrates/Lower Vertebrates held in Uppsala, Sweden in August 13-16. The meeting was excellently organized by colleagues Per E. Ahlberg, Henning Blom, Catherine Boisvert and others from the Department of Physiology and Developmental Biology, Evolutionary Biology Center, Uppsala University. Over a hundred participants arrived; more numerous were colleagues from the USA, Sweden and United Kingdom. During four days 73 perfectly illustrated talks were given practically on fossil fishes of all continents and from the Ordovician to the Jurassic Period. Much more information than previously came from South America, also from the Near East, Africa and

China. It appeared that study of chondrichthyan fishes advanced significantly. Special attention served presentations on the early tetrapods and closely related to them fishes, e.g. Tiktaalik, Panderichthys. The abstracts of the lectures were published in the *Ichthyolith Issues*, Special Publication 10, and papers, based on them will be included into a special volume of the *Acta Zoologica* (Stockholm).

Two collective papers (Dupret et al. 2007, Marshall et al. 2007), mentioned in the previous SDS Newsletter No 22 were published this year.

A paleobiological cooperation has developed with Hector Botella, Valencia University, Spain, who specially studies locomotion of fossil fishes. It is surprising how rarely tail fins in the early jawless fishes have been preserved. One of these unique forms with an almost complete caudal fin is the Early Devonian

Lochkovian pteraspimid *Errivaspis* from the Welsh Borderland, England.

In July young paleoichthyologist and stratigrapher Dmitry Plaksa, Institute of Geochemistry and Geophysics, National Academy of Belarus got successfully his PhD. He studied the Late Emsian-Frasnian fish faunas of Belarus and their stratigraphical significance. Devonian fish assemblages, occurring together with miospores make Belarus a key area for correlation of the different regions of the East European Platform via Poland with stratotype areas in western Europe, particularly in Germany.

The Geological Survey of Estonia continues publication of the series of descriptions of the drill core sections under the leadership of the enthusiastic geologists Anne Pöldvere. This time, in the Bulletin 8 core of the Tsiistre 533.7 m deep drill hole from the very south-eastern corner of Estonia was characterized, including the section from the Furongian (Upper Cambrian) up to the Upper Pleistocene. Among the Devonian fossils lingulates were

met rather often, especially in the middle part of the Narva Formation.

In autumn we received from St. Petersburg, Russia very sad news: in September, 28 died Svetlana Cherksova, our good friend and one of the best stratigrapher and paleontologists, specialized on the Silurian-Devonian brachiopods, faunal analyses, paleogeography and other aspects of the Arctic geology. Working during many year on the Novaya Zemlya Archipelago, in an area with extremely hard weather and landscape conditions, also on the Taimyr Peninsula and other regions of Siberian Arctic, she was extremely enthusiastic, involving paleontologists, busy with other groups into the study of the Arctic area. I was happy to work with her in 1972 on the New Siberian Islands, in particular on the Kotelny Island, where for the first time fossil fishes were discovered in the Devonian: the earliest (Lochkovian) ptyctodonts together with large paleoniscoids etc. We, her colleagues in Baltic shall miss Svetlana very much!

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#### TM John MARSHALL (Southampton)

It has again been a busy Devonian year. In July I participated in the final fieldtrip of the joint project with the Nanjiang Institute of Palaeontology 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 ran 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. The fieldwork successfully collected many spore samples and macrofossil plants. In early September I went on a brief field trip to Scotland to investigate several Mid and Late Devonian sections. This was then followed by the SDS meeting in Nevada with its excellent fieldtrip followed by the 2 day meeting in Eureka with the SDS business meeting and minutes. I then attended the CIMP spore and acritarch meeting in Lisbon, Portugal where I presented a talk on the Famennian of Greenland. This was followed by a 2 day fieldtrip to southern Portugal where we learnt all about how palynology has contributed to the understanding of the complex geology and ore deposits of this region.

I then attended the CNRS sponsored Eclipse II meeting on Terrestrialisation Influences on the Palaeozoic Geosphere-Biosphere. This was attended by a interesting mix of vertebrate palaeontologists, palynologists and palaeobotanists and geochemists. I gave a presentation on the Devonian Earth System or more explicitly its perturbations. Also in October I did fieldwork in Bolivia with former Southampton PhD student Ian Troth.

The year concluded at the Palaeontological Association 51st Annual Meeting in Uppsala, Sweden.

**Cm Bruno MISTIAEN (Lille, France)**

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My research deals essentially with Devonian stromatoporoids and tabulate corals: systematic, biostratigraphy, palaeobiology, palaeobiogeography... One of my principal topics concerns the relation between the stromatoporoids and the events occurring during Devonian, in relation with probable palaeoclimatic changes. This topic is especially focused on the upper Devonian period.

Investigated areas are essentially European countries (North of France, Belgium, Spain), North Africa, Eastern Asia (Iran and Afghanistan) and South China.

I am finishing, in collaboration, several papers devoted to some new stromatoporoids fauna of lower Devonian (Praguian) from Spain, Devonian from Morocco, upper Devonian

in July was to northern Xinjiang where we (uppermost Famennian) from Germany, and Givetian-Frasnien from Iran.

Two PhD are presently in preparation. The Mikolaj ZAPALSKI's PhD, is devoted to the Devonian tabulate corals from the Southern part of the Holy Cros Mountains (Poland) and co-directed with the Professeur Jerzy TRAMMER, University of Warsaw (Poland). The Benoit HUBERT's PhD concerns the biodiversity of the Devonian (Givetian-Frasnien) stromatoporoids in Avesnois and surrounding areas specially in Ardenne, in relation with the palaeoenvironmental changes and the sedimentological evolution; this PhD is also co-directed with the Professor Frédéric BOULVAIN, University of Liège (Belgique).

Last summer, with Hubert and Zapalski, I participated to the Xth Fossil Cnidaria & Porifera International Congress in St Petersburg from 12th to 16th august where one oral communication and three posters have been presented. We also participated to the pre-congress fieldtrip in the Paleozoic of the Subpolar Urals.

One of my projects, in collaboration with Dr. Isabel MENDEZ-BEDIA, University of Oviedo (Spain), concerns the study of the lower Devonian stromatoporoids and tabulate fauna from the Armorican Massif (France, Baubigny area) and comparison with fauna of same age in Cantabrian Chain (Spain) in relation with faunal migration.

In August 2008 (25-29th) will take place in Lille (France) an "International Congress on Palaeozoic Climates" with pre- and post-conferences excursions devoted to Lower and to Upper Palaeozoic of Ardenne and Avesnois (Belgium and North of France). This international congress is organized by Dr. BLIECK Alain, Dr.SERVAIS Thomas and Dr. TRIBOVILARD Nicolas (University of Lille 1), Dr. VERNIERS Jacques (University of Gent, Belgium) and Dr. MISTIAEN Bruno (Catholic University of Lille). This congress will serve as closing meeting on the international geoscience Programme IGCP 503 Ordovicien Palaeogeography and Palaeoclimate and is co-sponsored by the IGCP 497 The Rheic Ocean: it's Origin Evolution and Correlatives.

Publications dealing with the Devonian (2005-2007)

**Papers**

- AVERBUCH O., TRIBOVILLARD N., DEVLEESCHOUWER X., RIQUIER L., MISTIAEN B. & VAN VLIET-LANCE B. (2005) – Mountain building-enhanced continental weathering and organic carbon burial as major causes for climatic cooling at the Frasnian-Famennian boundary (ca376 Ma BP). *Terra Nova* : 25-34, 8 fig
- BLIECK A., BRICE D., COURVILLE PH., CRONIER C., DERYCKE CL. 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. *Géologie de la France*, Paris. 1-2 : 21-27, 1 fig.
- HUBERT B., ZAPALSKI M. K., NICOLLIN J.P., MISTIAEN B. & BRICE D. (2007) - Selected benthic faunas from the Devonian of the Ardennes: An estimation of palaeobiodiversity. *Acta Geologica Polonica*. 57 (2) : 223-262, 2 fig., 2 tabl., 1 appendix.
- MENDEZ-BEDIA I. & MISTIAEN B. (2007) – Stromatoporoids from the latest reefal episode in the Devonian (Late Frasnian) of the Cantabrian Mountains (NW Spain). In Hubmann, B. & Piller W.E. (Eds.) *Proceedings of the 9th International Symposium on Fossil Cnidaria and Porifera*. Graz. – Österr., Akad. Wiss., Schriftenr. Erdwiss. Komm. Wien. 17: 167-183, 4 fig., 2 pl.
- MISTIAEN B (2006) – Annotations to the Devonian Correlation Table, B 144-145 dm-ds 06 : Stromatoporoid and Tabulate Coral biostratigraphy in the Middle and Upper Devonian of the Ferques area, Boulonnais (North of France). *Senckenbergiana lethaea*. Franckfurt am Main 86 (2) 321, 337, 339-340, 344, 346-347.
- MISTIAEN B. (2007) – An older Devonian stromatoporoid from the Ardennes, St-Joseph Formation, Emsian (Vireux, France). In Hubmann, B. & Piller W.E. (Eds.) *Proceedings of the 9th International Symposium on Fossil Cnidaria and Porifera*. Graz. – Österr., Akad. Wiss., Schriftenr. Erdwiss. Komm. Wien. 17 : 153-165, 4 fig. 1 pl.
- QI YONGAN, HU BIN, MISTIAEN B. & NICOLLIN J.P. (2005) - Ichnofabrics and their environmental interpretation from Tianziling Formation (Upper Devonian) of Northern Guangdong. *Journal of Coal Geology and Exploration (in China)*. Vol. 33, n° 2, : 11-13.
- STREEL M., BRICE D. & MISTIAEN B. (2006) – Strunian. *Geologica Belgica*, 9 (1-2) : 105-109, 2 fig.
- ZAPALSKI M.K., HUBERT B. & MISTIAEN B. (2007) – Estimation of palaeoenvironmental changes: can analysis of distribution of tabulae in tabulates be a tool? In *Palaeozoic Reefs and Bioaccumulations: Climatic and evolutionary Controls* Alvaro, Aretz, Boulvain, Munneke, Vachard & Venning (Eds). Geological Society, London, Special Publications 275 : 275-281, 7 fig.
- ZAPALSKI M.K., HUBERT B., NICOLLIN J.P. MISTIAEN B. & BRICE D. (2007) – The palaeobiodiversity of stromatoporoids, tabulates and brachiopods in the Devonian of Ardennes *Bulletin de la Société Géologique de France*, Paris. : 55-62, 6 fig., 3 tabl.

**Abstracts and posters**

- BLIECK A., MISTIAEN B. & BRICE D. (2006) - 30ème anniversaire du G.F.P. (Groupe Français du Paléozoïque). [Poster et abstract] 21ème RST Dijon, Décembre 2006 : 256.
- BRICE D., MISTIAEN B., HUBERT B. & DE WEVER P. (2006) – GIVETIEN : Apogée du phénomène récifal. Le stratotype du Givétien à Givet : un site remarquable du patrimoine national. [Poster et abstract] 21ème RST Dijon, Décembre 2006. : 257.
- BRICE D., MISTIAEN B., NICOLLIN J.P. & LOONES CH. (2006) – Petrocrania, un cas de mimétisme chez les brachiopodes. [Poster et abstract] 21ème RST Dijon, Décembre 2006 : 189.
- HUBERT, B.L.M., BRICE, D., CRONIER, C., MILHAU, B., MISTIAEN, B., NICOLLIN, J.P. & ZAPALSKI, M.K. Distribution of stromatoporoids, tabulate corals, brachiopods, trilobites and ostracods around the Hanonet – Trois-Fontaines Formations boundary (Givetian, Givet, N. France) – Affinities and palaeogeographical implications. [Poster et abstract] 1st International Palaeobiogeography Symposium, Paris, Juillet 2007, vol. des résumés, p. 49
- HUBERT H., MISTIAEN B. & BRICE D. (2006) – Deux sites dévoniens remarquables en Avesnois. [Poster et abstract] 21ème RST Dijon, Décembre 2006 : 262.
- MISTIAEN B., BRICE D., LOONES CH., BLIECK A. & DEMARQUE D. (2006) – La carrière du Griset à Ferques (Boulonnais) : un site géologique remarquable. [Poster et abstract] 21ème RST Dijon, Décembre 2006 : 264.
- MISTIAEN B. & WEYER D. (2007) - New data on Strunian stromatoporoids from Germany a step for more comprehensive understanding of their palaeogeographic distribution. [Poster and abstract] Xth International Congress on Fossil Cnidaria and Porifera, St Petersburg August 12th - 16th: 63.
- MISTIAEN B., ZAPALSKI M.K. & BRICE D. (2006) - Primary and secondary factors in substrate selection of aulopodid tabulates. Second International Palaeontological Congress, Beijing July 2006. [Poster and abstract]. : 211

**Abstracts**

- FERNANDEZ-MARTÍNEZ E., MÉNDEZ-BEDIA I., SOTO F, MISTIAEN B & PEDRO FERNÁNDEZ L (2007) - Lower Devonian (Earliest Pragian) corals and stromatoporoids from the Cantabrian Zone (NW Spain) Xth International Congress on Fossil Cnidaria and Porifera, St Petersburg. August 12th – 16th.
- HEIDINGER E. & MISTIAEN B. (2005) - « Microstructure and ultrastructure of stromatoporoids » [Abstract] In Alvaro & al (Eds) Climatic and evolutionary controls on paleozoic reefs and bioaccumulations. Meeting Paris 7-8 sept 2005 : 25.
- HUBERT B., BRICE D., CRONIER C., MILHAU B., MISTIAEN B., NICOLLIN J.P. & ZAPALSKI M.K. (2007) - Distribution of stromatoporoids, tabulate corals, brachiopods, trilobites and ostracods around the Hanonet - Trois-Fontaines Formations boundary (Givet, N. France) - Affinities and paleogeographical implications. [Abstract]. 1st International Palaeobiogeography Symposium, Paris, 10-13 juillet 2007. Résumé: 49.
- MISTIAEN B. (2005) - « The skeletal density variation in palaeozoic stromatoporoids : index of the climatic variations » [Abstract] In Alvaro & al (Eds) Climatic and evolutionary controls on paleozoic reefs and bioaccumulations. Meeting, Paris 7-8 sept 2005.

**Guide-book**

- MISTIAEN B., HUBERT B. & BRICE D. (2006) - Le Massif Primaire de l'Avesnois « De l'acmé du phénomène récifal à sa disparition » APBG Juillet 2006 Excursion M5AVE. : 1-53, 28 fig.
- MISTIAEN B., HUBERT B. & BRICE D. (2006) - Le Massif Primaire de l'Avesnois « De l'acmé du phénomène récifal à sa disparition » APBG Juillet 2006 Excursion M5AVE. Complément. : 1-10, 10 fig.
- MISTIAEN B. & BRICE D. (2007) – Le Givetien de Ferques, Bas-Boulonnais (carrière du Grisot et du Banc Noir) – Société Stinkal – Livret guide excursion, Société géologique du Nord, 28 avril 2007. : 1-13, 8 fig., 3 pl.

**CM Nonna OVNATANOVA (VNIGNI)**

I have just completed (together with Dr. L.Kononova) the Manuscript «Frasnian Conodonts of East of Russian Platform» with 24 Plates, 18 figs, 25 Tables.

The Manuscript is devoted to the memory of Vladimir Menner - the outstanding Russian geologist.

The Manuscript gives a detailed paleontological and stratigraphical characteristics of the Frasnian Conodonts of the eastern Russian Platform from Timan in the north to Orenburg Region in the south. This work is a continuation of the earlier published manuscript (Ovnatanova, Kononova, 2001) on the Frasnian conodonts from shallow-water shelf sections of the Russian Platform central regions, in which polygnathids are mainly developed. The Conodont assemblages from the Frasnian shallow-water shelf and basinal sections of the Volgo-Ural Province and South Timan are analysed. Problems and difficulties related to the correlation of the Frasnian

shallow-water shelf and basinal sections of the eastern Russian Platform, as well as to the existing zonal conodont scales are discussed. Basing on the ontogenetic rows drawn up for particular species of genera *Palmatolepis* and *Polygnathus* and the presence of transitional forms between some of the species phylogenetic scales for these two genera are presented. The zonal Conodont scales for the Frasnian shallow-water shelf and basinal sections of the Russian Platform are based on the above scales; the levels of their correlation with the existing zonal conodont scales are given. Some aspects of the biofacial control, based on the conodonts distribution in the sections studied, are discussed. Systematics contains descriptions of 91 species of the genera: *Ancyrodella*, *Mesotaxis*, *Palmatolepis* and *Polygnathus*, including new ones: *Palmatolepis menneri*, *Pa. kaledai*, *P. acutangularis* and *Polygnathus reitlingerae*.

**TM Eberhard SCHINDLER (Frankfurt, Germany)**

In 2007 several research activities have continued or were newly started – all of them are embedded in the IGCP Project 499 “Devonian land–sea interaction: Evolution of

ecosystems and climate” (DEVEC). Leading this project together with other colleagues was also one of the tasks throughout the year.

In the Moroccan Dra Valley two things are to be mentioned: A summarizing paper on the correlation of Lower and Middle Devonian sections of the area has been published in the memorial volume for Michael HOUSE (Geological Society Special Publications, JANSEN et al.). In the same area a project sponsored by the National Geographic Society (main applicant was TM Carlton BRETT) has been started bringing together a large group of Devonian workers from the United States, Morocco (TM A. EL HASSANI), and Germany (Senckenberg and Münster groups). The focus of the project lies on studies of trilobite-rich cyclic strata in selected sections of the Dra Valley (Anti-Atlas) applying a multiple approach. Besides biostratigraphy (including palynology), palaeontology, and sedimentology topics such as taphonomy, magnetic susceptibility, cyclicity, palaeoclimatology, etc. are to be investigated. A vast amount of samples has been taken and shipped to further processing to the US and Germany. Another Moroccan item has been ongoing work on a reef mound from Southern Morocco.

Among the continuing projects there is further work on Lower Devonian siliciclastic sections, especially from the highest part of the Lower Emsian at Alken (Mosel area of the Rheinisches Schiefergebirge). Work was put forward on two fossil-rich units in that section. Together with American colleagues (TM C. BRETT to be mentioned among others) correlation work of sections from the Rheinisches Schiefergebirge (Eifel and Sauerland areas) has continued. A talk focussing on palynological aspects was presented in Eureka at the joint SDS/IGCP 499 Meeting in Nevada (BROCKE et al.), another was given at a GSA Meeting on the correlation of German and Appalachian sections (BRETT et al.).

Another ongoing project is the Turkish-German cooperation (DEVEC-TR). In spring

work on material from last year's samples has been carried out together with colleagues at Istanbul University. Two talks, one focussing on the Central and Southern Turkish Taurids (SCHINDLER et al.), one comparing these regions with the Devonian of Northern Turkey (YILMAZ et al.) have been presented at the Nevada Meeting.

Work also continued with B. ELLWOOD on magnetic susceptibility of Devonian sections. Contributions were made to a joint paper on Givetian sequences and during the Nevada Meeting the classical Frasnian/Famennian section at Devils Gate has been sampled. In this field a former cooperation with colleagues from Vietnam has been reactivated – a first report was given at the Nevada Meeting (ELLWOOD et al.).

Another continuing work is the cooperation with our Spanish colleagues (TM Nacho VALENZUELA-RIOS and Teresa LIAO) on sections from the Spanish Pyrenees.

Together with Mena SCHEMM-GREGORY (Senckenberg) and American colleagues a new cooperation on Lower and Middle Devonian sections has been started supported by the German DAAD. It included field work as well as research on collection material (in Mena's case mainly with Alex BARTHOLOMEW, Gordon BAIRD, Chuck VER STRAETEN, George MCINTOSH, and others – for next year cooperative work is planned with Jed DAY); in my case field work was carried out together with Chuck VER STRAETEN and Dick LINDEMANN including finds of well-preserved dacryoconarids on which joint research is about to start.

Some more activities: The before mentioned meeting in Eureka (Nevada) has been attended. Two popular articles have been published on Devonian matters (see list below). Close to the end of 2007 I have been elected as secretary of the German SDS for the next four years term.

#### **Publications 2007** (in chronological order)

KÖNIGSHOF, P., LAZAUSKIENE, J., SCHINDLER, E., WILDE, V. & YALCIN, M.N. (2007): The IGCP Project 499: "Devonian land-sea interaction: Evolution of ecosystems and climate" (DEVEC)" – what has happened, what's coming up. – Subcommission on Devonian Stratigraphy, Newsletter, 22: 66-71; Münster.

BRETT, C.E., DESANTIS, M., BARTHOLOMEW, A.J., BAIRD, G.C. & SCHINDLER, E. (2007): Paleoenvironmental and eustatic context of Middle Devonian bioevents in Eastern North America and Europe. – Geological Society of America, Abstracts with Programs, 39 (1): 39; Boulder.

- JANSEN, U., LAZREQ, N., PLODOWSKI, G., SCHEMM-GREGORY, M., SCHINDLER, E. & WEDDIGE, K. (2007): Neritic–pelagic correlation in the Lower and basal Middle Devonian of the Dra Valley (S Anti-Atlas, Moroccan Pre-Sahara). – Geological Society of London, Special Publications, 278: 9-37; London.
- BROCKE, R., RIEGEL, W., HARTKOPF-FRÖDER, C., BRETT, C.E., SCHINDLER, E. & WILDE, V. (2007): Palynology and environment: A case study of the Eifelian-Givetian transition in its type area (Eifel Hills, Germany). – Subcommission on Devonian Stratigraphy and IGCP 499 Devonian Land Sea Interaction, Eureka, Nevada, 9-17 September 2007, Program and Abstracts: 17; Eureka.
- ELLWOOD, B.B., SCHINDLER, E., LUU THI PHUONG LAN & TA HOA PHUONG (2007): The Frasnian/Famennian boundary interval from the Xom Nha Cave section, Quang Binh Province, Central Viet Nam: Correlation to the type Kellwasser locality, Oker Reservoir, Harz Mountains, Germany, using magnetic susceptibility data sets. – Subcommission on Devonian Stratigraphy and IGCP 499 Devonian Land Sea Interaction, Eureka, Nevada, 9-17 September 2007, Program and Abstracts: 32; Eureka.
- SCHINDLER, E., WEHRMANN, A., YILMAZ, I., YALCIN, M.N., WILDE, V., SAYDAM, G., ÖZKAN, R., NAZIK, A., NALCIOGLU, G., KOZLU, H., GEDIK, I., ERTUG, K. & BOZDOGAN, N. (2007): Stratigraphy and facies of Devonian sequences from the Northern margin of Gondwana (Central to Eastern Taurides, Turkey). – Subcommission on Devonian Stratigraphy and IGCP 499 Devonian Land Sea Interaction, Eureka, Nevada, 9-17 September 2007, Program and Abstracts: 75-76; Eureka.
- YILMAZ, I., YALCIN, M.N., WILDE, V., WEHRMANN, A., UGUZ, M.F., SCHINDLER, E., SAYDAM, G., ÖZKAN, R., MANN, U., NAZIK, A., NALCIOGLU, G., KOZLU, H., KÖNIGSHOF, P., KARSLIOGLU, Ö., JANSEN, U., GEDIK, I., ERTUG, K., BROCKE, BOZDOGAN, N. & BAHTIYAR, I. (2007): The Devonian of Turkey – an attempt for comparison of Laurussioan and Gondwanan continental margins. – Subcommission on Devonian Stratigraphy and IGCP 499 Devonian Land Sea Interaction, Eureka, Nevada, 9-17 September 2007, Program and Abstracts: 90-91; Eureka.
- KÖNIGSHOF, P. & SCHINDLER, E. (2007): Devonforschung – Rückblick in die Jetztzeit. – Vernissage, 15 (10/07): 30-35; Frankfurt am Main.
- KÖNIGSHOF, P., BROCKE, R., JANSEN, U., SCHINDLER, E., WEDDIGE, K., WEHRMANN, A. & WILDE, V. (2007): Erdgeschichte im Wandel der Zeit: Ökosysteme und Klima im Devon. – Senckenberg 2005-2006: 40-41; Frankfurt am Main.

### **Cm Ladislav SLAVIK (Czechia)**

In 2007 our team at the Institute of Geology, ASCR, v.v.i. (Ladislav Slavik, Jindra Hladil and Leona Koptíková) was mostly involved in the project: „Integrated biostratigraphy of the Lower Devonian of Central Bohemia matched against magnetic susceptibility and gamma-ray logs in outcrops“ – supported by GAAV science foundation. There are already available interesting biostratigraphic and chemostratigraphic data from the Lochkovian and Pragian from dense sampling and measurements. Especially the transition between Lochkovian and Pragian, that is usually marked by drastic faunal and sedimentological change, is well traceable also in other measured parameters such as gamma-ray spectrometry and magnetic susceptibility.

In winter 2007 we started work on publication on this topic. In cooperation with Stana Berkyova and Jiri Fryda (Czech Geological Survey) we also continued our work on the “Choteč” project (“The effect of the Basal Choteč Event on faunistic communities of the Prague Basin”). Preliminary data from both projects were presented at San Juan field meeting of the IGCP 499 (Argentina) and the SDS meeting in Nevada. Together with Peter Carls and Nacho Valenzuela-Ríos we are working on the late Silurian – early Devonian global conodont correlation. Last year we published two papers on the late Silurian – early Devonian conodont correlation and early Pragian conodont stratigraphy.

### **Recent publications:**

- Slavik, L., Valenzuela-Ríos, J.I., Hladil, J. & Carls, P. (2007): Early Pragian conodont-based correlations between the Barrandian area and the Spanish Central Pyrenees. – *Geological Journal*, ISSN 0072-1050, 42 (5), p 499-512.
- Carls, P., Slavik, L. & Valenzuela-Ríos, J.I. (2007): Revisions of conodont biostratigraphy across the Silurian-Devonian boundary. – *Bulletin of Geosciences*, ISSN 1214-1119, 82, (2), p. 145-164.
- Slavik L., Hladil J., Koptíková L., Carls P. & Valenzuela-Ríos J.I. (2007): Integrated stratigraphy of the Lower Devonian in the Barrandian area, Czech Republic – A preliminary data from the Lochkovian. - In: G. Acenolaza, M. Vergel, S. Peralta, R. Herbst (Ed): Field Meeting IGCP 499 (IUGS/UNESCO) Devonian

- land-sea interaction: evolution of ecosystems and climate, Universidad Nacional de San Juan, San Juan, Argentina, May 13 - 23. Abstract book: 80-83. San Juan, Argentina.
- Carls P. & Slavík L. (2007): Zonation concept in stratigraphic correlation – a discussion. - In: Adriena Zlinská (Ed): 8. Paleontologická konference, Štátny geologický ústav Dionýza Štúra, Bratislava, June 14 - 15. Zborník abstraktov: 30. Bratislava.
- Carls P., Slavík L. & Valenzuela-Ríos J. (2007): Pridolian to Mid-Lochkovian Biostratigraphic time marks in Bohemia. - In: Over D.J., Morrow J. (Ed): Subcommission on Devonian Stratigraphy and IGCP 499 Devonian Land Sea Interaction, Eureka, NV, San Diego State University & SUNY-Geneseo, Eureka. SDS & IGCP 499, Eureka, September 9 - 18. SDS & IGCP 499 Eureka, NV 2007 Program and Abstracts: 24-25. Geneseo.
- Carls P., Slavík L. & Valenzuela-Ríos J. (2007): Succession of Biostratigraphic marks for the Early Emsian. - In: Over D.J., Morrow J. (Ed): Subcommission on Devonian Stratigraphy and IGCP 499 Devonian Land Sea Interaction, Eureka, NV, San Diego State University & SUNY-Geneseo, Eureka, September 9 - 18. SDS & IGCP 499 Eureka, NV 2007 Program and Abstracts: 22-23. Geneseo.
- Koptíková L., Hladil J., Slavík L. & Frána J. (2007): The precise position and structure of the Basal Chotec Event: lithological, MS-and-GRS and geochemical characterisation of the Emsian-Eifelian carbonate stratal successions in the Prague Syncline (Tepla-Barrandian unit, central Europe). - In: Over D.J., Morrow J. (Ed): Subcommission on Devonian Stratigraphy and IGCP 499 Devonian Land Sea Interaction, Eureka, NV, 2007, San Diego State University & SUNY-Geneseo, Eureka, September 9 - 18. SDS & IGCP 499 Eureka NV 2007 Program and Abstracts: 55-57. Geneseo.

## **Tm V. TSYGANKO (Russia, Syktyvkar) 2003–2007**

In July 2003, I studied Lower Devonian sections on the western slope of the Northern Urals and in August, I took part in the 9<sup>th</sup> International Symposium on Fossil Cnidaria and Porifera (Austria, Graz, August 3-7). In 2004, I was one of the organizers of the 14<sup>th</sup> Geological Congress in the Republic of Komi (Syktyvkar, April 13-16), and made two presentations at the 32<sup>nd</sup> International Geological Congress (Florence, Italy, August 8-22). In 2005, I participated in the International Symposium «Geology of reefs» (Syktyvkar, July 4-6), International Conference «Devonian Terrestrial and Marine Environments: From Continent to Shelf» (IGCP 499 Project) and SDS joint field meeting (Novosibirsk–Altai, July 25 – August 9). In 2007, I took part in the 4<sup>th</sup> International Mineralogical Seminar «Mineralogy and Life:

The Origin of Biosphere, Coevolution of Mineral and Biological Worlds, Biomineralogy» (Syktyvkar, May 22–26), 10<sup>th</sup> International Congress on Fossil Cnidaria and Porifera (Russia, St. Petersburg, August 12-16), scientific-practical conference «Study, Preservation, and Usage of the Objects of Geological Heritage in the Northern Regions» (Syktyvkar, September 4–8) and in all-Russian scientific-practical conference «Upper Paleozoic of Russia: stratigraphy and paleogeography» (Kazan, September 25-27). Within the framework of the 10<sup>th</sup> International Congress on Fossil Cnidaria and Porifera, I, together with T. Beznosova and V. Lukin, organized and conducted a field trip to Paleozoic sections of the Subpolar Urals (August 6–10, 2007).

### **RECENT PUBLICATIONS**

- Tsyganko V.S. (2003) Paleontologicheskie ostatki i immanentnaya charakteristica statonov. – Paleontologiya i pryrodopol'zovanie: Abstracts. XLIX sessiya Paleontologicheskogo obshshestva. St. Petersburg. P. 199-200. (in Russian)
- Tsyganko V.S., Lukin V, Yu. (2003) Tabulata i rugozy verchnego devona v bassejne Pechorskoj Pizhmy (Srednij Timan). – Syktyvkarskij paleontologicheskij sbornik № 5. Syktyvkar: Geoprint. P. 26–54. (in Russian)
- Tsyganko V.S. (2003) Systematical importanse of the skeletal elements of Devonian Cystimorph Rugose – 9<sup>th</sup> International Symposium of Fossil Cnidaria and Porifera: Abstracts. Austria, Graz. P.109–110.
- Tsyganko V.S. Role of the Devonian Rugosa in organogenic constructions of the North Urals – Ibidem. P.111.
- Tsyganko V.S. (2004) Dinamika raznoobrazia devonskich koralllov rugoz Timano-Ural'skogo regiona. – Biosfernnye processy: paleontologia i stratigraphia: Abstracts. L sessiya Paleontologicheskogo obshshestva. St. Petersburg. P. 135-137. (in Russian)
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**CM Chuck VER STRAETEN (Albany, New York, U.S.A.)**

My present research is focused in two directions: Devonian studies, and the preservation of airfall volcanic ash layers in different depositional environments. The Devonian studies are concentrated on: 1) Emsian-Eifelian stratigraphy/sedimentology, including collaborative biostratigraphic work in the Appalachian basin, eastern U.S.; 2) Emsian sea level history and global correlations; 3) Devonian volcanic K-bentonites and tuffs in eastern North America; and 4) Lower to Middle Devonian (Acadian) orogenesis in eastern North America, from a foreland basin perspective.

Years of work on Emsian and Eifelian strata across the Appalachian Basin in the eastern U.S. culminated in 2007 with publication of a

paper in the new Geological Society volume dedicated to Michael House. The paper outlines a new basinwide stratigraphic synthesis and sequence stratigraphy for the interval. I was also co-author for another paper in the House volume, focused on Eifelian events that may be associated with the Kacak event (with Michael DeSantis and Carlton Brett).

Three of us had second successful expedition to central part of Appalachian Basin (states of Virginia, West Virginia, Maryland, Pennsylvania, in the eastern U.S.A.) to collect samples for biostratigraphic analyses of Eifelian, and especially Emsian age strata. With Dr. Eberhard Schindler (Senckenberg Museum of Natural History, Frankfurt, Germany) and Dr. Richard Lindemann

(Skidmore College, Saratoga Springs, New York, U.S.A.), we collected/collected samples for goniatites, dacryoconarids, conodonts, spores, ostracodes and brachiopods, for distribution to additional collaborators. During the previous fall, Lindemann, Bill Kirchgasser and I worked for a week in Virginia and West Virginia.

Other Devonian work during 2007 included:

- Continued documentation and study of Devonian volcanic tuffs and K-bentonites from eastern North America. At present, work is focused on documentation of beds, and their mode of preservation (e.g., single event bed, amalgamated ash falls, reworked ash) and implications for regional Devonian volcanism and tectonism. My additional ash preservation studies (e.g., in Eocene large and small lake systems, western U.S.) has greatly broadened my perspectives of processes and dynamics that act upon volcanic ash layers in subaqueous environments – and the resulting biases in the sedimentary record of ancient volcanism.

- Continued stratigraphic and sedimentologic study of Emsian and Eifelian age strata in eastern North America, with a first examination of same age strata in the western U.S. (at SDS/IGCP 499 meeting in Nevada, 9/07). Plan to return to Nevada to study those strata in 2008. In addition, opened discussions with potential international collaborators to further document global Emsian sea level history in the coming years.

- Submission of three Devonian papers (see below), on: Eifelian to Famennian mudrock sequence stratigraphy in western New York (with Carlton Brett and Brad Sageman); Emsian sequence stratigraphy, eastern U.S., and T-R Cycle Ib; and co-authorship on a paper with Carlton Brett, Gordon Baird, and Alex Bartholemew on Middle Devonian

sequence stratigraphy and T-R cycles in eastern North America.

- Presented a talk on the known record of Devonian volcanic tuffs and K-bentonites in sedimentary strata in eastern North America, and implications for regional explosive volcanism at that time. Given at a theme session “Caledonian Magmatism: Cross-Atlantic Connections — Again”, at the Northeastern Section meeting of the Geological Society of America, March 2007. Co-authors on the talk were Jeff Over and Gordon Baird.

- Presented a talk (SDS/IGCP 499 meeting, Nevada, 9/07) and submitted a paper (for an IGCP 499/SDS volume) on sea level changes through the Emsian Stage. Study based on recent detailed work in the eastern U.S. and literature search of the global record. The talk and paper proposes to subdivide Johnson et al.’s (1985) T-R Cycle Ib into five T-R Cycles. In 1985, little was known of Emsian sea level history, and the Emsian was generally interpreted to be of a relatively short duration. Recent sequence stratigraphic study by Ver Straeten (2007) and new geochronology portrays a different story.

For 2008, planned Devonian work includes: continued collaborative research on Emsian biostratigraphy in the eastern U.S.; further documentation of Upper Devonian K-bentonites in the Appalachian Basin (with Jeff Over, Bill Kirchgasser, Gordon Baird); study of Emsian strata in Nevada (with Maya Elrick, Mike Murphy and others), with a focus on sequence stratigraphy; and submit an invited manuscript on the sedimentary record of Devonian mountain building and volcanism. For a special GSA Memoir volume, “From Rodinia to Pangea: The lithotectonic record of the Appalachian region.”

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### POSTSCRIPTUM

The Chairman expresses his deepest thanks to Mrs. S. KLAUS who struggled hard to compile and re-format all texts. Word programmes can turn into nightmares. Mrs. M. LOEWENICH scanned and improved various figures.