INTERNATIONAL UNION OF
GEOLOGICAL SCIENCES
COMMISSION ON STRATIGRAPHY

—S—D—S—

SUBCOMMISSION ON DEVONIAN STRATIGRAPHY

NEWSLETTER No. 17

IMPORTANT EVENTS FOR 2001, 2002, & 2003

⇒15th International Senckenberg Conference (Frankfurt--May 11-21, 2001)

⇒SDS Business Meeting (Frankfurt —May 16, 2001)

⇒First International Palaeontological Congress (Sydney—July 6-10, 2002)

⇒Geology of the Devonian System (Syktyvkar—July 9-12, 2002)

⇒10th International Meeting on Early Vertebrates / Lower Vertebrates (Porto Alegre—May 5-9 2003)

December 2000

I. U. G. S Subcommission on Devonian Stratigraphy

Newsletter No. 17, **December 2000**

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The *Newsletter* appears annually following SDS meetings. Contributions may be sent to the Editor at any time during the year for inclusion in the next issue. Guidelines for consideration in the preparation of contributions are presented on the inside of the back cover.

The printing of this issue is 150 copies with 102 mailed to titular and corresponding members, 19 to honorary members, Chairmen of the Carboniferous and Silurian Subcommissions, IUGS and ICS officers, friends of the Devonian, and libraries. Remaining copies are available from the Chairman, Secretary, or Editor. The costs of preparation, printing and postage for the *Newsletter* are shared equally by SDS and The Department of Geology, University of Texas at Arlington.

The *Newsletter* can also be viewed in at the SDS World Wide Web site **http://sds.uta.edu**.

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EDITORIAL NOTES

This issue of the Newsletter brings together information of a very diverse nature. Missing from this issue is the document containing the Minutes of the business meeting held in Rio de Janeiro in August 2000. The Minutes will be placed on the SDS web site when they are made available and, hopefully, the Minutes will be available to the membership at the Frankfurt meeting.

The SDS has accomplished a great deal in the past four years and the Chairman has provided a summary of our collective work with a view toward the next four years. Please take time to complete and return the registration form (pg. 3) for the SDS Business Meeting to be held during the afternoon of May 16, 2001 in the Naturmuseum Senckenberg (Frankfurt). The form is also available in Microsoft Word format and Adobe Acrobat format at http://sds.uta.edu.

This issue contains a section devoted to documents relating specifically to the concerns about, proposals for, and controversies thereof surrounding the subdivision of various Devonian substages. If you missed the ongoing discussions pouring forth from members of the Frasnian Working Group, you can gain valuable insight into the passion of the FWG by visiting http://www.geneseo.edu/~frasnian/ administered by CM Jeff Over. Similar discussions, straw votes, etc., are available at http://www.es.mq.edu.au/mucep/emsian/index.htm for the Emsian Working Group. If other Working Groups wish to establish web sites and are in need of space, etc., I can offer the use of the same UT Arlington server that hosts the SDS web site. There are always work-study students in need of something to do and they can be pressed into service to put material into the proper format to develop the web site. Let me know if we can help in any way.

The organizers of the 15th International Senckenberg Conference – May 11 – 21, 2001(G. Plodowski, U. Jansen, P. Königshof, E. Schindler) have put together a superb meeting. Please complete and return the registration form on page 21 or download a Microsoft Word format and Adobe Acrobat format version at http://sds.uta.edu.

The year 2002 has the Macquarie University group hosting the First International Palaeontological Congress July 6-10 (2002) in Sydney. Specific questions regarding the Congress should be addressed to IPC2002@mq.edu.au. Overlapping in real time and geologic time is the International Symposium on the Geology of the Devonian System July 9-12 (2002) in Syktyvkar, Komi Republic hosted by the ICS of the Russian Academy of Sciences. Please contact organizer CM Vladimir S. Tsyganko at tsyganko@geo.komisc.ru.

In 2003, all SDS members are invited to attend the 10th International Meeting on Early Vertebrates / Lower Vertebrates May 5-9 (2003) in Porto Alegre, Brazil. Expressions of interest should be directed to Dr. Martha Richter via http://www.mct.pucrs.br.

CM Blieck and TM Turner have provided the membership with details of the impressive achievements and accomplishments of IGCP 328: Palaeozoic Microvertebrates Project (1991-1996). The report is also available at http://biodb.biology.ualberta.ca/wilson.hp/paleozoic/328.Final.Report.html.

It appears that the materials for the Special Issue of "Palaeogeography, Palaeoclimatology, Palaeoecology *Late Devonian Biotic Crisis: Ecological, Depositional and Geochemical Records* organized and edited by CM G. Racki and TM M.R. House will soon be in the hands of the P^3 editors.

Finally, the membership is treated to reports from 28 of its members with many reports containing several contributions.

MESSAGE FROM THE CHAIRMAN

Officers of subcommissions of the International Commission on Stratigraphy (ICS) are elected for a 4 year period between two International Geological Congresses. We, Rex Crick, Thomas Becker and myself feel encouraged by our re-election for the coming 4 years until the next IGC that will take place in Florence (Italy) in August 2004.

At the end of our first term it is the right moment to evaluate SDS activities of the past 4 years. The first task of SDS to define GSSP's for the seven Devonian stages was officially accomplished in 1997 by the publication of the Emsian GSSP in Episodes (vol. 20/4). However, duration of Devonian stages are long in comparison to other systems (between 5 and 10 Ma) and therefore or objective of the 4 past years was to start establishing a global Devonian chronostratigraphic chart with higher time resolution. And so the SDS activities mainly focused on definition of substages and/or additional stages using not only biostratigraphic methods, but also events, cyclicity, geochemistry, magnetosusceptibility. Discussion of the topic started in 1997 at the annual SDS meeting during a symposium on Devonian Cyclicity and Sequence Stratigraphy at the University of Rochester (NY). In 1998, after the SDS meeting in Bologna during ECOS VII, SDS held a provisional ballot concerning different proposals that were made for the subdivision of the Emsian, Frasnian and Famennian stages. The votes indicated a preference for a twofold subdivision of the Emsian and a threefold subdivision of the Frasnian and the Famennian. Arising from the discussion of these results at the SDS meeting in Morocco in 1999 working groups for the subdivision of the Emsian, Givetian, Frasnian and Famennian were established.

During the IGC at Rio de Janeiro in August 2000 SDS organized in collaboration with Dr Maria Antonieta C. Rodrigues (UE Rio de Janeiro) a symposium on **"Devonian Paleogeography and Paleoclimatology of Western Gondwana"** Twenty-three posters were presented and the seven following talks were given.

- Isaacson, P.E. - Silurian Devonian tectonic and paleogeographic Evolution of South America.
- Steemans, P. - Ordovician to early Devonian palynostratigraphy of Western Gondwana.
- Gerienne, P. - Early Devonian paleobotany of Western Gondwana.
- Loboziak, S. - Late early to late Devonian palynological events in Western Gondwana: an application to Northern Saudi Arabia.
- Marshall, J.E.A. - The Devonian of the Falkland Islands: A high latitude record of Gondwanan palynology, sea-level and climatic change.
- Streel, M. - Paleoclimatic evolution of the Late Devonian on palynological evidence.
- Boucot, A.J. - Silurian-Devonian paleobiogeography.

SDS also held its annual meeting (see minutes of the SDS Business Meeting in this Newsletter). Past SDS activities resulted in the edition of thematic volumes that were or will be published very soon:

- Subcommission on Devonian Stratigraphy - Fossil groups important for boundary definition. - Courier Forschungsinst. Senckenberg, **220:** 205 pp.
- Subcommission on Devonian Stratigraphy - Summary of GSSP's and recognition of Devonian series and stage boundaries in geographical areas. - Courier Forschungsinst. Senckenberg, n° ?: 350 pp. (in press).
- Proceedings of the SDS-IGCP 421 Morocco Meeting. - Travaux de l'Institut Scientifique - Série Géologie et Géographie physique, **20:** 146 pp. (in press).
- Moroccan meeting of the Subcommission on Devonian Stratigraphy (SDS) and IGCP 421, April 24th-May 1st 1999. Excursion Guidebook. - Notes et Mém. Serv. Géol. Maroc, **399** (in press).

The next SDS meeting will be held during the 15th International Senckenberg Conference at the Naturmuseum Senckenberg, Frankfurt am Main on May 16, 2001. (Please complete the registration form for the SDS Business Meeting on the next page). This meeting will mainly focus on the proposals arising from the working groups.

SDS thanks all members for their contributions and be aware we have to maintain our good reputation in the ICS. Indeed, in a letter of June 26, 2000 Dr. F. Gradstein and J. Ogg (incoming chairman and secretary of the ICS) write: "The Devonian Subcom-mission is truly the leading team within the International Commission on Stratigraphy".

P. Bultynck (Bruxelles)

REGISTRATION FORM FOR SDS BUSINESS MEETING

Naturmuseum Senckenberg, Frankfurt am Main, May 16, 2001 (afternoon)

First name:

Surname:

E-mail address:

Fax:

I will attend the SDS business meeting at the Naturmuseum Senckenberg	**yes**	**no**
I will present an oral contribution	**yes**	**no**
I will present a document	**yes**	**no**

Title of document or oral contribution

This form should be returned as soon as possible (before April 1st 2001) to the SDS secretary or Chairman

MINUTES FOR THE GERMAN SDS

At the end of last year, the titular members of the German SDS have been elected due to the end of the regular period; during the yearly meeting on February 12, 2000 in Frankfurt, the group also elected the chairman and secretary. After two withdrawals of TM's (and replacement of them according the further voting results), the following colleagues are the actual voting members of the German SDS: G. Becker (Frankfurt), T. Becker (Berlin), P. Carls (Braunschweig), C.-D. Clausen (Krefeld), H. Groos-Uffenorde (Goettingen), H. Jahnke (Goettingen), U. Jansen (Frankfurt), D. Korn (Tuebingen), F. Langenstrassen (Goettingen), H.-G. Mittmeyer (Schlangenbad), M. Piecha (Krefeld), G. Plodowski (Frankfurt), E. Schindler (Frankfurt), K. Weddige (Frankfurt), W. Ziegler (Frankfurt). During the meeting the TM's elected E. Schindler as chairman and U. Jansen as secretary.

The main activities of the German SDS have been devoted to the two working groups, i.e. on the subdivision of the Emsian and the Upper Devonian. About both topics, there have been submitted separate documents to the SDS business meeting in Rio (U. Jansen for the Emsian group and M. Piecha & E. Schindler for the Upper Devonian group) that can be found within this newsletter, too. Many of the German SDS members also contributed to activities of the international SDS, namely to the working groups for the subdivision of stages.

Few additional topics shall briefly be mentioned. There has been given a short note by a colleague from the Geological Survey of Hessen, Wiesbaden (T. Kirnbauer) about a recent dating of volcanoclastic material from one Hunsrueck Shale locality. When compared with the radiometric dates of the paper by Tucker et al. (1998) this rock unit - broadly agreed to be of Early Emsian age by biostratigraphic evidence - would be placed in the Middle Devonian. Such discrepancies have to be cleared by further research.

Another short report has been given by CM C. Hartkopf-Froeder (Geological Survey of Nordrhein-Westfalen, Krefeld) about a scientific drill hole in the Paffrath Syncline of the Rheinisches Schiefergebirge. In this area with an extremely low CAI, a core of more than 500 m of Upper Devonian rocks has been drilled. Especially the palynomorphs are of high interest and will be correlated with other fossil groups by a big research team.

Finally, there has been a brief discussion about the experiences with the 'Devonian Correlation Chart' edited by TM K. Weddige which is subsequently published and updated in recent volumes of 'Senckenbergiana lethaea'. Generally, the high value has been stressed - for detailed usage of the columns, however, further distinctions by additional explanations should be connected with single columns.

Eberhard Schindler (Frankfurt)

DOCUMENTS RELATING TO THE SUBDIVISION OF DEVONIAN STAGES

NEWS FROM THE EMSIAN WORKING PARTY

From the minutes of the SDS Meeting held in Morocco, it appeared clear that the SDS members had decided, by a large majority, for a twofold division of the Emsian. It remained, therefore, for our Working Group to decide:

1. the name for the substages, and
2. the level for the division

The Working paper was asked to address the second point first as we needed to come to some consensus regarding the basis for the position of the level for the boundary before naming the subdivisions.

We were asked to base our proposals on:

1. events related to the boundary we propose,
2. correlation between biostratigraphic data of different groups, and
3. non-biostratigraphic information.

Member of the Working Party were asked to submit documents relevant to the above and a number of items (all that were received) were posted on our home page that can be accessed via

www.es.mq.edu.au/mucep/

In order to ensure that the Working Party will have considered the questions carefully, an informal straw vote was carried out in December, 2000. Comments on this procedure and a summary of the results are presented.

PRELIMINARY CAUTIONARY COMMENTS FROM THE SECRETARY OF THE SDS

Before answering the Straw Vote I like to remind that the Working Group has been asked to act in the light of the preliminary vote conducted amongst all SDS members but there is not yet a formal vote on two substages. This will have to be achieved at the Frankfurt Meeting: If there are still any remaining objections, they should be raised now and be brought to the final discussion at Frankfurt.

I think it is much too early to decide on the precise level for a substage boundary since there is still a considerable lack of documentation concerning the precise entries of various taxa: *Po. inversus, Po. laticostatus, Gyro. gracilis, Now. cancellata*, marker brachiopods. Before any decision can be made, sections with NEW data need to be presented and I much hope that some new data will be available at Frankfurt. To give one example for my misgivings: Po. inversus has been recorded from below the entry of *Now. cancellata* at Cerveny lom Quarry in the Barrandian (Chlupac et al. 1979) but typical lower Emsian goniatite faunas, including *Mimosphinctes, Teicherticeras, Kimoceras* and *Gyro. laevis*, are said to overlap with *Now. cancellata in Central* Asia (Kim et al. 1979). For goniatite workers it would be difficult to support a level within the Anetoceratid faunal complex. There may be problems with dacryoconarid or polygnathid taxonomy that can solve the problem but I like to warn against a too hasty decision on a substage level.

RESULTS OF THE STRAW VOTE

There were 18 responses to the two questions posed:

1. A possible level for the division of the Emsian into two substages:

    a) Base of the *inversus* Zone (approximately the level of the first entry of *Nowakia cancellata* or *N. elegans*). The *Anetoceras* goniatite fauna appears to be extinguished at this level.

    b) Base of the *serotinus* Zone (approximately the level of the first entry of

    Nowakia richteri). Anarcestid goniatites appear worldwide at this level.

    c) Some other level (please justify)

2. Possible names for the substages:

    a) Early Emsian and Late Emsian

    b) Lower Emsian and Upper Emsian

    c) Zlíchovian and Dalejan

d) Some other names (please justify)

Voters included representatives from: Germany (5), Spain (2), Czech Republic (1), Belgium (1), France (2), Morocco (1), Russia (1), Tajikistan (1), Uzbekistan (1), USA (1), China (1), Australia (1).

Question 1

a) Base of *inversus* Zone or close proximity (*15 in favour*)

b) Base of *serotinus* Zone (*1 in favour*) Argument in favour of this included "The base of the *inversus* Zone in Tian-Shan coincides approximately with a level of change *elegans/concellata* and passes inside deposits with *Gyroceratites laevis, Erbenoteras, Mimosphinetes tripartitus* and other, and it not the best boundary for division of an Emsian stage on two substages. For Tian-Shan and I believe for the Urals, the most acceptable boundary would be a base of the *serotinus* Zone. It is close to the basis of a *richteri* Zone. From this level there is a considerable change in communities of benthic fauna. The zone *Megastrophia uralensis* and *Zdimir pseudopaschkirica* begins at this level."

c) Other [base of *"nothoperbonus* Zone"] (*1 in favour*) Argument in favour of this included "This level is critical in evolution of polygnathids as a start of the cavity inversion. At that time it coincides precisely to the start of the Daleje transgression (Daleje Event). Fortunately both these phenomena one can observe in the Barrandian "U Kaplicky" Quarry section."

Abstention (*1 in favour*). Argument in favour included: "At present I choose to reserve judgement on the position of the Emsian substages boundary. I have two reasons for this. I would like to have more data on:

1. Conodont biostratigraphy of the Emsian succession here in the eastern U.S., so that I can better understand its relationship to the global record (work presently in process by myself and Gil Klapper); and

2. More sedimentologic/facies descriptions of the interval in question, and a presentation of the relationship between the two proposed biostratigraphic levels and the position of significant lithologic/biofacies changes that would mark the position of a T-R cycle/stratigraphic sequence in the middle Emsian. Basically, I'd like to hear more from Working Party members about the successions they work on and know. The following questions come to mind:

a. Does one of the proposed levels occur closer to a major Emsian litho- and/or biofacies turnaround that marks a reversal from overall regression to overall transgression?

b. Does this occur at or near the "Zlichov-Daleje" contact, or correlative units in other areas?"

Please see Web page for continuation of this submission.

QUESTION 2

a) Early Emsian and Late Emsian (*6 in favour*)

b) Lower Emsian and Upper Emsian (*7 in favour*)

c) Zlíchovian and Dalejan (*2 in favour*)

d) Other (please justify)

1. To use Early/Lower and Late/Lower depending on context (*2 in favour).* Arguments presented include:

"In my point of view it should be avoided **at the present state** to deal with formal names. Until a determination of a boundary level and as long as a possible stratotype is not fixed, the informal names lower and upper Emsian (if the lithological rock sequence is considered) or early and late Emsian (if the time is considered) should be applied [note: both with small letters!]. About new names we should think after such decisions taking into account in which region/area a possible stratotype will be fixed."

And,

"The final decision on the substage names should be made when the boundary stratotype is defined. In my opinion, it is too early to think about names at present. The names should be chosen after the decision on a stratotype."

2. New name (*1 in favour*) Argument presented:

"The question is rather unnecessary at the moment. Emsian (early-lower, late – upper) as an informal name has already been accepted during the Morocco SDS-meeting in 1999. My opinion is that generally, at least at the category level of substages, a new name should be introduced in order to avoid confusions with hitherto used (and more or less defined) names. The new name should correspond with the GSSP name or at least with the name of the stratotype region. The lower Emsian substage is thus defined already by the current Emsian GSSP and therefore should be named "Zinzilbanian" (after the stratotype section Zinzilban) or so. If the upper Emsian substage will actually be defined for instance by a Bohemian GSSP, e.g. in the section "Cisarska rokle", the substage should be named "Cisarskian" (or so) – possibly "Dalejan", but only in that case that the spike sticks (in Cisarska) really at the regionally determined boundary between Zlichovian (limestones) and Dalejan (shales)." [See also argument proposed on the Web page.]

Summary

The straw vote stirred many members of the Working Party into action. Please refer to the Web page for submissions that came in with the vote. Prior to the meeting in Frankfurt all interested parties from all sections of the globe are urged to send in their comments, no matter how brief. At this stage the voting does not appear to reflect worldwide opinions and this should be rectified prior to final SDS decisions.

Ruth Mawson

SUBMITTED TO SDS/IGCP 421 MEETING IN MOROCCO

APRIL 24TH - MAY 3RD, 1999

COMMENTS ON PROPOSED EMSIAN, FRASNIAN AND FAMENNIAN SUBSTAGES

E.A.Yolkin

Institute of Petroleum Geology Siberian Branch of RAS, Novosibirsk, Russia

INTRODUCTION

Current discussion on substages is very important and productive. My point of view on substage numbers for all Devonian stages, except Pragian and Eifelian, is already expressed in the document that was submitted to the SDS (Yolkin, 1998). Two and three fold division of the Emsian Stage was discussed in our ECOS VII report (Yolkin & Izokh, 1998, 1999 in press). Herein, I would like to do some remarks to a subdivision of the Emsian, Frasnian and Famennian stages taking into account discussion appeared in the SDS Newsletters 14 and 15.

PRELIMINARY NOTES

Debating substage numbers in the Devonian individual stages, and levels for their separation as well, it is very important to remember about the benthic fauna. In general, evolutionary rates (steps) of its components coincide with time intervals that we consider now as substages. This is well documented in literature by successive sets of faunal associations and particular lineages. So, such units have a lowest chronostratigraphic rank that could be recognized by benthic fauna. It means that defining substage intervals we should take into account already established evolutionary levels according to benthic associations if we would like to apply them in chronostratigraphy. However, it seems that in some proposals there are not kept in mind this peculiarity of discussed subdivisions. For example, "Lower and Middle Frasnian" of Becker & House (1998) and Sandberg & Ziegler (1998) really are not recognizable by remains of benthic organisms. At that time, both these units taken together represent a subdivision called as "Lower Frasnian" that is well-traceable by shelly fossils. The same could be said about "Upper Famennian" of Ziegler & Sandberg (1997), Becker (1998) and others. I would prefer to keep this Substage as close as possible to the Strunian or Etroeungt (Bleick et al., 1988; Sartenaer, 1997; Streel et al., 1998). It contains well known transitional Devonian/Carboniferous benthic fauna that should not be mixed with certainly Devonian associations.

EMSIAN SUBSTAGES

According to a comparative analysis of ganinellan (trilobites) and polygnathid evolutionary rates (Fig.1; Yolkin & Izokh, 1998, 1999 in press), both two and three fold divisions of the Emsian Stage are principally acceptable. Both these Substage versions incorporate the basal Emsian GSSP (Yolkin et al., 1997) and, at the same time, are in a disargeement with a division of this Stage into Zlichovian and Dalejan particularly with position of the original lower Zlichovian boundary. Ivo Chlupac (1998) is right when he locates the present-day Pragian-Zlichovian boundary above the official Emsian base that is defined at the base of *kitabicus* Zone. He noted also that the lower Zlichovian boundary should be further re-studied and clarified in stratotype and in other Barrandian sections as well. Below I shall try to show most possible position of the lower Emsian GSSP in Barrandian sections 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 (35cm) 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 Barrandien to a certain level within the gap, above a top of the Koneprusy Limestone in the Zlaty kun quarries. In both Barrandian and South Tien Shan regions, below it, there are massive reef limestones with very similar benthic fauna. A start of wide Zinzilban transgression could be aligned also with the base of the Reporyje Limestone in the Stydle vody Quarry. Most likely their red colour is caused by the post-Koneprusy erosion of 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 & Ellwood, 1997, 1998). They demonstrate a presence of the only sharp MSEC level located between the bases of Pragian and Dalejan. These are "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 most Devonian sections of the former USSR and coincides with the most sharp changes in 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 Ellwood could go to the 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 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 *P. nothoperbonus* corresponds to the appearance of *Pol. laticostatus* (Yolkin & Izokh, 1988) i.e. to the level considered as a version of the lower Dalejan 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 Kaplicky" Quarry (Chlupac, 1998). The *Polygnathus dehiscens* is identified in both samples but illustrated only from the sample 5 (Chlupac et al., 1980, Pl.21, figs.2-3, 4). In spite 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 *excavatus* Zone or the Norbonak Horizon of the Kitab Reserve area (Yolkin et al., 1994b). This position for considered boundary is too high because in this case the whole Zlichovian will embrace only a part of *excavatus* Zone. Thus, if we shall try to clarify the lower Zlichovian boundary in Barrandian sections, that is needed according to I.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 section 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 silicious 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 Central Asia. They permit to propose three substages for the Emsian Stage: "Lower Emsian" (=Zinzilbanian), "Middle Emsian" (=clarified Zlichovian) and "Upper Emsian" (=Dalejan). The boundaries of these units coincide with evolutionary levels according to pelagic and benthic fauna (Fig.1; Yolkin & Izokh, 1998, 199 in press). They are well-recognizable and well traceable by: (1) undoubted conodont line-

age from the single Emsian succession (Yolkin et al., 1994b), (2) biologic, sedimentary and MS event levels (Yolkin et al., 1994a; Walliser, ed., 1995; Crick & Ellwood, 1997, 1998), and (3) depositional cyclicity that had eustatic origin (Yolkin et al., 1997; Yolkin, 1998b).

FRASNIAN SUBSTAGES

As it was above and previously stated (Yolkin, 1998) the best division of the Frasnian Stage into substages is two folded. In shallow water environments of the Kuznetsk Basin (Yolkin et al., 1997) these two units are represented by two asymmetrical sedimentary cycles and traditionally are considered to be the "lower" and "upper" Frasnian. Their delimitative level is represented by transition from short but deep regression to wide transgression. In West Siberia this level, according to conodonts and shelly fauna as well, could be correlated with a start of the *Palmatolepis semichatovae* transgression (Ziegler & Sandberg, 1997).

FAMENNIAN SUBSTAGES

I prefer to accept the previous two fold division of the Famennian Stage in Russia and in Europe as well, i.e. to recognize "Lower" and "Upper" Famennian. An additional part of the Devonian succession, that appeared after removing of the D/C boundary to the base of sulcata Zone, could be separated as "Uppermost" Famennian with the lower boundary at the base of U. expansa Zone (Streel et al., 1998). Thus, my proposal is to recognize three substages: "Lower Famennian ", "Upper Famennian" and "Uppermost Famennian" (approximate equivalent of the Strunian).

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ON THE CORRELATION OF MIDDLE-EMSIAN

Conodonts, Dacryoconarids, and Goniatites

P. Bultynck, H. Lardeux, O. H. Walliser

This communication concerns faunal sequences within the La Grange Limestone (Calcaire de la Grange) which is situated in the Eastern Armorican Massif of North-Western France, 110 km SE of Rennes, 3 km NW of Chalonnes-sur-Loire. According to Lardeux (1980) the La Grange Limestone represents an olistholit within the structural unit Horst de Tombeau Leclerc, part of the Ancenis Synclinorium. The entire sequence is overturned and disturbed by faults. Therefore, in 1978, the authors investigated several sections within this locality. The results from two of the sections (A and B. in Bultynck, 1989, Fig.2) are presented here, because they offer a detailed correlation between conodont and dacryoconarid sequences, and thus a basis for further investigations of the biostratigraphy of the time-interval which is proposed for the boundary subdividing the Emsian Stage into two units. A first notice on the correlation of conodonts and dacryoconarids in the La Grange Limestone was given by Walliser, 1997.

The conodonts of the La Grange Limestone have been published by P. Bultynck, 1989. The zonation given in that publication is used here, with the exception that the upper part of the *gronbergi* Zone then used is now taken as separate, namely the *nothoperbonus* Zone.

Goniatites are relatively abundant in the La Grange Limestone. However, in the range-chart presented here only those taxa are set out which were found in the here mentioned sections A and D. Since this communication is not the place to discuss the necessary taxonomic revision, we here consistently use those names published by Erben (1960). As an exception a transitional taxon between *Gyroceratites laevis* and *G. gracilis* is set up as *Gyroc.* n. sp. *v.*

Concerning the dacryoconarids we recognize within the phylogenetic sequence from *Nowakia barrandei* to *N. richteri* at least 7 taxa which can be shortly characterized as follows. If possible, we thereby simply refer to corresponding figures in Lukeš, 1977. In order not to complicate a further detailed taxonomic revision, we use a certain kind of open nomenclature which is based on known species names. However, the term ssp.*t* we use for those taxa which we assign to the typical subspecies.

N. barrandei ssp. *t*: as shown in Lukeš 1977, pl. 1, fig. 1; specimens with 20 or more longitudinal slats per half circumference (in the following shortened to 20 LS/hc)

N. barrandei ssp. *p*: progressive subspecies with reduced number (14-18 LS/hc) of longitudinal slats. The reduction proceeds from lower to higher stratigraphic levels.

N. elegans: as shown in Lukeš 1977, pl. 1, fig. 2. This species also shows a reduction of the longitudinal slats in the course of evolutionary development. Between the prominent longitudinal slats, a significant thinner one is always intercalated, at least in the mature part of the shell. Those thin slats are only visible in well preserved material or in imprints on fine-grained shale. Remains of badly preserved speciments can be misinterpreted as *N. barrandei* or *N. cancellata.*

N. elegans – N. cancellata ssp. *i*: transitional forms between the two taxa. In the La Grange Limestone very rare and restricted to one layer.

N. cancellata ssp. *i*: as shown in Lukeš 1977, pl. 1, fig. 3. This taxon is characterized by the same alternation of thick and thin longitudinal slats as also developed with *N. elegans*. Differences between both taxa concern the shape of the shell and the formation of nodes at the cross-point of transversal rings and longitudinal slats. Concerning the recognition of the fine slats, there exists the same problem as mentioned with *N. elegans*.

N. cancellata ssp. *t*: representatives of the species with 6 to 12 prominent longitudinal slats, but without intercalated thinner slats.

N. richteri: a descendant of *N. cancellata*, but smaller in size and with less than 6 longitudinal slats.

Closing the dacryoconarid part of this communication, we would like to emphasize the following: since the concep-

tion on the concerned dacryoconarid taxa strongly varies with the authors, the finally chosen index-taxon should be defined by a distinct morph of the concerned species.

Conclusion. We support a subdivision of the Emsian Stage. The upper unit could be called Dalejan (one of the authors, Walliser, proposes to call the lower one Zlichovian, but only after a revision of its lower boundary, for which he prefers a level near to the base of the Zlichovian in its traditional sense. He also prefers to finally handle the two new units as stages). The base of the Dalejan should be chosen in coincidence with the "natural" boundary, which is caused by a transgression, and recognized in many regions, as e.g. in Bohemia and the Tafilalt, by a change from a limestone sequence to a pelitic one, and by a major faunal change (Daleje Event). The event-level is near the traditional "*gracilis* or *cancellata* boundary". However, since all other Devonian stage-boundaries are charaterized by conodonts, this procedure should also be applied to the Zlichovian-Dalejan boundary.

Within the La Grange Limestone, *N. cancellata* (ssp. *i* and the typical ssp. *t*) occurs in the *inversus/laticostatus* Zone (in the sense of Bultynck, 1989), thus stratigraphically higher than the first occurrence of *Polygnathus inversus*, and in any case above the *Po. nothoperbonus* Zone. These results should now be controlled in as many sections as possible. As a procedure which is adequate in order to reach the best result, we propose to choose an index-species not in advance, but rather to investigate at first intensively the interval from *N. elegans* to *N. richteri*, and to choose the indicating conodont taxon in a final procedure as a result of the recognition of the most suitable level in the above mentioned intention of choosing a "natural" boundary.

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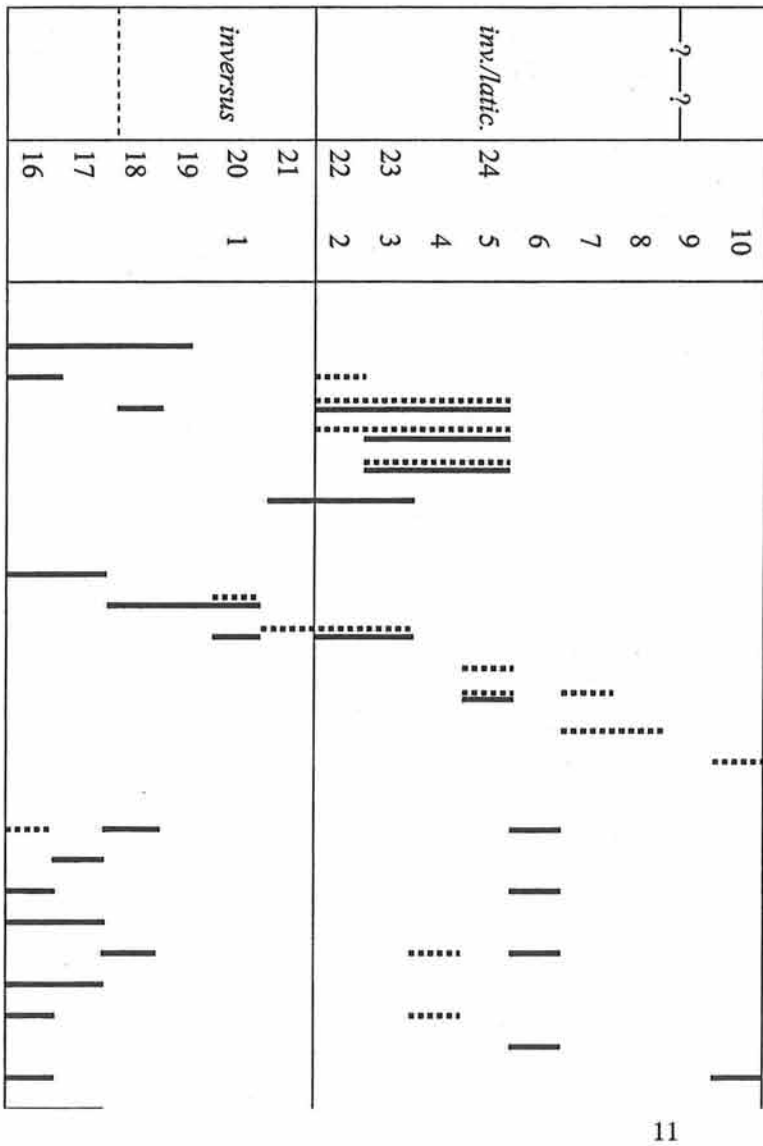

Table 1: Range-chart of selected species, occurring in the middle part of the Emsian in two sections of the La Grange Limestone. Solid lines: from section A; dotted lines: from section D.

CORRELATION OF THE PROPOSED CONODONT BASED UPPER DEVONIAN SUBSTAGE BOUNDARY LEVELS INTO THE NERITIC AND TERRESTRIAL MIOSPORE ZONATION

(Maurice Streel and Stan Loboziak, Rio SDS meeting, 07/08/2000)

(MARINE-NON MARINE CORRELATION / FRASNIAN AND FAMENNIAN SUBSTAGES WORKING GROUPS)

INTRODUCTION

No miospores are known from the Global Stratotype Sections for the base of the Frasnian Stage and the base of the Famennian Stage in the Montagne noire, in southern France. However, Frasnian miospores occur with conodonts in the Ferques railroad section , in the Boulonnais area, north of France, allowing correlation with the conodont zonation (Streel & Loboziak in Bultynck et al. 1987, Streel et al. 1987, Streel & Loboziak 1996). Famennian miospores occur with conodonts in the Ardenne (Dinant Synclinorium) but adverse conditions in lateral transport and probably poor vegetation cover prevent to use criteria of first occurrence of species for erecting a zonation below the middle Famennian. Furthermore conodonts are rare in the Ardenne during the Late *trachytera* - Early *expansa* interval (Streel 1986, fig. 2).

1. Base of a Middle Frasnian substage defined by first occurrence of *Palmatolepis punctata* (base of MN Zone 5 and base of *punctata* Zone) Becker & House, 1999 SDS Newsletter 15, 17-22.

The conodont zonation was first demonstrated in the Ferques railroad section by Bultynck (in Brice *et al.*, 1979). The first occurrence of *Ancyrodella gigas* was later noted by Coen (in Brice *et al.*, 1981) in the unit P within the Noces Member of the Beaulieu Formation. This first occurrence approximately corresponds to the base of the old middle *asymmetricus* Zone which is now the *punctata* Zone (Ziegler & Sandberg 1990).

Two successive Oppel Zones of miospores, *Samarisporites triangulatus - Chelinospora concinna* (TCo) and *Verrucosisporites bulliferus - Cirratriradites jekhowskyi* (BJ), are present in this section (Loboziak & Streel , 1980 and 1981; Streel *et al.*, 1987). In about the same timespan Richardson & McGregor (1986) defined two Assemblage Zones , the *Contagisporites optivus* var. *optivus - Cristatisporites triangulatus Zone* and the *Archaeoperisaccus ovalis - Verrucosisporites bulliferus* Zone. The limit between these Assemblage Zones corresponds approximately to the base of BJ (Streel *et al.*, 1987, fig. 13).

One biohorizon was selected by Streel & Loboziak (1996) in the same timespan.

The *V. bulliferus* FOB (First Occurence Biohorizon) occurs in sample 05 in unit O (Loboziak & Streel 1981, fig. 1). This Unit is a shale underlying a limestone (unit P) containing the conodont *punctata* Zone. *V. bulliferus* was absent in the five samples which have been studied below, in a 45 m interval above the base of the Beaulieu Formation. The *V. bulliferus* FOB might belong either to the conodont *punctata* Zone or to the conodont *transitans* Zone and might therefore be a good miospore characteristic of the base of a Middle Frasnian Substage as defined above.

2. Base of an Upper Frasnian substage defined near the base of the *rhenana* Zone Ziegler & Sandberg, 1997, SDS Newsletter 14, 11.

Conodonts have not been found in the Briqueterie de Beaulieu section where the late Frasnian Hydrequent Formation contains rich assemblages of miospores and acritarchs (Loboziak & Streel 1981, Loboziak *et al.* 1983). However, in the La Parisienne Quarry, 500 m north of the Briqueterie de Beaulieu, in the upper part of the Ferques Formation which underlines the Hydrequent Formation, *Ancyrognathus coeni (Ancyrognathus triangularis euglypheus in* Brice et al. 1981, p. 163) is present indicating the conodont Late *hassi* or *jamieae* Zones (Ziegler & Sandberg 1990).

On another hand the upper part of the Hydrequent Formation contains acritarchs (Loboziak *et al.* 1983) e.g. the first occurrence of the acritarchs *Visbysphaera (?) occultata* and *Ephelopalla media* which represent good markers for the transitional Late *rhenana-linguiformis* Zones timespan (Martin 1993, Bultynck & Martin 1995).

The Hydrequent Formation of the Briqueterie de Beaulieu section displays three miospore zones: the upper part of the *Verrucosisporites bulliferus - Lophozonotriletes media* (BM) Oppel Zone and the still unformal zones "IV" and "V". Zone "IV" has some similarity, in miospore composition, with the latest Frasnian *Cristatisporites. deliquescens - Verrucosisporites. evlanensis* (DE) Zone of eastern Europe (Avkhimovitch *et al.* 1993, fig. 4). The DE zone, starts with the entry of *Cymbosporites acanthaceus* = *Cymbosporites* sp. *B of* Loboziak & Streel 1981 (Avkhimovitch et al., 1988, p. 563) and corresponds to the Late *rhenana* conodont Zone in eastern Europe (Obukhovskaya *et al.* in press).

The *C. acanthaceus* FOB belongs to the interval Late *hassi* to late *rhenana* conodont Zones and might therefore serve as a provisional miospore characteristic of the base of an Upper Frasnian Substage as defined above.

3. Base of a Middle Famennian substage at the base of the Latest *crepida* Zone.

Sandberg & Ziegler 1999, SDS Newsletter 15, p. 45: "The only other usable position (for the Lower/Middle Famennian limit), easely recognized in conodont faunas is the Latest *crepida* Zone (but this position is too low for approximately equal threefold subdivision of the Famennian)".

Miospores are poorly represented in the early Famennian of western Europe and eastern North America, the tropical southern Euramerica. They are abundant, on the contrary, in eastern Europe and western North America, the equatorial northern Euramerica (Streel *et al.* 1990) where the genus *Cornispora* ,a very distinctive miospore, has its first occurrence in the early-middle Famennian range. In eastern Europe (Pripyat Depression), *Cornispora monocornata* first occurs (Avkhimovitch *et al.* 1993, p. 88) within a *rhomboidea* conodont Zone (Krutchek 1974). In western Canada, *Cornispora monocornata* and *C. varicornata* characterize a very distinctive biozone which, in the Arctic Red River section, yielded an upper *crepida* conodont assemblage, close to the lower boundary of the miospore zone (Braman & Hills 1992, p. 12).

The first occurrence of *Cornispora* in the northern Euramerican belt belongs to the interval late *crepida* to late *rhomboidea* conodont zones and might therefore serve as a provisional miospore characteristic of the base of a Middle Famennian Substage in these regions..

4. Base of a Middle Famennian substage at the base of the Early *marginifera* Zone. Ziegler & Sandberg 1997, SDS Newsletter 14, 11.

As stated by Streel & Loboziak (1999, p. 46), that level is closed to the base of the *Grandispora famenensis* FOB, a distinctive miospore which first appears in the Late *rhomboidea* or the Early *marginifera* (Streel & Loboziak 1996). *G. famenensis* var. *minuta,* a variety with reduced ornamentation, first occurs in the upper part of the Esneux Formation (Condroz Sandstone Group), immediately followed by the first occurrence of the typical variety (*G. f.* var. *famenensis*), a succession also observed at the Eletz/Petrikov limit in Byelorussia (Loboziak *et al.* 1997). Thus the *G. famenensis* FOB appears to be a good marker for long distance correlation within the southern and northern provinces of Euramerica.

5. Base of a Middle Famennian substage (threefold system) or an Upper Famennian substage (fourfold system) at the base of the Latest *marginifera* Zone.

Becker, SDS Newsletter 15, p. 15: "...*Pemoceras* and *Protomoceras* (which) spread slighly below the entry of *Scaphignathus velifer* in conodont terms, the base of the old *velifer* Zone (now Uppermost or Latest *marginifera* Zone) seems an acceptable level."

A very distinctive miospore, *Retispora macroreticulata,* first occurs in the lower part of the Montfort Formation in the Comblain-au-Pont/Bon Mariage section in the Ourthe Valley, Dinant Synclinorium, into a rock sequence containing conodonts of the Latest *marginifera* Zone (Bouckaert *et al.* 1968). *R. macroreticulata* is considered (Streel et al. 1999) as an ancestor of *R. lepidophyta* (See **7.**).

6. Base of an Upper Famennian substage (threefold system) at the base of the Early *expansa* Zone. Sandberg & Ziegler 1999, SDS Newsletter 15, p. 45

As stated by Streel & Loboziak (1999, p. 46), that level is poorly known in the Franco-Belgian basins where conodonts are rare at that level. Consequently no miospores can be proposed to characterize that level.

7. Base of an Upper Famennian substage (fourfold system) at the base of the Late *expansa* Zone

Streel *et al.* (1999) have reported that foraminifers, miospores, and to a lesser extent, conodonts and ostracods have been discovered in many localities across the Dinant Synclinorium. However, it is in the eastern part of Belgium, notably in the Ourthe Valley, a classical area for the lithostratigraphy of the middle and late Famennian, that these biostratigraphical data are the most reliable. In ascending order these are : 1) first occurrence of the worldwide distributed and very distinctive miospore *Retispora lepidophyta,* 2) foraminifers of the Df3δ Zone with bilaminated *Eoendothyra (E. communis radiata* and *E. radiata)*, characterized by a radial inner layer, associated with conodonts belonging to the Late *expansa* Zone including *Bispathodus ultimus*, 3) first occurrence of *Quasiendothyra kobeitusana* (Df3ε Zone)

The same sequence of miospores and foraminifers is observed in the type area of the Strunian (Avesnois, northern France), at levels situated more than 100 m below the Etroeungt Limestone, i.e., near the base of the Epinette Shales

If the Df3δ foraminifer Zone obviously belongs to the Late *expansa* Zone; it is still unknown whether the base of the *R. lepidophyta* Zone also belongs to the same conodont Zone, or better to the uppermost part of the Middle *expansa* Zone. The latter zone is found in the nearby Esneux railway section some 55 m below the Late *expansa* Zone.

The *R. lepidophyta* FOB, one the most common biostratigraphical marker used in Palaeozoic palynology, is a very good tool for long distance correlation.

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See Fig. 1

Document submitted to the Subcommission on Devonian Stratigraphy
Annual Meeting at Rio de Janeiro, Brazil, August 2000

SUBSTAGE SUBDIVISIONS OF THE FRASNIAN AND FAMENNIAN AND REDEFINITION OF THE GERMAN LATE DEVONIAN 'STAGES' (STUFEN)

Matthias Piecha (Krefeld) & Eberhard Schindler (Frankfurt)

The working group of the German SDS on the subdivision of the Late Devonian stages consists of the following 16 participants: AMLER, M.R.W. (Marburg), BARTZSCH, K. (Saalfeld), BECKER, R.T. (Berlin), BENDER, P. (Marburg), BLUMENSTENGEL, H. (Jena), BUCHHOLZ, P. (Braunschweig), CLAUSEN, C.-D. (Krefeld), GROOS-UFFENORDE, H. (Goettingen), HUENEKE, H. (Greifswald), KORN, D. (Tuebingen), PIECHA, M. (Krefeld), RIBBERT, K.-H. (Krefeld), SCHINDLER, E. (Frankfurt), SCHÜLKE, I. (Hannover), WEYER, D. (Berlin), ZIEGLER, W. (Frankfurt).

Since the last report at the annual meeting in Bologna, in June 1998, the German Late Devonian working group of the SDS met four times.

On October 24 and 25, 1998, a field trip to the Harz Mountains has been arranged, guided by Peter BUCHHOLZ and Heiko HUENEKE. Very interesting Late Devonian sections from the northern and southern parts of the Harz Mountains have been presented, even when these sections are unsuitable for the subdivision of stages, due to the extremly condensed character of their cephalopod limestone facies, to their location in shaly basinal facies with insufficient abundance of faunal groups, or to turbiditic limestone sedimentation with reworked conodonts (mixed faunas). Nevertheless, the members of the working group saw Upper Devonian strata with a variety of rocks from different facies realms located close to each other.

On August, 28 and 29, 1999, the members of the working group met for a fieldtrip to Late Devonian sections of the Frankenwald area. Harald TRAGELEHN from the University of Koeln guided the group. Famous classical sections have been visited as well as newly discovered Late Devonian sections. The Koestenhof Quarry (also known as 'Schuebelhammer' in the literature), a world-famous site for clymeniids, has been considered for investigations by the working group.

Two technical meetings have been held at the University of Marburg on February, 12, 1999, and on July, 3, 2000, where preliminary results of the working group were summarized and discussed.

Two alternative opinions about the problematical old German 'stages' are dominating the working group:

1. Redefinition in terms of chronostratigraphy of the German 'stages' as regional substages.

2. Lithostratigraphic definition of the German 'stages' in terms of groups and formations.

In any case, if the German 'stages' will be considered in the future, correlation of the boundaries with the Late Devonian substage boundaries (as proposed for the Frasnian and the Famennian into three substages in former submissions to the SDS by BECKER & HOUSE and ZIEGLER & SANDBERG, respectively) has to be distinctly clearified.

With respect to the position of the boundaries of an international subdivision of the Late Devonian, the members of the working group favour the following bases of substages, defined by conodonts:

Middle Frasnian: Base of the *punctata* Zone.

Late Frasnian: *Palmatolepis semichatovae* transgression, slightly above the base of the Early *rhenana* Zone. A second proposal, i.e. a level around the top of the lithological unit of the Lower Kellwasser Horizon, has also been discussed, but with minor support.

Middle Famennian: Base of the Early *marginifera* Zone.

Late Famennian: Two alternatives were discussed: Base of the Late *postera* Zone (directly above the *annulata* Event) and base of the Early *expansa* Zone (connected with a globally recognizable transgression). The latter is favoured.

The following German sections are currently investigated by participants of the working group:

- Behringhauser Tunnel section (northern part of the Rhein. Schiefergebirge), cephalopod limestones; Givetian to Lower Carboniferous.
- Ziegelei Nie Quarry (northern part of the Rhein. Schiefergebirge), basinal facies with shales, sandstones and nodular limestones (Kalkknotenschiefer); Early *rhomboidea* to Late *postera* Zone.
- Bohlen section (Thuer. Schiefergebirge), basinal facies with red shales and nodular limestones (Kalkknotenschiefer); entire Late Devonian.
- Kahlleite-E Quarry (Thuer. Schiefergebirge), cephalopod limestones; Frasnian to Lower Carboniferous.
- Effenberg Quarry (northeastern part of the Rhein. Schiefergebirge), nodular limestones; lower Famennian to Lower Carboniferous.
- Köstenhof Quarry (Frankenwald area), cephalopod limestones; tentatively ranging from the *marginifera* Zone to the Late *expansa* Zone, work on a more precise dating by conodonts is under way.

The selection of the sections listed above offers a very good opportunity for detailed correlations of various faunal groups (e.g. conodonts, ostracodes, goniatites, etc.) with respect to the traditional German 'stages' and to the new substages

15th International Senckenberg Conference

MID-PALAEOZOIC BIO- AND GEODYNAMICS: THE NORTH GONDWANA – LAURUSSIA INTERACTION

May 11 – 21, 2001

2ND CIRCULAR – FINAL REGISTRATION

A joint meeting of the 'International Geological Correlation Programme (IGCP) 421' and the 'Subcommission on Devonian Stratigraphy (SDS)' hosted by the 'Senckenbergische Naturforschende Gesellschaft' (SNG), Frankfurt am Main, will take place at the 'Forschungsinstitut und Naturmuseum Senckenberg' in Frankfurt am Main (Germany), May 15 – 17, 2001. In addition to the technical sessions, there will be two pre-symposium field trips and one post-symposium field trip. Field trips prior to the lectures will go to the Belgian Ardennes, May 11 – 12, 2001, and to the Rheinisches Schiefergebirge, May 13 – 14, 2001. After the technical sessions in Frankfurt, a field trip will go to the Thüringisches Schiefergebirge (May 18 – 19, 2001), and to the Barrandian area of the Czech Republic (May 20 – 21). During these trips, a broad variety of rocks generated in different facies inter-tidal to pelagic, will be visited – mainly Devonian, but also Carboniferous, Silurian, and Ordovician. A session of the IGCP 421 will be held in the morning of May 17, 2001, and a meeting of the SDS will take place in the afternoon of May 16, 2001.

Conference registration will be open starting from the afternoon of May 14, 2001 at the 'Naturmuseum Senckenberg', 2nd floor, room number 209 and the 'Icebreaker Party' is scheduled for that evening, beginning at 7.00 p.m. in the 'Dinosaur Hall'. A welcome party by the city of Frankfurt and by the 'Senckenbergische Naturforschende Gesellschaft' will take place in the evening of May 15, 2001.

Those participants who want to see specific Senckenberg collections, are asked for early information prior to the conference. Please, note that late demands, i.e. during the conference, can not be considered.

Climate during German spring in Frankfurt and in the areas of excursions may be temperate (about 20°C), but cooler conditions – including rain showers – must be considered.

The 3rd circular with the final program will be distributed to those participants who will reply to the 2nd circular and who will have paid the fees in March, 2001. Please, find a link to all forthcoming information via the Senckenberg homepage (http://www.senckenberg.uni-frankfurt.de); please, direct yourself to 'Research Institute – Senckenberg Conferences'.

ORGANIZATION

Please, contact one of the following persons (mailing address for all of them is: Forschungsinstitut Senckenberg, Senckenberganlage 25, D-60325 Frankfurt am Main):

G. Plodowski (phone: ++49-69-97075127, fax: ++49-69-97075137,

e-mail: gplodows@sngkw.uni-frankfurt.de)

U. Jansen (phone: ++49-69-97075146, fax: ++49-69-97075137,

e-mail: ujansen@sngkw.uni-frankfurt.de)

P. Königshof (phone: ++49-69-7542257, fax: ++49-69-7542242,

e-mail: pkoenigs@sng.uni-frankfurt.de)

E. Schindler (phone: ++49-69-97075132, fax: ++49-69-97075137;

e-mail: eschindl@sngkw.uni-frankfurt.de)

REGISTRATION

Besides the general organization costs, the registration fee includes the abstract volume, the proceedings volume, the icebreaker party and all coffee/tea etc. during the conference. The registration and payment of all fees is required until January 15, 2001 (deadline). Payment is possible by credit card or by bank account in German Mark [DM] or Euro [€] (Senckenberg bank account number: 5007380 at the BHF-Bank Frankfurt; Bank ID number: 50020200). In any case, the terms **'15th Senckenberg Conference'** and **'SNG 17346'** must be indicated.

Advanced registration fees (before January 15, 2001)		
Full participants	DM 300,-	€ 155,-
Students	DM 100,-	€ 50,-
Accompanying persons	DM 100,-	€ 50,-
Late registration (after January 15, 2001)		
Full participants	DM 360,-	€ 185,-
Students	DM 120,-	€ 60,-
Accompanying persons	DM 120,-	€ 60,-

Refunding will be possible until March 1, 2001 (with cancellation fee of 20%); after March 1, 2001 no refunding will be possible.

ACCOMODATION

In some hotels in the vicinity of the Senckenberg Museum, we have blocked rooms for the participants. The booking has to be done before January 15, 2001 (special prices, see listed hotels below). Booking must be done by yourself directly to the hotels listed below. Please, indicate **'15th Senckenberg Conference'**.

For booking of other hotels, please contact the 'Tourismus + Congress GmbH, Frankfurt am Main, Kaiserstraße 56, D-60329 Frankfurt am Main; phone: ++49-69-21238800, fax: ++49-69-21237880, e-mail: TCF-Info@frankfurt-main.de, internet: http://TCF.frankfurt-main.de'

Sophien Hotel, Sophienstraße 36, D-60487 Frankfurt am Main; phone: ++49-69-702034, fax: ++49-69-777370 (single room: DM 80,-; double room: DM 150,-)

Mercure, Voltastraße 29, D-60486 Frankfurt am Main; phone: ++49-69-79260, fax: ++49-69-97261606, e-mail: H1204@accor-hotels.com (single room: DM 195,-; double room: DM 260,-)

Novotel, Lise-Meitner-Straße 2, D-60486 Frankfurt am Main; phone: ++49-69-793030, fax: ++49-69-79303930 (single room: DM 179,-; double room: DM 246,-)

ABSTRACTS

Abstracts will be reviewed by the organizing committee and have to be submitted until January 15, 2001. They should be no longer than one page (German DIN A 4 format). The configuration of abstracts should be as follows: 2.5 cm space on each side of the sheet, lines single spaced, font: Times New Roman 10 pt. Extensive reference lists should be avoided. All abstracts should be sent as paper prints and in electronic version (diskette or e-mail as word document or .rtf file). Submissions must follow the example below:

Title of the submission (12 pt, bold)

Ralf MAIER, Bonn, Hans ZUFALL, Kassel & Ute FINGER, Berlin (12 pt)

Address(es): (10 pt)

Text of the abstract (10 pt), with names of genera and species in *italics*, volume numbers in references in **bold**, and all authors' names in SMALL CAPITAL letters.

Example for references (10 pt):

MAIER, M. & SCHMIDT, K. (1999): The example of giving references with *genera* and *species* names in abstract volumes. – Cour. Forsch.-Inst. Senckenberg, **555**: 23-39; Frankfurt.

PUBLICATIONS

Refereed and accepted papers will be published in a special volume of the Courier Forschungsinstitut Senckenberg (CFS) after the conference. The publications must be prepared in accordance to the instructions for authors, available at the conference office or from the editor of the CFS, Peter Königshof. The length of the contributions are limited to 25 pages (10 pt, 1.5 spaced) with a maximum of 3 plates. They must be submitted until August 1, 2001.

SCIENTIFIC SESSIONS

The lecture hall is situated at the 'Naturmuseum Senckenberg, Senckenberganlage 25, D-60325 Frankfurt am Main' (Festsaal, 2nd floor). All topics listed in the 1st circular can be incorporated into three sessions: geotectonics – evolution/stratigraphy – palaeogeography/regional geology.

May 14, 2001:	afternoon	Registration
	evening	Icebreaker Party' at the Senckenberg Museum
May 15, 2001:	morning	Welcome and opening of the scientific sessions
		Scientific sessions
	afternoon	Scientific sessions and poster presentations
	evening	Welcome party by the city of Frankfurt and the SNG
May 16, 2001:	morning	Scientific sessions
	afternoon	SDS meeting
	evening	Public lecture at the Senckenberg Museum
May 17, 2001:	morning	Scientific sessions
		Meeting of IGCP 421
	afternoon	Scientific sessions and poster presentations

Coffee, tea, soft drinks and snacks are available throughout the sessions.

PRESENTATIONS

The conference language is English.

Contributions in excess of the expected number of oral presentations may be accepted as posters by the organizing committee (only one presentation per participant). The time for oral presentations will be 15 minutes + 5 minutes for discussion. There will be two slide projectors, one overhead projector, and equipment for Power Point presentations.

Posters will be displayed also in the lecture hall (Festsaal) and in front of it. The space for poster presentations is 120 cm (height) x 100 cm (width).

FIELD EXCURSIONS PROGRAM

In case of exceeding numbers of registrations for the field trips, there must be a limitation of participants. Participation will be allocated on a 'first-come, first serve' basis. Therefore, you should make sure to register as early as possible for the field trips. Please, indicate if you need a single room accomodation or if you would agree to share a double room (in Saalfeld one of the rooms will be a four-bed room – please, indicate if this would be o.k. for you). If possible, please, denote a roommate you would prefer to share with.

May 11 – 12, 2001

PRE-CONFERENCE FIELD TRIP (V1): COUVIN AREA, BELGIAN ARDENNES

Organized by: P. Bultynck, J.-G. Casier, M. Coen-Aubert & J. Godefroid

Minimum number of participants: 20 Maximum number of participants: 35

Topics:

Late Eifelian – early Givetian formations: lateral facies changes and relationship with the Kacak Event and STRUVE's 'Great Gap'.

Lower part of the Frommelennes Formation: relationship with the Thaganic Event.

Lower part of the Frasne Group: auxilliary boundary stratotype for the base of the Frasnian at Nismes.

Late Frasnian Matagne and Valisettes Formations: relationship with Kellwasser Event and bearing on the distribution of reddish late Frasnian mud mounds.

For those participants who are not able to come directly to Couvin, there will be two ways to join this field trip (dates and meeting points to be announced in the 3rd circular):

a) transport from Bruxelles to Couvin on May 10, 2001, organized by P. Bultynck,

b) transport by coach from Frankfurt with the Senckenberg group on May 10, 2001.

Transport back to Frankfurt by coach is scheduled for late afternoon on May 12, 2001.

Excursion costs: DM 450,- (€ 230,-)

Including 2 nights in hotel with breakfast (nights of May 10 and May 11, 2001), 2 lunchpackages, guide book.

MAY 13 – 14, 2001

Pre-conference field trip (V2): Rhein/Mosel area and Lahn/Dill Synclines, Rheinisches Schiefergebirge

Organized by: U. Jansen, P. Königshof, G. Plodowski & E. Schindler

Minimum number of participants: 20 Maximum number of participants: 40

Topics:

On the first day, Lower Devonian rocks in clastic facies of the Rhein/Mosel area will be visited, among them the famous Hunsrück-Schiefer, Nellenköpfchen and Hohenrhein Formations, and Ems Quartzite. On the second day, Devonian sections of the Lahn and Dill Synclines with reefal and siliciclastic sections will be presented.

The excursion starts from Frankfurt on May 13, 2001 and will return to Frankfurt in the evening. The start for the second day on May 14, 2001 is also from Frankfurt. In the late afternoon the group will return to the Senckenberg Museum for the 'Icebreaker Party' of the conference.

Excursion costs: DM 150,- (€ 75,-)

Including lunchpackages and guide book.

Mark that overnight stay in Frankfurt on May 12 and May 13 is not included and has to be booked by yourself (addresses of hotels see above).

MAY 18 – 21, 2001

Post-conference field trip (N): Thüringisches Schiefergebirge and Barrandian area

Organized by: K. Bartzsch & H. Blumenstengel (Thüringisches Schiefergebirge); I. Chlupac (Barrandian area)

Minimum number of participants: 20 Maximum number of participants: 35

Topics:

On the first day, Upper Devonian to Lower Carboniferous strata in the Saalfeld area at the Southeastern flank of the Schwarzburg Anticline will be presented. The recently defined formations scheme of the pelagic sequences of this area are to be demonstrated, including Kellwasser, *annulata*, and Hangenberg Events. There will be a visit of an abandoned subsurface ore mine located in Ordovician strata of the central Schwarzburg Anticline. On the second day, strata of similar stratigraphical position will be shown in the Schleiz area of the Berga Anticline. Again, the recently defined formations schemes of the pelagic sequences for this area are to be demonstrated including the above mentioned events, in some cases with extraordinary features.

In the Barrandian area, on the third day, Ordovician to Middle Devonian strata of the Praha area will be demonstrated, including the Ludlow/Pridoli and Pragian/Zlichovian boundaries. On the final day, Silurian to Middle Devonian strata of the Karlstejn/Koneprusy area SW of Praha will be presented, including the Silurian/Devonian boundary.

This excursion can only be chosen as a combined field trip Thüringisches Schiefergebirge + Barrandian area. It starts from Frankfurt by coach and there will be an overnight stay in Saalfeld. In the afternoon of May 19, 2001, the trip will lead to Praha where the party will stay until the end of the excursion (including the night of May 21, 2001). For those who will be heading back to Frankfurt, transport by coach will be possible on May 22, 2001.

Excursion costs: DM 700,- (€ 360,-)

Including guide book, lunchpackages in the Thüringisches Schiefergebirge, and hotel for the night of May 18, 2001 + evening meal for that day. In the Barrandian area, 3 nights in the hotel are included. Lunch during the 2 days of the Barrandian field trip is not included; two lunch stops where cheap meals can be ordered on own costs will be arranged.

SOCIAL EVENTS

We will organize guided tours in the Senckenberg Museum, in the Botanical Garden (Palmengarten), and possibly in the Zoological Garden. A guided tour to historical places in the inner city of Frankfurt could be arranged. Please, inform us as early as possible about your wishes.

INSURANCE/VISA

All participants should note that they must have valid health and travel insurance; in case, please purchase prior to your departure.

Those who want to take part in the post-conference field trip to the Barrandian area, please check if you need visa for entering the Czech Republic.

LETTER OF INVITATION

If an official document is needed to confirm participation or help to get funding for travel and attendance, please write or contact the organizers.

PAYMENTS

Payment is possible by credit cards or by bank account in German Mark [DM] or Euro [€] (Senckenberg bank account number: 5007380 at the BHF-Bank Frankfurt; Bank ID number: 50020200). In any case, the terms **'15th Senckenberg Conference'** and **'SNG 17346'** must be indicated.

DEADLINES

Return of 2nd circular with final registration	January 15, 2001
Payment of registration fee	January 15, 2001
Payment of excursion fee(s)	January 15, 2001
Submission of abstracts	January 15, 2001
Submission of manuscripts for the proceedings volume	August 01, 2001

Payments (conference and excursions); after January 15, 2001, 20% more until January 31, 2001.

Costs – especially for the field trips – are calculated for a minimum number of participants. In case of higher numbers and/or additional funding by sponsors (to be found during the next months), the prices may be lower and refunding is well possible.

15th International Senckenberg Conference

MID-PALAEOZOIC BIO- AND GEODYNAMICS: THE NORTH GONDWANA — LAURUSSIA INTERACTION

Final registration form IGCP421/SDS Meeting; May 11 – 21, 2001
(please print clearly and indicate wishes by circles, please, send back until **January 15, 2001**)

Last name:

First name:

Degree:

Address:
Institution:
Street:
Zip code:
City:
Country:

Phone:
Fax:
e-mail, website:

Attendance:

Technical sessions:	yes	no
Excursion V1:	yes	no
Excursion V2:	yes	no
Excursion N:	yes	no

Presentation of oral lecture (15 minutes + 5 minutes discussion):
yes no (if yes, please give title below)

Presentation of poster:
yes no (if yes, please give title below)

Publication of contribution in proceedings volume (intention): yes no probably

I agree with putting my name onto a publicly accessible electronic list of participants (WWW)

Date, signature:

Russian Academy of Sciences
International Commission on Stratigraphy
Interdepartmental Stratigraphic Committee of Russia

International Symposium

GEOLOGY OF THE DEVONIAN SYSTEM

July 9-12, 2002
Syktyvkar

Russian Academy of Sciences, Interdepartmental Stratigraphic Committee of Russia, Institute of Geology of the Komi Science Centre of the Uralian Division of RAS in co-operation with Subcommission on Devonian Stratigraphy (SDS) of the International Stratigraphic Commission announce that an international symposium "Geology of the Devonian System" will be held on July 9-12, 2002 in Syktyvkar, Russia.

Organising Committee Bureau

Co-Chairmen:

Yushkin N.P., Academician of RAS, Director of the Institute of Geology of the Komi SC UD RAS
Bultynck P., Professor, SDS Chairman
Rzhonsitskaya M.A., Professor, Chairman of the Devonian Commission of ISC

Deputy Co-Chairmen:

Becker T., SDS Secretary
Bogatsky V.I., Director of the Timan-Pechora Research Centre
Tsyganko V.S., Head of Laboratory of Stratigraphy at the Institute of Geology of the Komi SC UD RAS

Scientific Secretaries

Beznosova T.M., senior research worker, Institute of Geology
Lukin V.Yu., junior research worker, Institute of Geology

Organising Committee Address

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Registration Form
Geology of the Devonian System
July 4-18, 2002

Last name:
First name:
Degree:
Institution:
Street Address:
Zip/postal code:
City:
Country:
Phone:
Fax:
E-mail:
Attendance:

Technical sessions:	yes	no	probable
Pre-Symposium excursion:	yes	no	probable
Post-Symposium excursion:	yes	no	probable

Oral presentation (intention; 15 minutes + 5 minutes for discussion)

yes no probable (if yes, please, give a tentative title below)

Poster presentation (intention):

yes no probable (if yes or probable, please, give a tentative title below)

The registration fee is 20$ USA (in rouble equivalent). The registration fee includes the right to receive proceedings of the Symposium and to take part in all general events.

Main Themes:

1. Evolution of Devonian sedimentary basins.
2. Main issues of Devonian sections subdivision.
3. Peculiarities in Devonian biota evolution.
4. Multidisciplinary approaches to subdivision and correlation of marine and continental deposits of the Devonian.
5. Patterns in the occurrences of hydrocarbon deposits in Devonian sediments.
6. Geology of Devonian stratiform solid mineral deposits.

The programme of the Symposium will include plenary sessions and sections as well as discussion of poster presentations. The working languages of the Symposium are Russian and English. Proceedings of the meeting will be published in the form of extended abstracts to four A4 pages in size, including figures, tables, and references. Russian participants are expected to submit both Russian and English variants of their abstracts (the latter may be shortened to two A4 pages).

Two field trips are planned for the participants.

The Pre-Symposium field trip (5-20 participants) scheduled on July 4-8 will visit the classic Devonian sections in South Timan (Ukhta Region) and an oil mine. Estimated fee is 180$ USA. Accommodation in a hotel (three nights, 15-20$ USA per night, to be paid by the participants) and a field camp.

The Post-Symposium field trip (5-20 participants) is to take place on July 13-18, with Devonian sections in the Subpolar Urals (Kozhym and Syv'yu rivers) as the target. Estimated fee is 300$ USA (provided more than 10 participants, the fee may be reduced to 250$ USA).

The fee for the trips includes the cost of transportation from Syktyvkar and back and meals.

Syktyvkar hotel rates are 15-20$ USA per night, meals 3-10$ USA daily.

Important Dates

Distribution of the First Circular - February 1, 2001

Preliminary registration - November 1, 2001

Distribution of the Second Circular - January 1, 2002

Deadline for the extended abstract submission - March 1, 2002

Distribution of the Scientific Programme - May 1, 2002

FIRST INTERNATIONAL PALAEONTOLOGICAL CONGRESS
6-10 JULY 2002, SYDNEY

Under the auspices of the International Palaeontological Association, the Australasian Association of Palaeontologists, and the Macquarie University Centre for Ecostratigraphy and Palaeobiology

Preliminary notification

and

Expression of Interest

Venue: Sydney, principally Macquarie University and the Australian Museum. There is abundant accommodation (student to 4-star categories) in the vicinity of Macquarie University.

Symposia (in parallel sessions) will include some or all of:

- Global extinction events: abrupt, gradual or polyphase
- Terrestrialization
- Evolution of pelagic communities through time
- "Black smoker" and "cold seep" faunas past and present
- Computer palaeobiogeography
- Organic-rich facies, faunas and genesis
- Experimental taphonomy and unusual preservation
- Biomineralization—including periodicity

- Early Palaeozoic vertebrate zoogeography
- Palaeozoic communities revisted
- High precsision biostratigraphic alignments
- Spongiomorphs
- Implications of advances in fossil plant anatomy
- Palynomorphs as environmental indicators
- Towards zonation of the Proterozoic
- Dinosaur evolution and biogeography
- Early mammalian evolution
- Cainozoic mammalian biogeography
- Molluscan functional morphology and biogeography
- Trace fossils
- Living fossils

Posters on any of the conference themes

Coupled with these will be:

Final meetings of IGCP 410 and IGCP 421

Proposed excursions (dependent on interest):

- Proterozoic–Cambrian of the Flinders Range, South Australia
- Ordovician–Silurian graptolite succession of SE Australia
- Palaeozoics of NE Queensland (Broken River region; Burdekin and Hodgkinson Basins) and the Canning Basin of Western Australia
- Palaeozoic fish
- Permian of the Sydney Basin
- Cainozoic vertebrates of Queensland
- Mesozoic sequences of New Zealand
- The classic Cainozoic sequences of New Zealand
- Cainozoic sequences of SE Australia
- Reef dynamics (Heron or Lady Elliot Island)

Note that the program may appear "light" as regards, for instance, foraminifers and conodonts. Forams 2002 will have taken place in Perth in early February. The international conodont symposium. ECOS-8 (Oviedo-Toulouse-Montpellier), is timed so that participants may conveniently link up with IPC 2002, including its pre-conference excursions and/or the Australian Geological Convention in Adelaide (30 June–5 July). However, such meetings should in no way inhibit presentation of contributions on any fossil group to any appropriate symposium.

Contacts:

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Specific questions might also be addressed to: IPC2002@mq.edu.au

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John Talent—tel.: (02) 9850 8336; e-mail: jtalent@laurel.ocs.mq.edu.au

In order to make this the best possible conference, incorporating your special interests, **please tick any of the above items which interest you and fax back to (02) 9850 6053.** This will enable us to eventually generate a better program and better home-page

Suggestions of associated meetings and workshops, and additional or alternative symposia and excursions:

I expect to be able to make a presentation and provide a manuscript for publication on:

Name:

Address:

Telephone

E-mail:

SUBJECT: IGCP 328 ACHIEVEMENTS
TIMING OF EARLY VERTEBRATE EVOLUTION
RESULTS OF IGCP 328: PALAEOZOIC MICROVERTEBRATES PROJECT (1991-1996)

*By Alain BLIECK * & Susan TURNER ***

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This volume contains results which have been obtained during the 6 years of the international co-operative geological research project UNESCO-IUGS IGCP 328: Palaeozoic Microvertebrate Biochronology and Global Marine/Non-Marine Correlation (1991-1996).

These papers are now published as a special issue of Courier Forschungs-Institut Senckenberg # 223 (Frankfurt am Main, FRG). The volume comprises 575 pages, 140 text-figs., 29 tables, 37 black-and-white photographic plates, 50 authors, 25 papers

Below please find the list of papers which have been presented to the volume. To obtain your copy please make contact with the editor of CFS: Dr. P. Königshof, Forschungs-Institut Senckenberg, Senckenberganlage 25, D-60325 Frankfurt a.M., FRG; pkoenigs@sng.uni-frankfurt.de .

PALAEOZOIC VERTEBRATE BIOCHRONOLOGY AND GLOBAL MARINE / NON-MARINE CORRELATION FINAL REPORT OF IGCP 328 (1991-1996) A. BLIECK & S. TURNER EDS

BLIECK, A. & TURNER, S. eds (2000).- Palaeozoic Vertebrate Biochronology And Global Marine/Non-Marine Correlation - Final report of IGCP 328 (1991-1996).- Cour. Forsch.-Inst. Senckenberg, 223 : 575 p., 140 figs, 29 tables, 37 plates, 50 authors, 25 papers; Frankfurt a.M.

CONTENTS

MARINE NON-MARINE CORRELATION AND DEVONIAN BIOZONATION (SDS REPORT 2000)

By Drs Alain Blieck and Susan Turner

<http://gause.biology.ualberta.ca/wilson.hp/paleozoic/Palaeozoic.News.html>

CONTRIBUTIONS TO BIOSTRATIGRAPHY

1) New synthesis of the Silurian-Devonian vertebrate assemblages and biozones of the Old Red Sandstones Continent (ORSC) [Blieck & Turner, 2000], with reviews of Lower Devonian assemblages (Blieck *et al.*, 2000), of Middle and Upper Devonian assemblages of the western ORSC (Elliott *et al.*, 2000), of Middle and Upper Devonian assemblages of the eastern ORSC (Mark-Kurik, 2000, and Esin *et al.*, 2000, respectively); including syntheses on various taxa (Talimaa, 2000 on thelodonts; Vergoossen, 2000 on acanthodians and chondrichthyans; Valiukevicius & Kruchek, 2000 on acanthodians; Ginter & Ivanov, 2000 on chondrichthyans). Also Ahlberg *et al.* (1999) on macrofossils of Scotland, Latvia and Russia; Ginter (2000) on microvertebrates of Thuringia; Ivanov & Derycke (1999) on *Omalodus*.
2) Synthesis of the Australian Devonian macro- and microfossil assemblages including thelodonts, placoderms, chondrichthyans, acanthodians, actinopterygians, and sarcopterygians, with data bases on systematics, biostratigraphy, and biogeography (Basden, 1999; Basden *et al.*, 2000; Jones *et al.*, 2000; Long & Trinajstic, 2000; Turner *et al.*, 2000; Young, 1999; Young & Turner, 2000).
3) Synthesis of Chinese, Devonian macro- and microvertebrate zonations (Zhu, 2000; Zhu *et al.*, 2000), including Lower Devonian of Longmenshan, Sichuan (Burrow *et al.*, 2000) and Upper Devonian of Guangdong province (Turner & Wang, in prep.).
4) New data from North and South Gondwana terranes — Spain, NW Africa, Iran, South Africa (Anderson *et al.*, 1999 a-c; Botella & Valenzuela-Rios, 1999 a-b; Derycke, in prep.; Gholamalian *et al.*, 2000; Ginter after material from Belka *et al.*, 1999; Valenzuela-Rios *et al.*, 1999; Verduyn, 2000).

CONTRIBUTIONS TO DEVONIAN STAGES AND SUBSTAGES DEFINITION

Turner (in a previous paper published in 1997) established an *Australolepis seddoni* thelodont zone for the early Frasnian; new data acquired by K. Trinajstic (UWA) from G. Klapper's collection allows correlation of the Gneudna and Gogo Formations to be made in Australia, as *A. seddoni* has been confirmed in the latter (Trinajstic, 2000). In addition *A. seddoni* has been found in the lowest beds of the Chariseh section of Central Iran dated as early Frasnian (Gholamalian *et al.*, 2000). Scales of the thelodont *T. hutkensis* also present in the same beds confirm the early Frasnian age for this taxon (not well-constrained in the type section at Hutk). Ginter's work (e.g., Ginter & Ivanov, 2000; Ginter & Turner, 1999) on the phoebodont shark teeth zonation also has relevance to the debate about Frasnian and Famennian Substages; zone phoebodont shark teeth are being found in Upper Devonian deposits of Iran as well (Hampe, in press; Yazdi *et al.*, in press).

OTHER MATTERS

See the list of publications appended here.

CONFERENCES

The 1999 Annual Meeting of IGCP 406 "Lower-Middle Palaeozoic Events Across the Circum-Arctic" took place in Jurmala (near Riga), Latvia, September 27 - October 2, 1999, in conjunction with the 4th Baltic Stratigraphical Conference (BSC), and included a field excursion to the Devonian of northeastern Latvia. The volume of extended abstracts from the Jurmala meeting has been published (Luksevics *et al.*, 1999b; also Luksevics *et al.*, 1999a for the abstracts of the 4th BSC).

The 9th Early/Lower Vertebrates Symposium & IGCP 406 Circum-Arctic Palaeozoic Vertebrates Conference took place at Flagstaff, Arizona, USA, May 15-19, 2000; with a post-symposium field excursion in Devonian fish localities of eastern Nevada and Utah. Corresponding abstract volume and field trip guide book have been published (Elliott *et al.*, 2000 b-c).

The Final Meeting of IGCP 406 – CAPV 2000 "Pan-Arctic Palaeozoic Tectonics, Evolution of Basins and Faunas" with pre- and post-meeting field excursions, took place in Syktyvkar, Russia, July 12-15, 2000. The volume of extended abstracts from the Syktyvkar meeting is available: Antoshkina *et al.* (2000b). Also available the guide books to the two field excursions: Belyaeva & Ivanov (2000) and Antoshkina *et al.* (2000a).

AB'S REPORT

— SYSTEMATICS

1) Biodiversity of pteraspidomorph faunas (*Handbook of Paleoichthyology*): Siluro-Devonian assemblages from boreholes of Poland; revision of Lower Devonian *Protopteraspis* of England (Blieck & Tarrant, in press); Lower and Middle Devonian heterostracans of Severnaya Zemlya, Russia (IGCP 406 project; collaboration with V.N. Karatajute-Talimaa, Vilnius); new localities from the Ardenne Massif, both in Belgium and the Grand Duchy of Luxembourg;
2) Re-evaluation of the phylogenetic relationships of pteraspidomorphs (ingroup and outgroup; *Handbook of Paleoichthyology*).

— BIOSTRATIGRAPHY

1) New synthesis of the Silurian-Devonian vertebrate assemblages and biozones (Blieck & Turner, 2000), with a review of Lower Devonian assemblages of the Old Red Sandstones Continent (ORSC) (Blieck *et al.*, in Blieck & Turner, 2000);
2) This synthesis should be extended to the whole Devonian (and eventually Carboniferous) assemblages of the Boulonnais-Artois-Ardenne area in northern France and Belgium (including agnathans, placoderms, chondrichthyans, acanthodians, actinopterygians, sarcopterygians; data bases on systematics, biostratigraphy, biogeography);
3) This project might as well be extended to the revision of the Lower Devonian localities from the Rhenish Slate Massif, Germany (incl. the same higher taxa; stratigraphical control through the miospore data and various invertebrate groups; collaboration with a team of scientists from the Senckenberg Natural History Museum, Frankfurt am Main, Germany), and to the Lower to Upper Devonian localities from the Holy Cross Mountains, Poland (collaboration with M. Ginter, Warsaw, and A. Ivanov, St Petersburg) (data bases on systematics, biostratigraphy, biogeography).

— BIOGEOGRAPHY / PALAEOECOLOGY

1) The partly unsolved problem of palaeogeographical relationships between the ORSC and Gondwanaland is, among others, dependent upon study of the Devonian-Carboniferous series of southern and Alpine Europe [Portugal, Spain, Italy, Austria; work in progress in collaboration with C. Derycke (Villeneuve d'Ascq), C. Perri & C. Spalletta (Bologna), S. Garcia-Lopez (Oviedo); see Verduyn, 2000, thesis];
2) A study of new Lower Devonian (Emsian) localities from Atlantic Canada is in a preliminary stage in collaboration with R. Cloutier (Rimouski Univ., Quebec); various fish assemblages are known there; co-occurring miospores + sometimes acritarchs + sometimes invertebrates should help in re-evaluating the classical paradigm "ORSC + fish = fresh water environments"; other conclusion will include taxonomy and biostratigraphy (correlation with North America and Europe).

— CURATION OF COLLECTIONS

The paper-printed and electronic catalog of Palaeozoic vertebrates of the Natural History Museum of Lille, France, is now completed; it includes mainly collections of agnathans and placoderms from the Lower Devonian, as well as chondrichthyans and osteichthyans from the Upper Carboniferous of northern France, plus various taxa from the Devonian to Permian of Europe and Canada (including the Frasnian locality of Miguasha, Quebec) (Blieck *et al.*, 1999; Malvesy & Blieck, 2000).

ST'S REPORT

— SYSTEMATICS

1) Biodiversity of thelodont faunas (*Handbook of Paleoichthyolog, Vol. 1 Agnatha,* editor Prof. Dr H.-P. Schultze, publishor F. Pfeil, München): Siluro-Devonian assemblages from England (Turner, 2000); Early to Late Devonian thelodonts of Australia (IGCP 421: North Gondwana breakup; Turner, in prep.); Siluro-Devonian microvertebrates of Canada and Russia (IGCP 406 project; collaboration with C.J. Burrow, J.M.J. Vergoossen, J. Savelle - see publication list, and papers in press and prep.); new localities from the central USA (Mayer *et al.*, 2000).

2) Re-evaluation of the phylogenetic relationships of thelodonts (ingroup and outgroup; *Handbook of Paleoichthyology*).

3) Biodiversity and systematics of early chondrichthyans: Devonian shark remains from Canada, USA and Australia (Cloutier, Miller & Turner talk at the Flagstaff meeting, papers in prep.).

—BIOSTRATIGRAPHY

See here above under "Contributions to Devonian Stages and Substages definition".

PUBLICATIONS 1999 – 2000

VOLUMES AND BOOKS

ANTOSHKINA, A., MALYSHEVA, E. & WILSON, M. V. H. eds (2000) [Antoshkina *et al.*, 2000b].- Pan-Arctic Palaeozoic Tectonics, Evolution of Basins and Faunas.- *Ichthyolith Issues, Special Publication* **6**: 166 p.

BLIECK, A. & TURNER, S. eds (2000).- Palaeozoic vertebrate biochronology and global marine/non-marine correlation — Final report of IGCP 328 (1991-1996).- *Cour. Forsch.-Inst. Senckenberg*, **223** : 575 p., 140 figs, 29 tables, 37 plates, 50 authors, 25 papers; Frankfurt a.M.

BOUCOT, A.J. & LAWSON, J.D. eds (1999).- *Paleocommunities: A case study from the Silurian and Lower Devonian* [IGCP 53 Project Ecostratigraphy Final Report].- World and Regional Geology Series, **11**: 895 p.; Cambridge University Press [includes three papers on fish assemblages (paleocommunities) and two other ones on invertebrates, but with informations on Devonian fish assemblages; see the list of refereed papers here below].

DINELEY, D.L. & METCALF, S.J. (1999).- *Fossil fishes of Great Britain*.- Joint Nature Conservation Committee, Peterborough (UK); *The Geological Conservation Review Series*, **16**: 675 p.

ELLIOTT, D.K., JOHNSON, H.G. & GILLETTE, D. eds (2000) [Elliott *et al.*, 2000b].- 9th International Symposium: Early Vertebrates/Lower Vertebrates (Flagstaff, Arizona, USA), 15-19 May 2000. Program + Abstracts: VI + 24 p.

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LUKSEVICS, E., STINKULIS, G. & KALNINA, L. eds (1999) [Luksevics *et al.*, 1999a].- The Fourth Baltic Stratigraphical Conference: Problems and methods of modern regional stratigraphy (Jurmala, Sept. 27-30, 1999). Abstracts: 127 p.; Riga.

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TURNER, S. & BLIECK, A. eds (1999).- Gross Symposium, Volume 3.- *Modern Geology*, Special Issue, **24** (1): 108 p., 47 fig., 9 tabl., 4 articles, 5 authors; Reading.

FIELD TRIP GUIDE BOOKS

ANTOSHKINA, A., MALYSHEVA, E. & MÄNNIK, P. eds (2000) [Antoshkina *et al.*, 2000a].- Subpolar Urals Field Trip Guidebook, July 16-23, 2000.- Supplement to *Special Publication 6 of Ichthyolith Issues*, 119 p.

BELYAEVA, N. V. & IVANOV, A. O. eds (2000).- South Timan Field Trip. Guidebook, July 6-11, 2000.- Supplement to *Special Publication 6 of Ichthyolith Issues*, 85 p.

BLIECK, A. (1999).- UPRESA 8014 Workshop: vertebrate Famennian localities (Upper Devonian) of the Ardenne massif: stratigraphy – palaeoenvironment – palaeobiogeography (Villeneuve d'Ascq and Belgium, 11-12 June 1999).- Field Trip Guidebook, 8 p. [mimeographed].

ELLIOTT, D.K., REED, R.C., JOHNSON, H.G., SCHULTZE, H.-P., SMITH, C.D. & DEHLER, C.M. (2000) [Elliott *et al.*, 2000c].- 9th International Meeting: Early Vertebrates/Lower Vertebrates (Flagstaff, Arizona). Field Guide, 20-27 May 2000. 95 p. + figs.

STINKULIS, G. (1999).- Field Trip "Devonian" Guidebook (Oct. 1-2, 1999).- In: 4th Baltic Stratigr. Confer. (Jurmala, Latvia, Sept. 27-Oct. 2, 1999): 50 p., 22 fig.; Univ. Latvia, Riga.

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AFANASSIEVA, O.B. (1999).- The exoskeleton of *Ungulaspis* and *Ateleaspis* (Osteostraci, Agnatha) from the Lower Devonian of Severnaya Zemlya, Russia.- *Acta Geol. Polon.*, **49** (2): 119-123.

ANDERSON, M.E., ALMOND, J.E., EVANS, F.J. & LONG, J.A. (1999) [Anderson *et al.*, 1999a].- Devonian (Emsian-Eifelian) fish from the Lower Bokkeveld Group (Ceres Subgroup), South Africa.- *Jl. Afric. Earth Sci.*, **29** (1): 179-193, 8 fig.; Elsevier, Amsterdam.

ANDERSON, M.E., LONG, J.A., EVANS, F.J., ALMOND, J.E., THERON, J.N. & BENDER, P.A. (1999) [Anderson *et al.*, 1999b].- Biogeographic affinities of Middle and Late Devonian fishes of South Africa.- In: BAYNES, A. & LONG, J.A. (eds): Papers in Vertebrate Palaeontology (VI Confer. Australas. Vert. Evol. Palaeont. System., CAVEPS 6, Perth, 7-11 July 1997). *Rec. W. Austral. Mus., Suppl.* No. **57**: 157-168; 9 fig., 1 tabl.; Perth.

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156, 5 fig.; Perth.

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BLIECK, A. & KARATAJUTE-TALIMAA, V.N. (in press).- Upper Silurian and Devonian heterostracan pteraspidomorphs (Vertebrata) from Severnaya Zemlya (Russia): a preliminary report with biogeographical and biostratigraphical implications.- In: GOUJET, D. (ed.), Palaeontology and stratigraphy of the Silurian-Devonian of Severnaya Zemlya, Russia (IGCP 406 volume). *Geodiversitas*, Paris.

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NEWSLETTER

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Announcement of conferences

OBRUCHEV SYMPOSIUM

Recent Problems of Palaeoichthyology

Moscow, Russia, December 5-8, 2000

FIRST CIRCULAR

AIMS AND OBJECTIVES

The memorial meeting dedicated to the 100th anniversary of the outstanding Russian palaeichthyologist Dmitry V. Obruchev is planned to be held in the Palaeontological Institute of the Russian Academy of Sciences, Moscow, on 5-8 December, 2000.

Dmitry Obruchev is renown for his prominent contribution to the world palaeontology and creation of a school of palaeoichthyologists. His research was dealing with a wide range of Palaeozoic vertebrate studies on morphology, phylogeny, systematics, histology and biostratigraphy.

Obruchev Symposium is aimed at emphasising current problems of the Palaeozoic lower vertebrate evolution.

A plenary session, a wide poster session and a workshop with the collections are planned.

In order to proceed with the organisation of the meeting you are requested to return a reply to this circular as soon as March 15, 2000.

OFFICIAL LANGUAGE

Official language at the Symposium is English.

SYMPOSIUM PUBLICATIONS

An abstract volume will be published. Symposium volume is also planned as a post-meeting publication.

Instructions for the abstracts will be sent in the second circular, which will be issued in April.

HEAD OF THE ORGANIZING COMMITTEE:

Emilia I. Vorobyeva, Corresponding Member of the RAS, Animal Evolutionary Ecology and Morphology Institute of the RAS

PLEASE REPLY ELECTRONICALLY TO the Secretaries of the Organizing Committee:

Oleg A. Lebedev: olebed@paleo.ru

Olga B. Afanassieva: oafan@paleo.ru

Natasha I. Krupina:nkrup@paleo.ru

Galina V. Zakharenko: galkaz@paleo.ru

Complete informations and registration form available at : http://gause.biology.ualberta.ca/wilson.hp/paleozoic/obruchev.sympos.html

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All SDS members are invited to attend the

10TH INTERNATIONAL MEETING ON EARLY VERTEBRATES / LOWER VERTEBRATES

Porto Alegre, RS, Brazil, 5th-9th May 2003

CONVENER

Dr Martha Richter, Porto Alegre, Univ. Rio Grande do Sul, Science & Technology Museum

PLACE OF MEETING

Pontifícia Universidade Católica do Rio Grande do Sul, Museu de Ciências e Tecnologia, Laboratório de Paleontologia

AIMS OF MEETING

Intercontinental and southern continents stratigraphical correlations based on lower/early vertebrates; palaeoenvironments/geochronological dating based on early vertebrate faunas; correlations of marine/non-marine fish-bearing strata; systematics and evolution of fossil and extant agnathans and fishes, especially the South American and other Gondwanan faunas; IGCP business meetings; pre-meeting field trip to vertebrate localities of the Paraná Basin; abstracts volume plus special meeting volume with complete papers.

SEND EXPRESSIONS OF INTEREST

First Circular and Instructions for Authors due soon at

http://www.mct.pucrs.br (Laboratório de Paleontologia)

and at

http://gause.biology.ualberta.ca/wilson.hp/paleozoic/Palaeozoic.News.html

REPORTS FROM THE MEMBERSHIP & OTHER INTERESTED PARTIES

CM G.K.B. ALBERTI (GROSSHANSDORF)

1999 and 2000 were serious years for health reasons,especially concerning problems with closed coronary blood vessels, which must be re-opened by coronary catheter stents, in order to avoid further cardiac infarctions.

Notwithstanding, the studies on Lower and Middle Devonian planctonic tentaculitids have been continued and moreover further trilobite studies have been carried through.

I. Research was concentrated on planctonic tentaculitids from Lower and Middle Devonian sections of North Africa (Rabat-Tiflet area,Tafilalt,Ben Zireg and Marhouma areas), of Central Europe (Lower Harz Mountains,Frankenwald) and of Victoria (Jacobs Creek and Buchan areas) with special respect to systematics, evolution, biostratigraphy and biogeography (see publication of ALBERTI 2000a).

Highlights include the discovery of strongly curved tubes (see Newsletter n° 15:63) of the new subspecies Guerichina strangulata deflexa, which is thought to be indicate of the uppermost Guerichina strangulata-zone (as new subzone) in the Ben Zireg and Bou Tchrafine/Amlane sections.It probably also occurs in the uppermost layers of the Steinberg Limestone in the Lindener Mark of the Rhenish Slate Mountains.G.strangulata deflexa after present knowledge seems probably to be the only relevant indicator for the kitabicus-Zone, regarded by means of planctonic tentaculitids.

In the Bou Tchrafine section Penesavia biannulata starts a bit earlier before the entry of Guerichina strangulata strangulata, but the upper range of P.biannulata overlaps with the lower range of G.strangulata, being in agreement with their vertical ranges in the Ebersdorf "Tentaculitenknollenkalk" section of the Frankenwald (see ALBERTI 2000a).P.biannulata and G.strangulata strangulata also occur in the Ouidane Chebbi I section of the Tafilalt (material, collected by Dr.B.KAUFMANN,Tübingen and Dr.D.WEYER,Berlin).

Nowakia (Turkestanella) clathrata with its nearly worldwide distributed "geographical" subspecies has a similar vertical range like P.biannulata (pireneae- to lower "dehiscens"-Zone) (ALBERTI 2000a).

Mostly in the Pragian (of e.g.Morocco,Harz Mountains,Seravshan) occuring species with the typical "cancellata—ornamentation" patterns are assigned to the new subgenus Nowakia (Bouregregia) (see ALBERTI 2000a).

Another ongoing research is (was) the work on the planctonic tentaculitids and the asteropygiinid trilobites from the Lower Harz "Kieselgallenschiefer"-sections/sequences. Progress is to be seen from figure 1; for example the "ranges" of Guerichina strangulata rhenohercynia are supposed to correlate with the Lowermost Emsian age of Pseudocryphaeus rothei—levels.

II. Research on trilobites was concentrated on the so far in taxa numerically richest Struveaspis micromma micromma/Eopalpebralia herrmanni assemblage (collected more than ten years ago by Dr.D.WEYER,Berlin) from a Lower Eifelian aged Styliolinid limestone layer (conodonts determined by Dr.K.WEDDIGE,Frankfurt) of the classic Lower Scheerenstieg "Hercynkalk" sequence (see HUENEKE 1998) in the Lower Harz Mountains(ALBERTI 2000c).

This assemblage is composed of 12 species/subspecies from 11 genera/subgenera.The high percentage of taxa that are common with Morocco (e.g.Dechra-ait-Abdallah in the Meseta Marocain) might indicate nearer palaeobiogeographical relationships between the mentioned regions and/or similar environmental conditions at that time (ALBERTI 1981c).Piriproetus amblyops, one of the most relevant representatives of this assemblage, has been discovered for the first time (ALBERTI 1979:232) in a contemporaneous sample (collected in those days by Prof.G.LJASCHENKO,VNIGNI/Moskva, stored in its museum`s collection) from the eastern slope of the Ural Mountains.See ALBERTI 2000c.

The vertical range of the revised index taxon Struveaspis micromma micromma seems to be restricted biostratigraphically to the span of the upper N.maureri-Zone to the lower N.sulcata-Zone, that means to the boundary interval Dalejan/Eifelian.The specimens of Str.micromma from the N.richteri-Zone of the Barrandian,described and pictured by CHLUPAČ (1977 and 1998) may belong to a new taxon resp.subspecies of Str.micromma (see ALBERTI 2000c).In this publication the palaeobiogeographical distribution of the most relevant taxa of the Struveaspis micromma micromma/Eopalpebralia herrmanni assemblage is outlined.

Fig.1. Updated simplified columnar sections through the Lower Devonian part of the "Harzgerode Tongallen - und Kieselgallenschiefer-Formation", Lower Harz Mountains (from G.ALBERTI & L.ALBERTI 1996 and G.ALBERTI 1998, modified and completed).

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ALBERTI,G.K.B.(2000b) : Zur paläobiogeographischen Verbreitung der Struveaspis micromma/Eopalpebralia herrmanni-Assemblage (Herzynische Trilobiten) im jüngeren Unter-Devon.— Senckenbergiana lethaea,79 (2):357-360,1 fig.;Frankfurt.

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ALBERTI,G.K.B. (in preparation) : Planktonische Tentakuliten des Devon. V.— 5 pls.

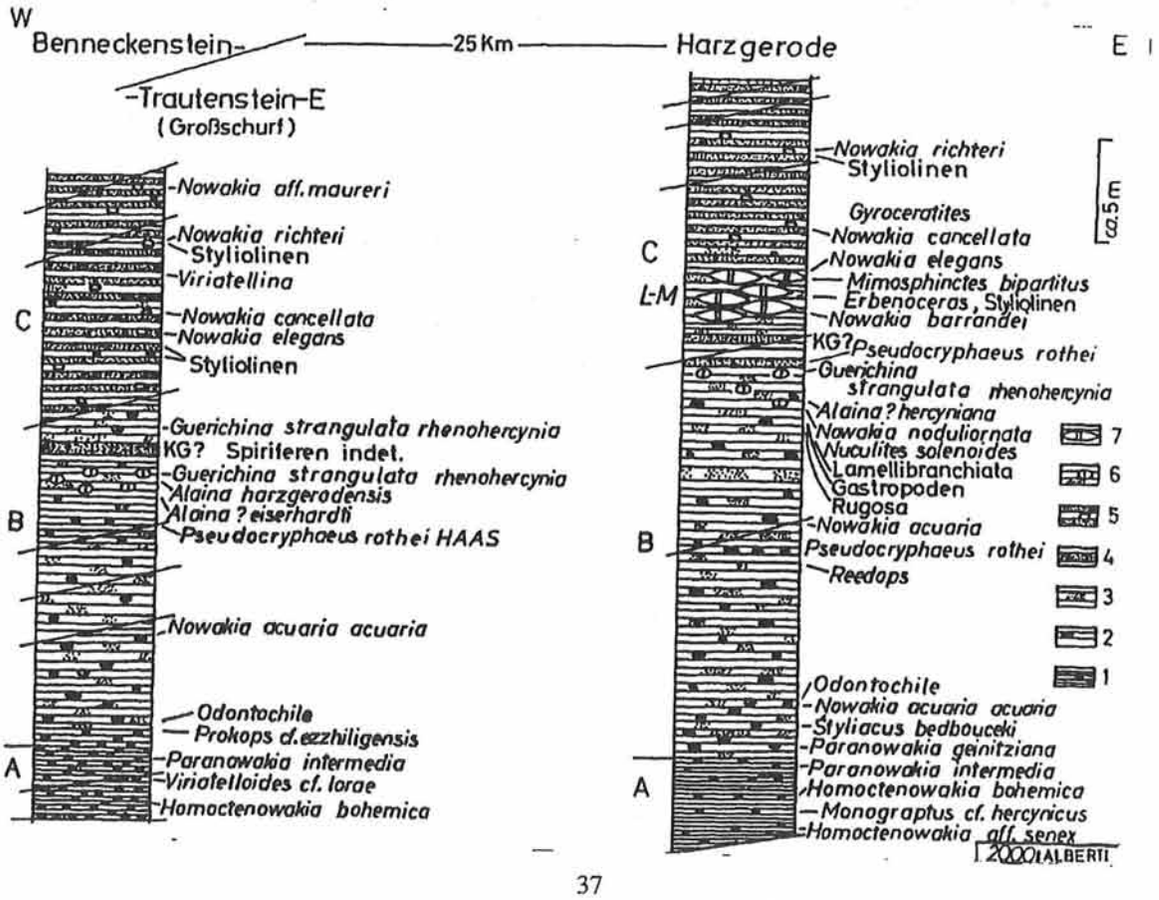
ALBERTI,G.K.B. (in preparation) : Planktonische Tentakuliten des Devon.Allgemeines: Morphologie,Taxonomie,Evolution, Events,Biochronologie,Paläoenvironment,Paläobiogeographie).

ALBERTI,G.K.B. (in preparation): Planctonic tentaculitids in space and time.

ALBERTI,G.K.B. (in preparation): Events and Lower to Middle Devonian global planctonic tentaculitid diversity.

ALBERTI,G.K.B. (in preparation): Zur Paläobiogeographie ausgewählter Gruppen herzynischer Trilobiten des Unter- und Mittel-Devon.

ALBERTI,G.K.B. (in preparation): Zur litho- und biofaziellen Charakteristik der Rahal-Schiefer (oberes Unter-Devon bis tiefes Mittel-Devon,NW-Marokko).



GORDON BAIRD (FRENDONIA)

Relevant work by Gordon Baird in 2000 centered on regional mapping of the Tully Formation in New York State and in Pennsylvania A key discovery this past year in the Lock Haven-Williamsport area was discovery of continuous passage beds from the Hamilton succession (Windom Mbr.) upwards into the Tully. Similarly, these same beds we observed below the Tully in the Tully DeRuyter area in NYS. Since low diversity diminutive brachiopod faunas characterize both this interval and overlying basal Tully beds, it appears that the Tully fauna incursion occurred during a sea level highstand . Another observation in New York State is evidence of major erosive bevelling beneath the West Brook Shale involving several tens of feet of regional discordance. This renders all the more meaningful the widespread sharp biofacies discordance beneath this unit that is virtually observed everywhere. The major regression indicated by Bellona Bed - West Brook Bed facies is consistent with evidence of this unconformity It shows that the highest Tully is effectively a separate unit from the underlying succession. The discover of microbiolite stromatolites from at least two levels in eastern New York is but one of several other surprises encountered in recent Tully research.

CM ALAN BLIECK (Villeneuve) [see also IGCP 328 achievements pg]

CM MARGARET BRADSHAW (CHRISTCHURCH)

Several Devonian projects are currently underway. The publication of an AAP Memoir on Lower Devonian bivalves from Reefton, New Zealand (1999) completed a long-term project, which included two earlier papers on the stratigraphy and structure of the Reefton Group (1983, 1995) to provide the biostratigraphic control necessary for reliable fossil collection.

CURRENT RESEARCH IS FOCUSSED ON SEVERAL FRONTS:

Dr J. Al Fagerstrom, previously of Oregon State University, now retired and an annual visitor to New Zealand expressed an interest in the coral-rich Lankey Limestone at Reefton (Emsian). I was able to relocate a good 'non-vegetated' outcrop, although a track had to be made through 2 m high gorse that had sprouted since I did the original mapping. After a detailed collecting programme cut and polished slabs were analysed with reference to the reef guild concept. We have established that preburial skeletal transport was minimal and constructor and bafflers, though sometimes toppled, were close to in situ. This is the first study of the Lankey Limestone faunas since Dorothy Hill's paper in 1956 (corals) and Tony Cockbain's paper on stromatoporoids in 1965, and is long overdue. Unfortunately, the limestone outcrops are now not nearly as clear as they were several decades ago. A jointly authored paper entitled "Lower Devonian reefs at Reefton, New Zealand: guilds, origin and palaeogeographic significance" will be submitted this month for publication.

My work is now concentrating on the second area of New Zealand Devonian at Baton River, where I have already completed several seasons' fieldwork. The Baton Formation is slightly older (Lochkovian-Pragian) than the Reefton Group (Pragian-Emsian) and was probably deposited in deeper water. The stratigraphy and structure of the Baton Formation is in the process of being written up and I have begun a detailed study of the fauna and its ecology. How the Baton Formation relates to older rocks has been especially important. Previous workers proposed a regional pre-Baton tectonic event based on a breccio-conglomerate at the base of the formation. Remapping suggests that this deposit has a debris flow origin and in places it may interfinger with mudstones near the base of the Baton Formation. In all areas the Baton Formation appears to have a conformable and gradational contact with the sandstones of the underlying Ellis Formation. The Ellis Formation has previously been correlated with the Hailes Quartzite further north, the highest outcrops of which have yielded Silurian fossils. However, the different nature of this quartzite and the fact that the Ellis Formation contains rare Early Devonian brachiopods, suggests that the correlation may be incorrect. The Hailes Quartzite is more likely to be the lateral equivalent of the Late Ordovician Wangapeka Formation. These observations have been summarised in a recent publication (2000).

My research on Devonian sequences in Antarctica continues. A paper on the sedimentary geology, paleoenvironments and ichnocoenoses of the Lower Devonian Horlick Formation of the Ohio Range, Antarctica is close to being submitted. A detailed systematic paper on the trace fossils will follow closely. The Ohio Range is an important Devonian locality because it is the only one in Antarctica to possess an abundant marine Emsian fauna. The Ohio Range was at a higher latitude than the Reefton sequence, but faunas indicate tenuous faunal links between the two areas. The bivalves of the Horlick Formation have already been published (1991), but trace fossils are also significant, and link in with my work on similar age(?) sediments in southern Victoria Land, which lack body fossils but contain a variety of trace fossils.

RELEVANT DEVONIAN PUBLICATIONS

BRADSHAW, M. A., HEGAN, B. D., 1983. Stratigraphy and structure of the Devonian rocks of Inangahua Outlier, Reefton, New Zealand. *New Zealand Journal of Geology and Geophysics 26*, 325-344.

BRADSHAW, M. A., McCARTAN, L. 1991. Palaeoecology and systematics of Lower Devonian bivalves from the Horlick Forma-

tion, Ohio Range, Antarctica. *Alcheringa, 15*, 1-42.

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

BRADSHAW, M. A., 1999. Lower Devonian bivalves from the Reefton Group, New Zealand. *Memoir, Association of Australasian Palaeontologists, 20*, 171 pp.

BRADSHAW, M. A., 2000. Base of the Devonian Baton Formation and the question of a pre-Baton tectonic event in the Takaka Terrane, New Zealand. *New Zealand Journal of Geology and Geophysics 43*, 601-610.

CM DENISE BRICE (LILLE)

I just finishing some joint papers on some Upper Devonian brachiopods from Central Iran and I am continuing to study with Jean-Pierre Nicollin Famennian spiriferids from Morocco (Hollard's Collections) and their distribution in central part of North Gondwana. Our aim is to establish a biozonation based on Famennian spiriferids and a correlation of this biozonation with the standard conodonts and ammonoids zones.

TM PIERRE BULTYNCK (BRUXELLES)

RECENT PUBLICATION

GOUWY, S. & BULTYNCK, P. (2000): Graphic correlation of Frasnian sections (Upper Devonian) in the Ardennes, Belgium. Bulletin Koninklijk Belgisch Instituut voor Natuurwetenschappen - Aardwetenschappen, **70**: 25-52.

TM IVO CHLUPÁČ (PRAHA)

At the end of 1998 the comprehensive joint monograph on the Palaeozoic of the Barrandian (Cambrian to Devonian) was finally published in occasion of the bicentennial birth anniversary of Joachim Barrande and the 80th anniversary of foundation of the Czech Geological Survey (see references). The Devonian activities were concentrated in the Lower Devonian of the Barrandian area where the cyclostratigraphic studies were terminated and the results published. The study of the Lower Devonian Reef Complex of Konìprusy continued with regard to progressive quarrying in this area (a joint project with the National Museum, Prague). The study of the stratotypes of the Silurian-Devonian boundary, the Lochkovian-Pragian boundary and some other important limits continued in terms of several projects and diploma works provided by the Czech and foreign Universities and institutions, partly under the guidance of the Charles University (e.g. diploma theses of T. Vorel, P. Èáp a.o.). The evaluation of the depp boring at the boundary stratotype section at Klonk, realized by the University of Jülich (Germany) in collaboration with the Czech Academy of Sciences (J. Hladil, V. Suchý a.o.), continued. In 1999, in terms of activities connected with the bicentennial anniversary of Joachim Barrande, a stratigraphic and topographic revision of all Barrande's paleontological localities was terminated and published within a special volume of the Journal of the Czech Geological Society devoted to Joachim Barrande. In 2000, a review of occurrences and stratigraphic significance of Devonian trilobites known from Moravia-Silesia was finished and submitted for press. A joint excursion of the German Subcommission on Devonian Stratigraphy and the Czech Devonian workers (particularly members of the Czech Stratigraphic Commission) was realized in June, 2000. The selected sections - potential candidates for the boundary stratotypes of the subunits of the Emsian, were visited and in a subsequent discussions evaluated from different viewpoints. As a result, a general consensus was reached to use formal, geographically derived designations for the Emsian subunits (instead of the informal "Lower" and "Upper") and to place the limit between the lower and upper subunits of the Emsian at the level identical or close to the base of the Nowakia cancellata Zone, well traceable by different faunal groups. As most suitable candidates of the boundary stratotype, the sections at Císaøská rokle near Srbsko and the Èervený lom Quarry near Suchomasty were recognized (discussed in the paper by Chlupáč and Lukes 1999).

RECENT PUBLICATIONS

Chlupáč I. (1999): Barrande's stratigraphic concepts, palaeontological localities and tradition - comparison with the present state. Journal of the Czech Geological Society, 44, 1-2, 3-30. Praha.

Chlupáč I. (2000): Cyclicity and duration of Lower Devonian stages: Observations from the Barrandian area, Czech Republic. Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen, 215, 97-124. Stuttgart.

Chlupáč I., Feist R., Morzadec P. (2000): Trilobites and standard Devonian stage boundaries. In: P. Bultynck, ed., Fossil groups important for boundary definition. Courier Forschungsinstitut Senckenberg, 220, 87-98. Frankfurt a.M.

Chlupáč I. (in press): Devonian trilobites from Moravia-Silesia, their occurrence and significance. Sci. Studies of the District Museum Prostìjov, 4, (in Czech, Engl. summary).

Chlupáč I., Havlíèek V., Køiz J., Kukal Z., Storch P. (1998): Palaeozoic of the Barrandian (Cambrian to Devonian). 183 p., 68 pls., edit. Czech Geological Survey, Prague.

Chlupáč I., Lukes P. (1999): Pragian/Zlíchovian and Zlíchovian/Dalejan boundary sections in the Lower Devonian of the Barrandian area, Czech Republic. Newsl. Stratigr., 37, 1/2, 75-100. Stuttgart.

TM REX E. CRICK (ARLINGTON) & CM BROOKS B. ELLWOOD (BATON ROUGE)

RECENT DEVONIAN LITERATURE (ANNOTATED)

Ellwood, B.B., Crick, R.E., and El Hassani, A., 1999, The MagnetoSusceptibility Event and Cyclostratigraphy (MSEC) method used in geological correlation of Devonian rocks from Anti-Atlas Morocco: American Association of Petroleum Geologists Bulletin, v. 83, p. 1119-1134.

MagnetoSusceptibility event and cyclostratigraphy (MSEC) was used as a means of establishing sensitive chronostratigraphic markers or chronohorizons useful for high-resolution correlation. MSEC was presented as a composite of the magnetic susceptibility (MS) record of marine strata and the coeval biostratigraphic record, and, like chronozones, zones based on MSEC data have boundaries which are isochronous. MS, a measure of the concentration of magnetic grains in sediments, proxies for the ratio of lithogenic to biogenic components. Controls on the detrital input of lithogenic material include eustasy and climate, however induced, and sea floor/basin subsidence. The development of an initial MSEC composite reference curve for the Middle/Upper Devonian of the Anti-Atlas region of southern Morocco was presented and discussed in the context of global sea-level transgressive and regressive cycles. MSEC trends composed of increasing MS magnitudes were shown to correlate well with episodes of regression, while trends of decreasing MS magnitudes were shown to correlate with episodes of transgression.

Crick, R.E., Ellwood, B.B., Hassani, A.E., and Feist, R., 2000, Proposed Magnetostratigraphy Susceptibility Magnetostratotype for the Eifelian-Givetian GSSP (Anti-Atlas, Morocco): Episodes, v. 23, p. 93-101.

We were able to use the magnetosusceptibility event and cyclostratigraphy (MSEC) record for the Eifelian–Givetian Global Boundary Stratotype Section and Point (GSSP) located in the western Sahara of southeastern Morocco to establish a sequence of magnetostratigraphic susceptibility units organized into magnetostratigraphic susceptibility zones (MSZ) and magnetostratigraphic susceptibility subzones (MSSZ). Magnetic susceptibility data are summarized into two complete MSZs (Atrous and Mech Irdane) and two partial MSZs (Gheris and Rissani). The Atrous (Upper Eifelian) is comprised of 3 MSSZs and the Mech Irdane (uppermost Eifelian and lowermost Givetian) of 11 MSSZs. The Eifelian–Givetian boundary falls within Mech Irdane MSSZ 2 making the magnetosubzone an important boundary marker unit. Large-scale transgressive and regressive patterns in the MSEC data establish that the Eifelian–Givetian boundary in the GSSP sequence occurs immediately after the first regressive pulse following the transgressive conditions established during the Atrous MSZ. The Lower Kačák/*otomari* Event occurs in Atrous MSSZ 3 and the Upper Kačák/*otomari* Event occurs in Mech Irdane MSSZ 1. The magnetic properties of the MSZs and MSSZs were tested by comparison with a coeval magnetostratigraphic susceptibility sequence in the Montagne Noire region of southern France

Ellwood, B.B., Crick, R.E., El Hassani, A., Benoist, S.L., and Young, R.H., 2000, Magnetosusceptibility event and cyclostratigraphy method applied to marine rocks: Detrital input versus carbonate productivity: Geology, v. 28, p. 1135–1138.

Magnetic susceptibility (MS) data from marine rocks can be used for global correlation due to time synchronous variations in global erosion. We have shown that the MS signature, found in two forms, resides mainly in paramagnetic and other detrital constituents in most marine rocks. The first form is a short-term, low-magnitude, high-frequency cyclic climate signature, which is often useful for regional correlation. The second form is a longer-term, higher magnitude, low-frequency signature resulting from transgressive and regressive events which can be used for global correlation. Fluctuations in detrital input, due to eustatic-based erosion, are the primary cause of events. These fluctuations are driven by large-scale processes such as global orogenic cycles. However, variations in carbonate productivity cannot be ruled out when explaining the low-magnitude climate-driven cyclicity also observed in MS data sets.

[IN PRESS / IN REVIEW]

Crick, R.E., Ellwood, B.B., Hladil, J., El Hassani, A., Hrouda, F., and Chlupác, I., 2001, Magnetostratigraphy Susceptibility of the Prídolian-Lochkovian (Silurian-Devonian) GSSP (Klonk, Czech Republic) and a Coeval Sequence in Anti-Atlas Morocco: Palaeogeography, Palaeoclimatology, Palaeoecology, v. 166 (IN PRESS).

The magnetosusceptibility event and cyclostratigraphy (MSEC) record for the Přídolian-Lochkovian (Silurian-Devonian) Global Boundary Stratotype Section and Point (GSSP) (Klonk, Prague Basin, Czech Republic) has been described and used to establish a magnetostratigraphy susceptibility profile for the GSSP. GSSP MSEC data are summarized into three magnetozones (MSZ). The Tmaň MSZ (Late Přídolian) with 13 MSSZs (MSSZ), the Klonk MSZ (latest Přídolian and earliest Lochkovian) with 17 MSSZs, and the Voskop MSZ (Early Lochkovian) with 7 MSSZs. The base of Klonk MSSZ 2 is coincident with the base of Lochkovian and the Devonian. The proposed magnetostratotype for the Přídolian-Lochkovian boundary was supported by MS data from a nearby core through the

GSSP sequence and into the upper Ludlow. Three additional MSZs were recognized for the portion of the core sequence older than the GSSP boundary sequence. The extension of the MSZs and MSSZs away from the proposed magnetostratotype is tested by comparison with a Lochkovian sequence in the western Sahara of southeastern Morocco.

MSZs are the result of global sea level fluctuations that alter base level and the pattern of erosion and influx of detrital paramagnetic mineral components into the marine environment. Large-scale transgressive and regressive patterns interpreted from the MSEC data establish that the Silurian-Devonian boundary in the Barrandian region falls between a short-lived transgressive pulse in the latest Přídolian and an equally short-lived regressive pulse in the earliest Lochkovian. MSSZs identified in the GSSP and core sequences are the result of variation in climate cycles and the resulting periodicity can explained by either the 38.9 Ka Silurian and Devonian equivalent of the modern 54 Ka obliquity cycle or the eccentricity cycle of 106 Ka periodicity. Use of the obliquity periodicity gives a duration for the Barrandian Lochkovian of 4.46 Ma which agrees with the most recent geochronometric estimate of 4.5 Ma for the Lochkovian. Use of the eccentricity periodicity gives a duration for the Barrandian Lochkovian of 12.16 Ma which agrees with the previous geochronometric estimates of 12.2 Ma and 12.5 Ma for the Lochkovian. In either case the cyclic nature of the MSEC data established by the MSSZs can be explained by variations in the rate of supply of weathered terrigenous paramagnetic grains to the marine system. These variations in supply occurred due to climate changes resulting from the either the obliquity or eccentricity of Earth's orbit.

Knowledge of the periodicity of Lochkovian cycles in the Barrandian area allows estimation of the rates of sediment accumulation, the duration of fossil ranges, and the rates of evolution. Depending on the choice of obliquity or eccentricity to explain the cyclicity in the Barrandian Lochkovian, the estimated rate of sediment accumulation in the GSSP outcrop averaged either 51 Ka/m or 140 Ka/m. The range of the graptoloid *Monograptus uniformis angustidens*, wholly contained within the Lochkovian sequence at the GSSP, is also estimated at either 51 Ka or 140 Ka.

Crick, R.E., Ellwood, B.B., Over, D.J., Feist, R., and Girard, C., 2001, Magnetostratigraphy susceptibility of the Frasnian/Famennian boundary (Upper Devonian) in southern Oklahoma and its type area in southern France: Oklahoma Geological Survey Circular, v. 103 IN PRESS.

Magnetosusceptibility event and cyclostratigraphy (MSEC) was used to establish a non-polarity based magnetostratigraphy susceptibility (MSS) between the stratotype region for the Frasnian-Famennian (F-F) boundary sequence in the Montagne Noire of southern France and two F-F sequences located in the Arbuckle Mountains and Criner Hills of southern Oklahoma. Despite differences of depositional environment, the MSS is remarkably consistent and can be described in the context of a hierarchy of magnetozones that allows extension of correlation away from the Montagne Noire reference section.

Ellwood, B.B., Benoist, S., Crick, R.E., Day, J., and El Hassani, A., IN REVIEW, Evidence for A New Extraterrestrial Impact Immediately Proceeding the Eifelian - Givetian, Middle Devonian Stage Boundary: Geology.

It has been suggested that in all of Earth history, there is strong evidence for only three bolide impacts at stage boundaries, points in geologic time of major life-form extinctions. These impacts occurred at the end of the Cretaceous [K/T boundary], at or near the Permian - Triassic boundary, and at or near the Frasnian - Famennian boundary in the Late Devonian. These boundaries represent three of the five greatest mass extinction events, and it has been argued that these three impacts may have been responsible, at least in part, for the extinctions. Following identification of the well-documented K/T impact event by Alvarez et al. (1980), scientists have been searching for additional, extinction-related impacts in the geological record. Here we present evidence (microtektites, shocked quartz, spheres and anomalous geochemistry) for a fourth such impact that occurred immediately before the Middle Devonian, Eifelian - Givetian [E/G] stage boundary. This is the oldest impact event (~387 Ma) identified in the rock record that is associated with a stage boundary. We predicted this impact and the precise stratigraphic level where the evidence would be found based on a comparison between the unique magnetic susceptibility (MS) signature identified for the K/T boundary section at Gubbio, Italy (and elsewhere), and MS measurements at the E/G global stratotype located in Morocco. Using MS data, we have also predicted and identified additional impact evidence (shocked quartz) from a core drilled through Devonian subsurface rocks in Iowa that crosses the E/G boundary.

Ellwood, B.B., Crick, R.E., Garcia-Alcalde Fernandez, J.L., Soto, F.M., Truyols-Massoni, M., El Hassani, A., and J., K., IN REVIEW, Global Correlation Using Magnetic Susceptibility Data from Middle Devonian Rocks: Geology.

Magnetic susceptibility (MS) data from marine rocks can be used for global correlation due to time synchronous variations in global erosion. We show here correlations between MS data from two middle Devonian, biostratigraphically well defined sections, one in NW Spain, and one from the Anti Atlas region of Morocco. Then, using the Moroccan section, collected in outcrop, we correlate to cuttings from a well with minimal biostratigraphic control, drilled in Bolivia. Using the MS data we identify in the Bolivian well samples the Lower Devonian, Pragian – Emsian and Lower – Upper Emsian stage boundaries.

CM JAMES EBERT (ONEONTA, NEW YORK)

Ongoing field and petrologic studies of portions of the Helderberg Group (Pridolian – Lochkovian) in New York have resulted in the recognition of two cryptic, regionally angular unconformities. One of these sequence-bounding surfaces was recognized by some earlier workers (e.g., Chadwick, 1944), but was dismissed as insignificant by later workers. Stratigraphic relationships have traditionally been interpreted as a result of gradual migration of coeval facies (Rickard, 1962; Laporte, 1969). Two graduate students and I are currently trying to trace the lateral extent of these unconformities and evaluate the group in terms of sequence and biostratigraphy.

Ramp carbonates of the Helderberg Group have long been held to encompass the Silurian – Devonian boundary. Despite the absence of definitive biostratigraphic study, these strata were considered as a candidate for the boundary stratotype in the deliberations of the Subcomission on Devonian Stratigraphy (e.g., Barnett, 1977). Our recognition of cryptic unconformities in the Helderberg has prompted a new biostratigraphic study in an attempt to more accurately place the Silurian - Devonian boundary. One key section has already been measured and sampled. Others are planned for the near future. Preliminary examination of samples has indicated the same paucity of conodonts that has plagued earlier studies. However, many samples have yielded an extremely abundant and seemingly diverse chitinozoan fauna. We believe that a multi-taxa approach will enable us to identify the Silurian - Devonian boundary and build a framework of additional biostratigraphic time lines. Our preliminary analysis has suggested that several Helderberg formations that have been regarded as Lochkovian are, in fact, probably Pridolian.

I am also participating in a study of the impact of early land plants on the global cycling of carbon that is being conducted by Ulrich Mann (Forschungszentrum, Jülich, Germany) and others. Our Helderberg biostratigraphy will contribute a framework for some of the North American aspects of this study.

In the coming months, I hope to put the finishing touches on a manuscript describing a new sequence of Lochkovian (*praehercynicus* zone) K-bentonites from the Chaleurs Group of Gaspésie, Québec, Canada.

CM MOSTAFA EL BENFRIKA (CASABLANCA)

I finished my Ph. D. in 1994 at the Katholiek Universiteit Leuven (Belgium) under the direction of the Professor P. Bultynck, whom I thank deeply to have initiated me to the passionate world of conodonts.

After my Ph.D., I returned to Morocco to work, as teacher researcher, in the University Hassan II - Mohammedia (Casablanca).

In spite of the relative poverty of conodonts of the Upper Silurian and the Lower Devonian of the North Western Moroccan Meseta, I always continue to look for the best possibilities to date new sections and to refine the biostratigraphy of those that was not studied enough. This permits to establish the more precise biozonation and the larger correlations.

I am also interested in to the C.A.I. of the Moroccan Meseta, in collaboration with some of my colleagues of the university Hassan II - Mohammedia. Several limestone samples, providing from the different outcrops (Silurian, Devonian, Carbonaceous) of meseta are in progress. A preliminary map of C.A.I from North Western Moroccan Meseta is achieved. I hold this opportunity to thank the Professor A. Harris, who has sent me some documents and a collection of reference of the C.A.I.

I am also interested in a comparison between conodonts and tentaculites. A master thesis on the tentaculites of the Devonian from central Morocco is in progress.

Some results are the objects of communications or publications, individual or in collaboration (See references) .

REFERENCES:

BENFRIKA, E.M. (1998): Les Conodontes et le Wenlock (Silurien) dans l'axe Rabat-Tiflet (Meseta marocaine occidentale). *2ème Congrès Français de Stratigraphie, Paris, p.42, Abstracts.*

BENFRIKA, E.M. (1999): Some Upper Silurian – Middle Devonian Conodonts from northern part of the Western Meseta of Morocco. Systematic and palaeogeographical relationships. *Bolletino della Societa Paleontologica Italiana, Vol . 37, (2-3), p.311-319, Ipl. Modena.*

BENFRIKA, E.M. & BULTYNCK, P. (1999): Emsian Conodont succession from the Oued Akrech Formation (North -Western Meseta, Morocco). *Abstract Book Errachidia Meeting SDSD-IGCP 421 : 3-4 .*

GOUWY, S. ; **BENFRIKA, E. M.** , HELSEN, S. & BULTYNCK, P. (1999): Late Emsian to Early Givetian conodont succession in the Tiflet area (North-Western Meseta, Morocco, Central Morocco). *Abstract Book Errachidia Meeting SDS-IGCP 421 : 22.*

BENFRIKA, E.M.; BULTYNCK, P & EL HASSANI, A : Conodontes siluriens et dévoniens de la zone de Rabat-Tiflet (Maroc). Implications stratigraphiques (*in prep.*)

EL HASSANI, A & **BENFRIKA, E.M.**: The Devonian of the Moroccan Meseta Biostratigraphy and correlations (*in press*)

CM AHMED EL HASSANI (RABAT)

Below is presented the cover to the volume containing the proceedings from the SDS meeting held in Morocco.

ROYAUME DU MAROC
MINISTÈRE DE L'ENERGIE ET DES MINES
DIRECTION DE LA GEOLOGIE

NOTES ET MÉMOIRES DU SERVICE GÉOLOGIQUE
N° 399

MOROCCAN MEETING OF THE SUBCOMMISSION ON DEVONIAN STRATIGRAPHY (SDS) AND IGCP 421

April 24th – May 1st 1999

Excursion Guidebook

ÉDITION DU SERVICE GÉOLOGIQUE DU MAROC
RABAT

2000

CM AHMED EL HASSANI (CONTINUED)

RESEARCH:

My research tasks were concentrated this year on two fields the Anti Atlas and the north western Moroccan Meseta with particularly three topics: magnetostratigraphy-susceptilbuilty, Devonian stratigraphy, sedimentology and stable isotopes.

NATIONAL PROGRAM: CONTINUATION OF INVESTIGATIONS WITH MY PH.D STUDENTS:

Rehamna (Mr. Fouad EL KAMEL) : In the carbonated platform of Upper Emsian to Givetian age, the reef edification is previous to, and contemporaneous with, a tilted block tectonic that has favored the bioconstruction in its upper part. The tectonic expression is illustrated by several instability marks, such as tension faults, progressive unconformity and the resulting landslide, observed in both the reef development zone and the external platform.

Oued Cherrat (Mjahed LEHMAMI) Silurian Devonian sedimentology and stable isotopes in the oued Cherrat with the collaboration of the Free University of Brussels (VUB : Prof. Keepens).

Rabat: Ph-D defended (F. BHIJA) On the Silurian Lochkovian limstones turbidites, sedimentological analysis and palaeogeographic implications : In the Rabat-Tiflet zone, Late Silurian-Lochkovian limestones and shales are, in large part interpreted as fine-grained allochthonous deposits of medium to low density turbidity currents. Sedimentological analysis allowed to define fine-grained turbiditic limestone facies (complete calciturbidites, incomplets calciturbidites, rythmic turbidites), associated with coarse resedimentations (megabreccias, slump deposits). These lithofacies are grouped into two facies associations: a bassin plain association and a base of slope association. This second facies association developed a detritic carbonate apron of lower slope, immediately adjacent to a northward facing continental paleoslope.

Tiflet: The Devonian sedimentology was continued this year in the Tiflet area within the framework of the DESA (A. RAZOUANI) and will probably developed in Ph-D study by RAZOUANI.

INTERNATIONAL COOPERATION:

Continuation of work in the Anti Atlas in:

1. Devonian Magnetostratigraphy and Susceptibility in collaboration with Prof Rex CRICK (University of Texas at Arlington) and Brooks ELLWOOD (Louisiana State University). May and September 2000.

2. Stratigraphy & paleontology: co-operation and coordination with colleagues from the Free University of Berlin (Dr. Thomas BECKER) and with The Senckenberg Museum (Dr. Gerhard PLODOWSKI): February and May 2000: Several sections were visited and sampled more particularly in the anti Atlas Western.

MEETING AND VISITS:

June 12 –July 22nd 2000:

On invitation of Prof Pierre BULTYNCK, I visited with the Royal Museum of Earth Sciences, from June19 to 25 2000. Concepts on the museology were particularly approached with the persons in charge of this museum.

On Invitation of Dr. PLODOWSKI I accomplished a two stays with the Senckenberger group (June 25 at July 1st and July 11-22, 2000).

During the first period I took part in the Meeting on the European Palaeontological Association Workshop 2000: Stable Biomarkers and isotopes in palaentology (30.6-2.7.200) Frankfurt am main. with pleasant invitation of Prof F.F. STEININGER (Director of the Museum)

On invitation of Dr. Thomas BECKER I visited the Museum of Berlin (July 2-10 2000) and I animated a conference on the geology of Morocco and developped particularly Silurian and Devonian bio-events.

PUBLICATIONS:

Most of my time was devoted to the edition of two volumes relating to the SDS-IGCP 421 Meeting held in Morocco in 1999. These two volumes are under press and will come out soon in the following editions:

1. : Excursion **guidebook**. Notes & Mém. Serv. Géol. Maroc, 399, 150p. with the following content:

- P. BULTYNCK & O.H. WALLISER : Emsian to Middle Frasnian sections In the northern Tafilalt
- R. T. BECKER & M.R. HOUSE : Emsian and Eifelian ammonoid succession at Bou Tcharafine (Tafilalt platform, Anti Atlas, Morocco)
- R. T. BECKER & M.R. HOUSE : Late Givetian and Frasnian ammonoid succession at Bou Tcharafine (Anti Atlas, Southern Morocco)
- R. T. BECKER & M.R.HOUSE : The Famennian ammonoid succession at Bou tcharafine (Anti Atlas, Southern Morocco)

- PLODOWSKI, G.; BECKER, G.; BROCKE, R. ; JANSEN, U.; LAZREQ, N.; SCHINDLER, E.; SCHRAUT, G.; WALLISER, O.H. ; WEDDIGE, K. & ZIEGLER, W. : The section at Jebel Issimour (NW Maïder, Early to early Middle Devonian). First results with respect to lithology and biostratigraphy
- R. T. BECKER & M.R. HOUSE : Devonian ammonoid succession at Jbel Amelane (western Tafilalt, Southern Morocco)
- O. H. WALLISER : The Jebel Mech Irdane section
- R. E. CRICK, B. B. ELLWOOD, & A. EL HASSANI : High-Resolution MSEC Chronocorrelation Among Tafilalt Eifelian – Givetian boundary sequences
- B. B. ELLWOOD, A. EL HASSANI, & R. E. CRICK : The MSEC signature for the latest Pridoli through Dalejan at Jbel Issoumour (Ma'der Basin)
- R. T. BECKER, J. BOCKWINKEL, V. EBBIGHAUSEN, M.R. HOUSE : Jebel Mrakib, Anti Atlas (Morocco), A potential Upper Famennian Substage boundary stratotype section. Document submitted to the International Subcommission on Devonian Stratigraphy Field Meeting in Morocco, April 1999
- A. EL HASSANI & A. TAHIRI : The Eastern part of Central Morocco (western Meseta)
- O. H. WALLISER, A. EL HASSANI & A. TAHIRI : Mrirt: A Key Area for the Variscan Meseta of Morocco
- R. T. BECKER & M.R. HOUSE : sedimentary and faunal succession of the allochthonous Upper Devonian at Gara d'Mrirt (Eastern Moroccan Meseta)
- A. ELHASSANI : The Rabat-Tiflet zone : Late Devonian – Early Carboniferous of Tiflet and Lower and middle Devonian of Rabat
- M. ZAHRAOUI, A. ELHASSANI & A. TAHIRI : Devonian outcrops of the Oued Cherrat shear zone

2. **Proceedings**: Travaux de l'Institut Scientifique Rabat, série géologie & géographie physique, N°20, 120p. with the following content:

- S. GOUWY, E. M. BENFRIKA, S. HELSEN & P. BULTYNCK : Late Emsian to early Givetian Conodont succession in the Tiflet area (north-western Meseta, Central Morocco) pp: 1-10
- BRICE D. , Brachiopodes du Silurien supérieur et du Dévonien inférieur (Praguien probable) de Khémis n'Ga (région de Safi) Maroc, pp : 11-24
- ELHASSANI A. & EL KAMEL F. Tectonic control of Devonian reef building in Mechra ben Abbou area (northern Rehamna, Morocco), pp: 25-30
- CHAKIRI S. & TAHIRI A. : Genèse et démantelelment de la plate-forme carbonatée dévonienne du Maroc central occidental, pp : 31-35
- JANSEN U., Stratigraphy of the Early Devonian in the Dra Plains (Moroccan Pre-Sahara), pp: 36-44.
- KLUG Ch , KORN D & REISDORF A. , Ammonoid and conodont stratigraphy of the late Emsian to early Eifelian (Devonian) at the Jebel Ouaoufilal (near Taouz, Tafilalt, Morocco), pp: 45-56.
- BRICE D. & NICOLLIN J.P., Eobrachythyris Brice, 1971, an index genus (Spiriferid Brachiopod) for the Late Devonian and Early Carboniferous in Southern Anti Atlas (N. Africa) North Gondwana, pp: 57-68.
- KORN D, KLUG Ch. & REISDORF A. , Middle Famennian ammonoid stratigraphy in the Amessoui Syncline (Late Devonian; eastern Anti-Atlas, Morocco), pp : 69-77.
- FEIST R. & ORTH B.: Trilobites de la limite Eifélien/Givétien de la région stratotypique (Tafilalet, Maider, Maroc)., 78-91.
- LEGRAND-BLAIN M. & PERRET-MIROUSE M.F., Brachiopodes et Conodontes carbonifères du Bassin de Taoudéni (Mali, Afrique de l'ouest) : Biostratigraphie, Paléobiogéographie, pp : 92-107.
- WEBSTER G. D., YAZDI M., DASTAMPOUR M. & MAPLES C. Preliminary analysis of Devonian and Carboniferous Crinoids and Blastoids from Iran, pp : 108-115.

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CM JINDRICH HLADIL (PRAHA)

ANATOMY OF THE PRAGIAN STRATIGRAPHIC COLUMN: GAMMA SPECTROMETRIC RECORD THROUGHOUT COMPLETE 170-M THICK PRAGIAN SECTION IN CALCITURBIDITE/HEMIPELAGITE FACIES

(Prague, Section 'Under Barrandov Bridge')

SLAVIK, L. and HLADIL, J., in cooperation with BLAZEK, R. and KRUTA, T.

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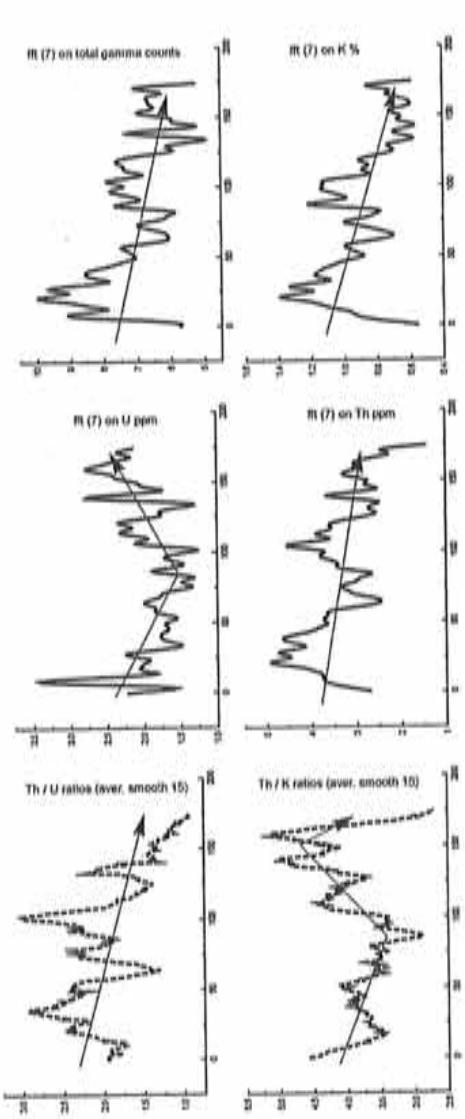
LOCATION, GENERAL SITUATION AND REPEATED BASICS OF PRESENT KNOWLEDGE

The Pragian section 'Under Barrandov Bridge' or 'Along the Old Zbraslav Road' is a steep slope on the left bank of Vltava River, on the periphery of Prague, south of the Daleje-Brook mouth at Hlubocepy and close below the Barrandov Film Studios. The easiest access is from the tramway terminal 'Hlubocepy', line No.12. The section is opened with an old road cut, many pits and quarries. On the south, the Barrande Rock shows strongly and irregularly folded Lochkovian beds of rhythmically alternated limestones and black shales. Further to north, a rigid and slightly folded structure-ramp segment of Pragian limestones occurs. Both the preservation and uncovering of the Pg section are excellent. According to macropaleontological research by I. Chlupac, the section through Pragian is practically complete and undisturbed, with an exception for the narrow zones at the absolute base and top of the Pragian strata sequence, where tectonic detachments from the underlying Lochkov and overlying Zlichov formations cause some problems in connection with high-resolution stratigraphy. An unusual thickness of the Pragian sequence (170 m) corresponds to unusual lithology. Practically, the whole section consists of gray-colored Dvorce-Prokop limestone, where lime-mud supported calcisiltites with scattered pelagic fauna are stacked in turbiditic beds with sparsely preserved low-carbonatic, black-colored background sediment. Rare macrofossils (such as orthoconic cephalopod shells or trilobite carapaces) are in 'floating' position in the sediment and turbidite phases are present. Gradation ends in micrites or shales and even thin deposition units are top-down bioturbated (*Chondrites* ichnofossils are very abundant, and also *Zoophycos* is present). Only several first meters of sediment contain abundant debris of abraded and partly ferruginous crinoid columnals and have got yellowish-rose color (Slivenec Limestone). An advantage of this section is long continuation of Zlichovian calciturbidites under Barrandov Bridge and toward the both sides of Daleje Brook. This upward fining and thinning sequence consists of lithoclastic-bioclastic lime-mud supported canalized debris-flows, grainstones, calcisiltites and micrite beds (redeposited carbonate ooze mostly). Content of cherts is much higher than in the Pragian beds. The Zlichovian differs from Pragian both in the source areas and direction of the gravitational flows.

GAMMA SPECTROMETRIC CHARACTERISTICS OF THE PRAGIAN SECTION

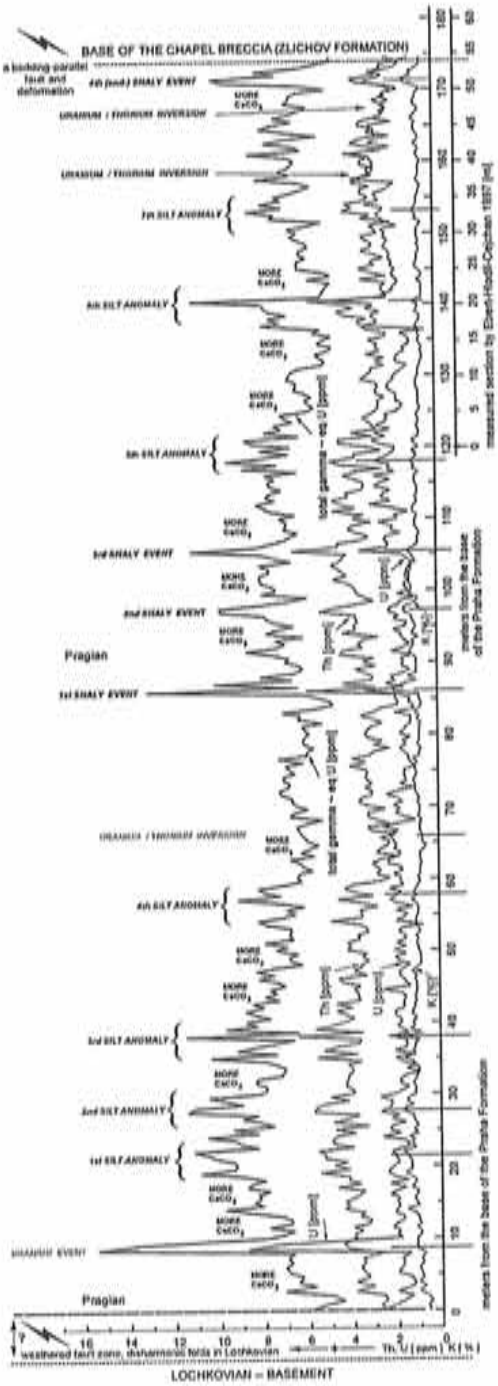
The thin layer of Slivenec Limestone is characterized by low gamma-ray counts. Contents of potassium (clay) increase steeper than thorium (negative shift in Th/K ration at the base). Uranium contents decrease, but at 9m form an extraordinary spike. This 16-ppm spike of uranium contents, unrelated to adequate changes on K has been called 'Uranium Event'. From this uranium spike to 'First Shaly Event' at 86m, evolved a broad sinusoidal elevation of gamma-ray counts. In general, this 'wave' (as well as two subsequent waves above) corresponds to increase of K- and Th-contents (clay, silt). Contents of uranium are changing independently, even with slight negative correlation with the values on K, Th. Four 'Silt Anomalies' are reported at 22, 27, 38 and 58m. These partial anomalies are characterized by strongest increase on Th, whereas sluggish, parallel elevations on U, K are inexpressive. A specifically low-oscillating zone within the late phase of the first 'wave' (0 to 86 m) involves an 'U/Th' Inversion, where content of U becomes equal or slightly higher than the Th-content (at 66 m). It is first time from the 'Uranium Event' (at 9m) when it was possible. The evolution of the Th/U rations significantly copy the shape of the total gamma-ray curve and also details of this rela-

tionship within the 'First, Second and Third Wave' seem to repeat. Also the setting and distribution of the silt-related anomalies within the 'Second and Third Wave' resembles the situation in the 'First Wave'. Concerning the sharp offsets at 86 and 141 m (associated with very narrow total gamma-ray spikes), the section would be suspected of tectonical repetition. However, these sharp offsets and spikes occur also in minor patterns and therefore are, assumedly, normal stratigraphical characters of this section. The end-peak on K, U and Th at 172 m is close above H.-P. Schoenlaub's findings of *Po. dehiscens*, its entry is used as indicator of the Pragian-Emsian stage boundary. However, the structure of this end-peak cannot possibly be a good equivalent of the 'Dark-colored Graptolitic Event', which is known from facies in northern limb of the Barrandian synform (from Na Pozarech near Prague, on the east, to Stydle vody near Sv. Jan on the west). It can be only suggested, in this connection, that another interesting, highly oscillating pattern occurs within the segment 161-166m of this section. In connection with general interpretation of this section, we can suggest that this deep-water facies reflected the sea level rise with increased amount of the non-carbonate material. This is the main difference from platform carbonates. An evidence for this statement is, at least, the rise of total gamma-ray counts on the transition from Slivenec to Dvorce-Prokop facies. Downshift asymmetry observed on the 'First and Second Wave' is typical characteristic of deep turbiditic sediments. The generally decreasing trends on total gamma-ray, K and Th may partly correspond to general shallowing trend during the late Pragian times. However, this decreased amount of K(clay) juxtaposed with the gradual sedimentary (or diagenetic?) condensation towards the end of the Pg section opens many unanswered problems. The Th/U ratios are developed in the same way as fluctuation on the total gamma-ray curve. Especially significant is, that values of the Th/U ratio are mostly positive (between 1 to 3). It also completely differs from situation on Devonian carbonate platforms, where calculated Th/U ratios are usually in deep negative values. Strong offsets at the boundary of waves at 86 and 141 m are interpreted as major episodes of sedimentary starvation in this section. The three waves mentioned in this paper are regarded as **three eustatic cycles**, which can potentially serve as physical-stratigraphy base for subdivision of the Pragian into three parts.



THE ENTIRE-PRAGIAN GAMMA SPECTROMETRIC SECTION (BARRANDIAN, PRAGUE, 'UNDER BARRANDOV BRIDGE'

... L. SLAVIK & J. HLADIL 2000



FRASNIAN EUSTATIC CYCLES VIEWED WITH GAMMA SPECTROMETRIC AND MAGNETOSUSCEPTIBITY STRATIGRAPHY TOOLS (MORAVIA): SIX MAJOR FLOODINGS ON CRATONIZED BASEMENT

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This extended summary originated within framework of the 1998-2000 GA CR Project 301-3-809 'Sea level change'.

PRIMARY LOCATION OF STUDIES

The studies on gamma-ray and magnetosusceptibility stratigraphy of the Frasnian sediments have been concentrated on margins of carbonate platforms, where continuous tilting/subsidence of the basement provided sufficient accommodation space. It caused both low relief of the platform edge and relatively uneventful accumulation of the beds. Frasnian limestones drilled in these locations have an average thickness about 400 m, but all thirty two 'entire-Frasnian' drillholes found Frasnian in subcrop of younger sediments (often in depths of several kilometers). Complete quarry sections throughout tectonically or erosionally dissected Frasnian sequences are relatively rare, because the Moravian Paleozoic was uplifted and dissected on present surface mainly in the central and western parts of Moravia, where variscan thrust faults usually occur. The best preservation of an 'entire-Frasnian' strata sequence was found in the Mokra Quarry West (several hundreds of meters large, rigid and resistant structure ramp, involving also undetached late Givetian basement as well as Famennian cover). However, the thickness of the Frasnian at Mokra is at lowermost limits of general requirements on sufficient stratigraphical continuity in platform carbonates – about 100 m only.

DEVELOPMENT AND APPLICATION OF GS- AND MS-PRINCIPLES

Two extant concepts, both suggested during 1990s, have been developed to sufficient stage of applicability in connection with thick sequences on carbonate platforms. The first concept concerns the reciprocal lowstand clastic and highstand carbonate sedimentation on platforms and was introduced, from aspect of gamma logs, by Southgate et al. in 1993. Basically, increased total gamma-ray counts correspond to depression stages of sea level fluctuation. The late falling stage and lowstand system tracts are connected with increased production/dispersal of terrigenous weathering products, just when the low rates of carbonate accretion are typical. The second concept, introduced for this purpose by Crick et al. in 1977, relates to the application of magnetosusceptibility to stratigraphic studies in carbonate sequences of past. This approach is based on well-documented experience that specific MS patterns as well as major depression in elevations on records from section provide surprisingly good and high-resolution correlation among distant areas, even if there was considerable difference in paleoposition of basins, sources of terrigenous material or varying pathways of diagenesis. Basically, the increased magnetosusceptibility response on the rock corresponds to increased amount of iron, which is carried in terrigenous weathering products related to FST/LST (such as silty particles of paramagnetic minerals from crystalline and sedimentary rocks, volcanogenic minerals) or to authigenic minerals associated with TST (such as microbial magnetite, maghemite, thiospinnels, siderite, or Fe-segregates within glauconite, francolite etc.). Thereat, even massive late diagenetical emplacements of pyrite or alpha-Fe^{3+} oxides (hematite or goethite) have only little additional influence on the primary MS-records. To conclude the basics, the gamma ray and magnetosuceptibility profiling in sections through platform limestones show that elevated GS- and MS-values usually corresponds to depressions of sea level and, vice versa, the weak response marks pure and rapidly accreted carbonate banks of late TST/HST. Although presence of specific event patterns indicates an existence of other climatic and biogenic controls, that are mostly unmodelled for Frasnian, and also in spite of undoubted occurrence of regional bias, the interpretation essentials like 'high GS- and MS-values ~ depression of sea level' are working good and concern much of the evaluated length of logs in platform carbonate rocks.

INSTRUMENTS AND MEASUREMENT/SAMPLING STEP

The total gamma-ray counts in drillholes have been measured with complex US probes Dreser Atlas in adapted 80xx-series and adapted Russian Nggk-Sp of 35x-generations, the gamma spectrometer for field is Czech GS-256/259 (Geofyzika) and samples for magnetosusceptibility were measured on Czech KLY-3/4 Kappa bridges (Agico). Digitized measurement step for natural gamma-ray counts in drillholes was 0.1m, gamma-spectrometric measurements were taken with step 0.5m (axis bedding-parallel, orientation perpendicularly to massif, in full contact), and sampling step for magnetic susceptibility of rocks was 0.1m.

MAIN CHARACTERISTICS OF THE GS- AND MS RECORDS IN MOKRA SECTION

The main trend in total natural gamma counts is an increase of values from the base to end of the Frasnian section. It well-corresponds to rising amount of radiogenic potassium ^{40}K (recalculated to contents of K at whole). The potassium and throrium records at the beginning of Frasnian are largely chaotic and calculable elevations are visually better apparent according to presence of narrow dividing peaks. On the other hand, the fluctuation of magnetic-susceptibility values shows clear three-part pattern within the lower half of the Frasnian. The LST/FS levels became to be strongly developed (and specifically arranged) within the upper half of the Frasnian. The MS-maxima at the boundary between 4th/5th cycles are accompanied by specifically low contents of uranium, which are in contrast with increased content of thorium by sluggish subsidy of potassium. This special configuration is explained in agreement with amounts of aeolian silt as a result of a 'desert-climate sea-level lowstand event'. Completely different is the 5th /6th cycle boundary, where a massive increase of gamma-ray is jointly generated by corresponding changes of K, U and Th. Especially, a long-term surplus of terrigenous uranium wash-out (with continuation to FS with organic-matter binding), together with FS-related amounts of microbial magnetite, indicates a 'humid lowstand event'. This conclusion corresponds to presence of 'micro-pebbles' of crystalline rocks from distant areas, lateritic alterations and/or shallow-water ferruginous coatings on other particles, which all are related to riverine drainage of low-relief coast, low-salinity coastal swamps, and other phenomena. The Mokra section is very similar to borehole Slavkov-2, as well as to many sections in the Moravia-Center and Moravia-North drilling sectors. Comparison of the Mokra Section with all boreholes suggests that Frasnian is preserved at Mokra completely (or almost completely, with an exception of several last beds). This greatly contrasts with absence of GS- and MS-patterns for beginning of the Famennian. In lieu of laterally traced patterns, we can see a sharp U-Th spike, which is only idly followed by an increase of contents of K (clay). This well-documented situation throw serious doubt on previous, paleobiologically derived assumptions about direct Fr-Fa continuation at Mokra.

REFUTATION OF Fr/Fa SURVIVAL OF REEFBANKS AT MOKRA

The whole story originated during 1970s, when conflict between two extreme schools was growing to intensity, i.e. between the 'horizontal concept' of Fr-Fa event boundaries (V. Zukalova, V. Skocek) vs. ' consistently oblique stratigraphic boundaries' (J. Dvorak, O. Friakova). Especially, the mid-Frasnian termination of reef limestones at Hranice with continuation of light gray colored grainstone banks up to Tournaisian at Hnojnik were the key arguments against 'horizontalists'. However, this antithesis was based on exceptional localities, where reefs were drowned due to sliding, truncation or transgressive backstepping of reef margins, and also on very shallow areas, where emerged Frasnian reef-banks were covered by thin, light-colored grainstones to breccias with scattered stromatoporoid and coral, Fa-Tn debris. In this connection, another very interesting phenomenon attracted the interest of researchers. It was a large (0.5 km across) bedding-parallel contact between the Frasnian reef-banks and Famennian cephalopod limestones in the Mokra Quarry West. Speculations about possible small Famennian survival were seemingly supported by the following arguments: a) presence of a strong coral-killing crisis several meters below the end of reef-bank formation, b) findings of rare populations of *Pa. crepida* and associated conodonts, ?infiltrated but not the same composition as in the cover c) absence of neptunian dikes in the Mokra Quarry West, d) change and mainly impoverishment of benthonic communities, with emergence of several Famennian-related endemics (such as rugose corals *Tabulophyllum*, stromatoporoids *Labechia* or tabulate corals *Syringopora*). Although several alternatives have been considered, many papers exaggerated this possibility reef-banks survival. Practically, all local publications from last two decades (many made by me, or in teams! - rem. by the first author) have been partly polluted with some consideration of this 'possible continuity concept in Mokra'. The present GS- and MS measurements show that this section consists of all six Frasnian cycles. The plotted patterns of changes are very similar to many boreholes and involve attributes of the complete section. Gamma-ray counts in beds relevant to terminating Frasnian are undoubtedly fitted. Only the proper UKW interval (or its part) is missing at Mokra. The sharp uranium spike with sluggish reaction in potassium(clay) contents are good documents for hiatus, which is correlated with several eustatically emerged areas (Rataje, Uhrice, etc.). Therefore, the thinking about areas where several Frasnian shallow-water coral and stromatoporoid taxa escaped the Fr-Fa overkills get even more puzzling than it was before.

CUMULATIVE INFORMATION FROM LOGS, SIX FRASNIAN EUSTATIC CYCLES

During this laborious task, ca 140 km of logs have been investigated and 15 km of the best gamma-ray records have been used for corrected and standardized logs, forming the base of study. The reliability of counts has been checked also according to juxtaposed spontaneous-potential, resistivity, sonic, density, neutron, neutron-neutron, gamma-gamma, and other methods (such as obsolete laterologs). Generally, the contents of clay and silt in carbonate are typically facies dependent quantities. But the fine patterns never repeat completely and contain significant event- or time-related information that is used for strata correlation in wells for half of century. Studies on well logs detected several incorrectness introduced in past. It can be exemplified by Raskovice-Ja-7 borehole, where tectonic repetition was found and entire section had to be re-interpreted on the base of well logs, biostratigraphy and reflection-seismic profiling. Tens of boreholes have been ordered according to patterns of variety of magnitudes. The most common, up to over-simplified principles of interpretation suggest that LST-related periods provided better conditions for production, redistribution and deposition of weathering products on the carbonate platform than the HST periods. Main correlative ele-

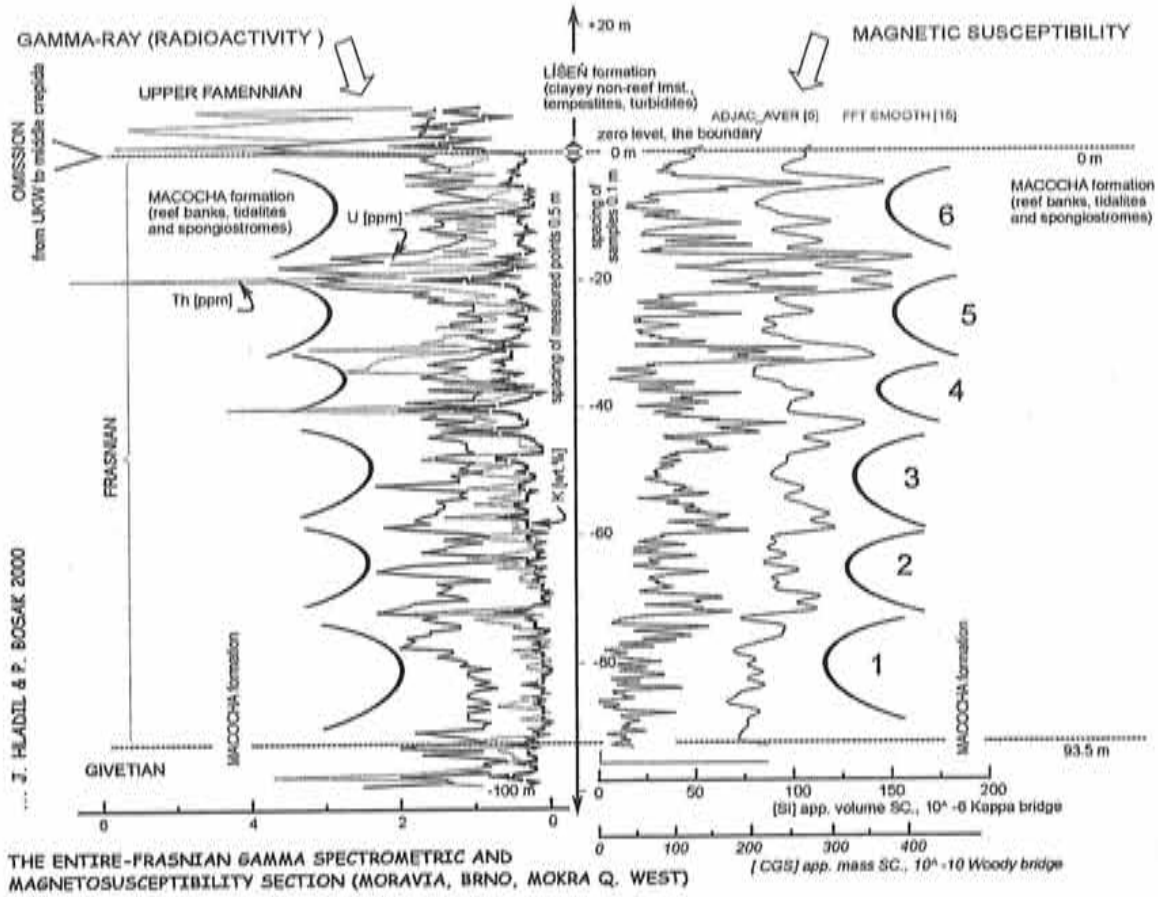
ments in logs are, inevitably, the amplitude- and distribution-related parameters together with sequentional and unique markers. The dispersion fans of the weathering products may have many specifics (due to changing composition of coastal regolite/soil as well as braiding or karstic drainage on the emerged coastland, variation of aquatic and atmospheric circulation, etc.). Having the stratigraphical series of paleographic subsurface maps, these facts have been considered as much as possible. Using of the spline with optimum inter-correlative value minimized other bias. The proper way for finding of representative values was to balance specific sectors and select the key logs. By balanced selection, the number of the sections has been decreased from 80 -> 32 -> 6 [=Jablunka-1, Drevohostice-1, Choryne-9, Svabenice-1, Slavkov-2 and Nemcicky-2]. Besides the facies- and gamma-facies balancing, two other limiting postulates have been introduced: – less than 5% of relative th. variability (by 1/10 of entire-Fr thickness); – entire-Fr thickness [0.25; 0.5] km. This limitation involves a discrimination of the wells in very nearshore positions (low thickness, low sed. record/hiatuses ratio) as well as in slope paleoenvironments (truncations, sliding). Juxtaposed and calibrated 'big six' served for cumulative addition of amplitudes in corresponding levels. Result was again re-calibrated against average carbonate contents in levels of addition. This step aimed at re-introduction of real dimensions and was used also as a loop check of the entire procedure. Next step required finding of the suitable continuous function that can correct the vertical deformation of the section against the time scale (rate of sedimentation through entire-Fr, platform-margin sections), i.e. a moderate downward decrease but more intensive upward decrease has been suggested, as expressed in exponential form of the simple fitting curve

$$(1)\ y = -8\ E\text{-}14 \cdot x6 + 4\ E\text{-}11 \cdot x5 - 7\ E\text{-}09 \cdot x4 + 1\ E\text{-}06 \cdot x3 + 5\ E\text{-}05 \cdot x2 - 0.0102 \cdot x + 0.3103,$$

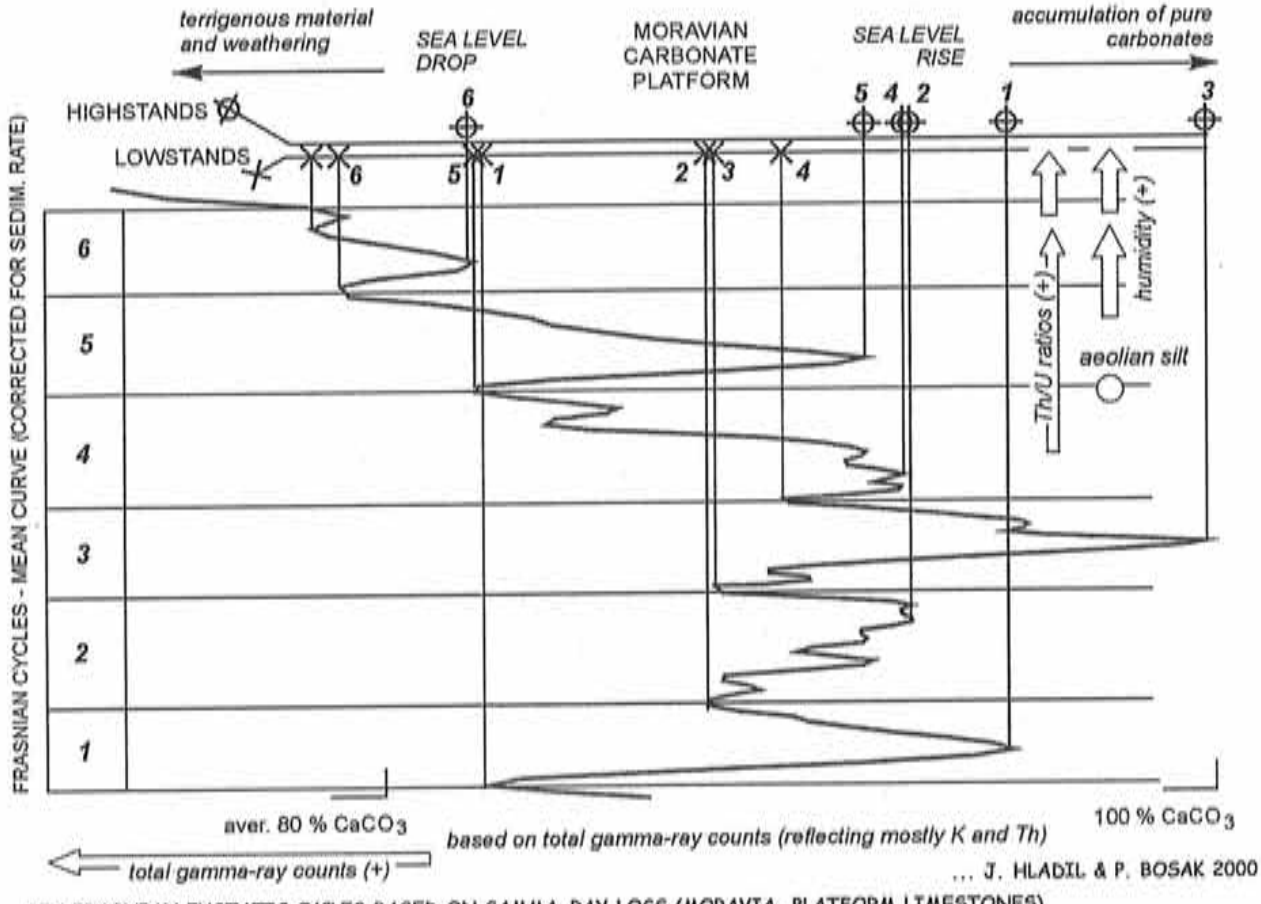
where x = position on juxtaposed logs scaled by thickness of sediment and

y = relative time distance between neighboring points in log.

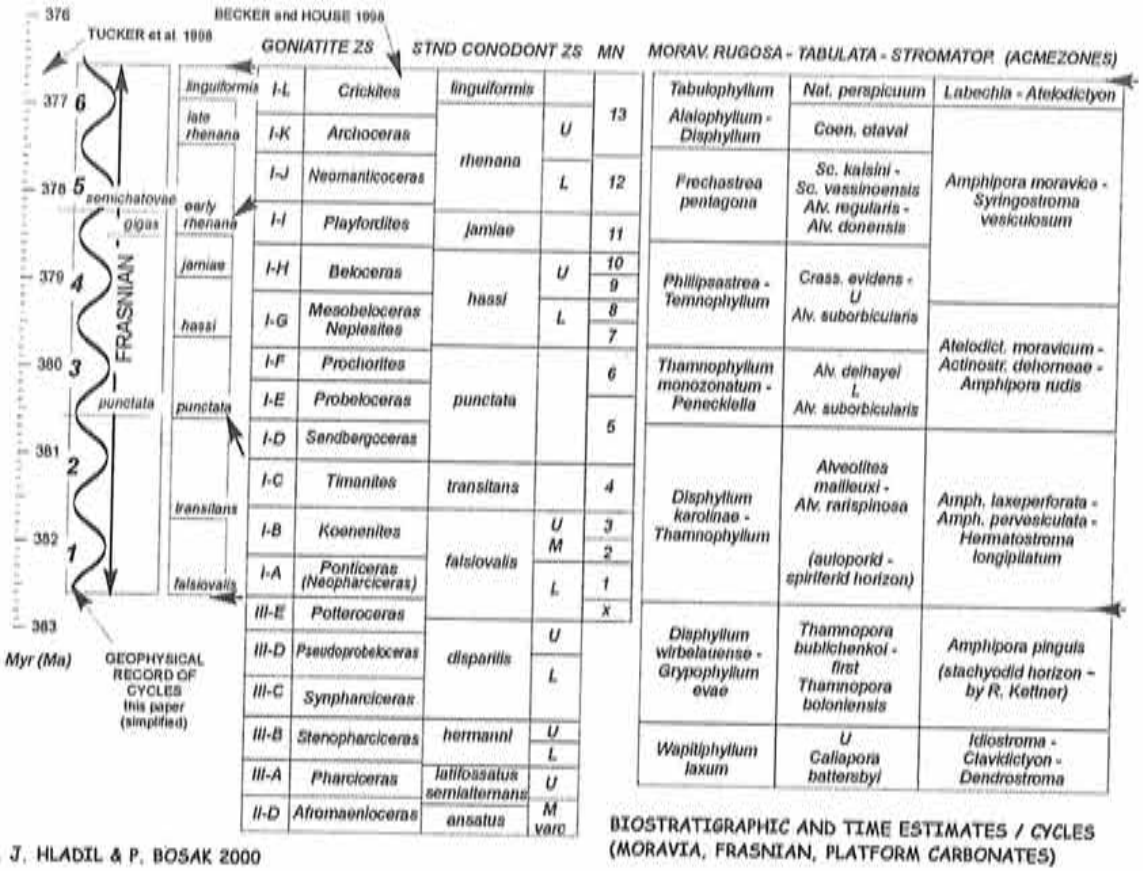
Setting of this correction considered both geological and paleobiological indicators (such as seasonal growth in sediment and stromatoporoids, thickness of the banks, quality/frequency of hiatuses or thickness of biozones). These steps are simply empirical calculations and only 'translate' normal geological sequence-evolution estimates to numbers. A comparison of the mean gamma-ray log with the paleogeographical T-R shifts (incl. platform margin and coastal line) unveils one difference, that gamma-ray counts tend to a long-term increase since the end-levels of 'Pa. punctata correlates', but the long-term backstepping/progradation at shore itself, resp. front of platform/ramp, has not appeared before the Fr turning-point at 'Pa. jamiae correlates'. This difference reflects two minor causes and one big influence. Any borehole vertically drilled in marginal part of tilted platform penetrates the upper parts closer to axis of tilting (upper parts are close to leg, the lower parts are close to hypoptenuse, Pythagorean theorem; uncorrected but very slight). Another part of the above mentioned difference would be ascribed to diminished growth potential on reef banks + narrowing of accommodation space for banks (? 20-30–% influence). But the main reason for this difference was rising humidity during second half of the Frasnian, which caused larger influx of clay material as well as washing of uranium from dry-land weathering products. The general Fr curve shows six major flooding pulses (eustatic cycles), which can be also recognized/cross-checked on raw logs – cf. Mokra, herein. The up-dated Moravian biostratigraphy chart suggests that duration of these six cycles is comparable, i.e. ca 1Ma. The cycles 1, 3, 5 and 6 are symmetrical, but the shape of the cycles 2 and 3 signalizes a considerable structural heterogeneity. Laterally and vertically scattered biostratigraphical markers suggest that 'big six of Fr cycles' can correspond to: **FrC-1** – Pa. falsiovalis; **FrC-2** – Pa. transitans; **FrC-3** – Pa. punctata; **FrC-4** – Pa. hassi + Pa. jamiae; **FrC-5** – Early Pa. rhenana, and **FrC-6** Late Pa. rhenana + Pa. linguiformis Zs. The major T-R reversal of the entire Middle-Upper Devonian carbonate sequence is connected with the boundary FrC-4/FrC-5. According to previous 'Moravian terminology' from 1980s, this stratigraphic level corresponds to the parasequence boundary MC-III/MC-IV (J. Hladil) and/or start of the Upper Frasnian Division IV (V. Zukalova).



THE ENTIRE-FRASNIAN GAMMA SPECTROMETRIC AND MAGNETOSUSCEPTIBILITY SECTION (MORAVIA, BRNO, MOKRA Q. WEST)

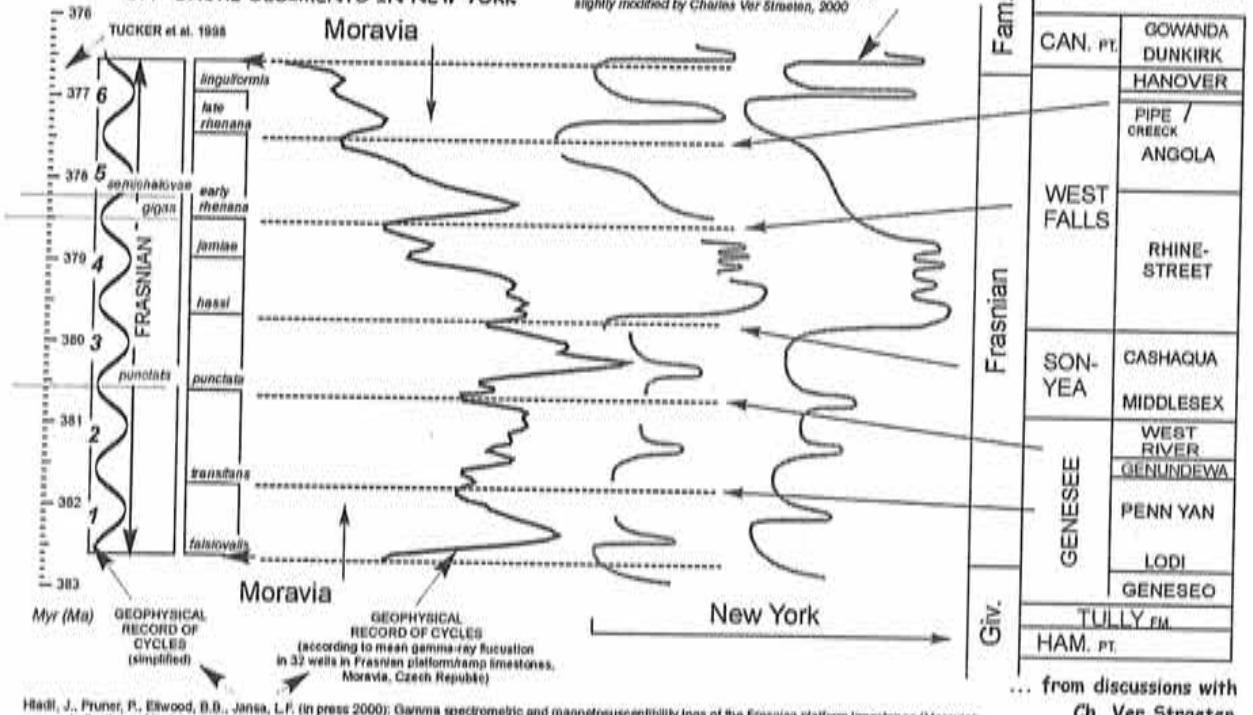


SIX FRASNIAN EUSTATIC CYCLES BASED ON GAMMA-RAY LOGS (MORAVIA, PLATFORM LIMESTONES)



? POSSIBLE CORRELATION OF RESULTS FROM MORAVIA WITH EUSTATIC CURVE DERIVED FROM OFF-SHORE SEDIMENTS IN NEW YORK

House, M.R., Kirchgasser, W.T., 1993. Devonian goniatite biostratigraphy and timing of facies movements in the Frasnian of eastern North America, In: Hailwood, E.A., Kidd, R.B., (Eds.), High Resolution Stratigraphy. Geol. Soc. London, Spec. Publ. 70, 267-292.
slightly modified by Charles Ver Straeten, 2000



Hladil, J., Pruner, P., Ellwood, B.B., Jansa, L.F. (in press 2000): Gamma spectrometric and magnetosusceptibility logs of the Frasnian platform limestones (Moravia): indications of their large correlation potential. 8th Internat. Meet. IGCP 421 at 1st Iber. Paleont. Congr., Evora, Portugal.

Hladil, J., (submitted 2000): Geophysical records of dispersed weathering products on Frasnian carbonate platforms and Early Famennian ramps in Moravia, Czech Republic: their correlation potential and information about eustasy and paleoclimate. Palaeogeogr., Palaeoclimat., Palaeoecol.

... from discussions with Ch. Ver Straeten

... J. HLADIL & P. BOSAK 2000

CM HUBERT LARDEUX (RENNES)

Ongoing study of Anjou Devonian (Armorican Massif), especially Tentaculite faunas. Quarrying in the Erbary limestone has offered new materials (Tentaculites, Corals, Brachiopods, Trilobites) which should enable us to precisely localise the species described in Ch. Barrois' famous monograph.

RECENT PUBLICATION.

1998 - H. Lardeux - La Formation des Maisons Rouges, unité lithostratigraphique d'âge devonien inférieur du domaine ligerien, Sud-est du Massif Armoricain. *Bulletin de la Société d'Etudes Scientifiques de l'Anjou,* Angers, t.16; 71-88, fig. 1-3

CM ELGA MARK-KURIK (TALLIN)

Two biostratigraphical papers were published this year (Mark-Kurik, 2000;Blieck et al., 2000). First of them gives detailed range of the Middle Devonian fishes in local stratigraphical units, including members, of Baltic area and Belarus. The data from the latter region are scarcer. Correlation of the Middle Devonian of Baltic area and Scotland is given. Approximate position of the miospore zones in above sections is shown together with zones of different dominating fishes. The position of two stage boundaries are noteworthy. The Emsian/Eifelian boundary is generally agreed now to be between the Rezekne and Pärnu formations in Baltic or the Vitebsk and Adrov formations of Belarus (see also Valiukevicius in the same CFS volume 223). The Givetian/Frasnian boundary is situated roughly between the Amata and Plavinas formations (or perhaps somewhat below the boundary of these formations). The correlation of the Middle Devonian section of the Baltic area and those of Belarus and Moscow Basin shows once more that at least the Gauja Formation and its coeval units are of the Givetian age (Mark-Kurik et al., 1999). This conclusion is based on miospore data. It should be mentioned that the position of the Middle/Upper Devonian boundary below the Gauja Formation or Asterolepis ornata Zone was proposed by D. Obruchev (1951) and was based on hiatus and unconformity between the Middle and Upper Old Red Sandstone in Scotland and hiatuses on the same stratigraphical levels in the Baltic area and Leningrad Region. The Late Devonian age of the Gauja Fm and overlying Amata Fm was fixed for many years in the correlation charts of the East European Platform until late 90s (see Rzhonsnitskaya, 1998, SDS Newsletter No. 15: 53-61). The Middle Devonian age of the Gauja Formation is of interest in the context of the occurrences of the oldest known prototetrapod from Latvia and Estonia (Ahlberg et al., 2000; Ahlberg et al., 2000, Abstract). The chapter on placoderms, mainly arthrodires, in the Devonian of Severnaya Zemlya, Siberian Arctic (Mark-Kurik, 1999) in the book R. Matukhin & V. Menner (eds) "Stratigraphy of Silurian and Devonian of Severnaya Zemlya" is worth to mention [the book reached Tallinn in 2000]. The Early Devonian placoderms show resemblance to those in Spitsbergen, whereas the Middle Devonian forms are close to those in the Baltic area.

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Mark-Kurik, E. 2000. The Middle Devonian fishes of the Baltic States (Estonia, Latvia) and Belarus. Courier Forschungsinstitut Senckenberg, 223: 309-324.

Blieck, A., Turner, S., Young, G.C. with contributions of Luksevics, E., Mark-Kurik, E., Talimaa, V.N. & Valiukevicius, J.J. 2000. Devonian vertebrate biochronology and global marine/non-marine correlation. Courier Forschungsinstitut Senckenberg, 220: 161-193.

Mark-Kurik, E., Blieck, A., Loboziak, S. & Candilier, A.-M. 1999. Miospore assemblage from the Lode Member (Gauja Formation) in Estonia and the Middle-Upper Devonian boundary problem. Proceedings of the Estonian Academy of Sciences, 48(2): 86-98.

Ahlberg, P.E., Luksevics, E. & Mark-Kurik, E. 2000. Near-tetrapod from the Baltic Middle Devonian. Palaeontology, 43, Part 3: 533-548.

Ahlberg, P.E., Luksevics, E. & Mark-Kurik, E. 2000. A new proto-tetrapod and the phylogenetic status of the Elpistostegalia. 9th Annual International Symposium, Early Vertebrates/ Lower Vertebrates. Northern Arizona University, Flagstaff. Abstract: p. 1.

Mark-Kurik, E. 1999. Placodermy (Arthrodira) [Placoderms (Arthrodira)]. In: Matukhin, R.G. & Menner, V.V. (eds). Stratigrafija silura i devona Severnoj Zemli [Stratigraphy of Silurian and Devonian of Severnaya Zemlya]. Novosibirsk: 139-142 (in Russian).

CM WM. A. OLIVER, JR. (WASHINGTON, D.C.)

Current work is on Devonian rugose corals from New York. A paper on the anomalous occurrence of a hand-size colony in black, fetid shale is undergoing review. A monograph on Heliolphyllum (with Jim Sorauf, Binghamton) is nearing completion, and several additional small and large studies are underway.

RECENT PUBLICATIONS:

OLIVER, W.A., Jr. 1999. The principal Pridolian and Lochkovian rugose coral assemblages or communities in eastern North America pp.800-805 in Boucot, A. J. & Lawson J.D., eds., Paleocommunities: Cambridge Univ. Press.

OLIVER, W.A., Jr. 2000. Stage boundary recognition in the Eastern Americas Realm based on rugose corals; pp.57-63 in Bultynck, P., ed. S.D.S.; Fossil Groups Important for Boundary Definition: Courier Forschungsinstitut Senckenberg, v.220.

IN PRESS:

OLIVER, W.A., Jr. in press. The origin of "Spongophylloides" in eastern North America: Proceedings of 8th International Symposium on Fossil Cnidaria (1999, in Sendai, Japan).

CM G. RACKI (SOSNOWIEC), TM M.R. HOUSE (SOUTHAMPTON, UK)

LATE DEVONIAN BIOTIC CRISIS: ECOLOGICAL, DEPOSITIONAL AND GEOCHEMICAL RECORDS (SPECIAL ISSUE OF "PALAEOGEOGRAPHY, PALAEOCLIMATOLOGY, PALAEOECOLOGY")

The Frasnian-Famennian (F-F) transition has for a long time attracted attention due to its presumed link with one of the severest extinctions in Earth history (so called Kellwasser Crisis), exemplified primarily by collapse of the low-latitude Devonian reef biota and overall carbonate production crash. Nevertheless, many aspects of this major biotic turning point remain conjectural, including timing and magnitude of ecosystem changes and mediated extinction dynamics, and especially their prime causes. The main aim of the approved special issue of **"Palaeogeography, Palaeoclimatology, Palaeoecology"** is to present different paleoenvironmental approaches, and high-resolution results and interpretations currently available from different parts of the Devonian World.

The starting point are integrative stratigraphical-ecological, lithofacies and geochemical case-studies for some regions, available for eastern Laurussian shelves in the frame of international project "Ecosystem aspects of Late Devonian biotic crisis", supported by Committee for Scientific Research in Poland. A summary of recent advances in the study of key F-F problems will be given in several review papers, focused mostly on up-to-date stratigraphical and geochemical results. We hope this volume will constrain at least some of the uncertainties and highlight significant interrelated events and processes in the evolution of Late Devonian ocean-climate and biological systems, from a regional to a global scale.

TM C.A. SANDBERG (DENVER) & TM W. ZIEGLER (FRANKFURT)

LATE DEVONIAN EVENTS AND MASS EXTINCTIONS. C. A. Sandberg[1], W. Ziegler[2], and J. R. Morrow[3], [1]U.S. Geological Survey, Box 25046, MS 939, Federal Center, Denver, CO 80225, U.S.A., sandberg@usgs.gov; [2]Forschungsinstitut Senckenberg, D-60325 Frankfurt am Main, Germany; [3]Department of Earth Sciences, University of Northern Colorado, Greeley, CO 80639, U.S.A.

Introduction: The Late Devonian Epoch, one of the most intensively studied of all the Paleozoic Epochs, was a time of major sea-level changes, catastrophic events, some of which were impact related, and two mass extinctions, one of which was impact related. These many events are plotted herein against the generally accepted sea-level curve [1, 2]. Detailed knowledge and dating of Late Devonian events resulted from a high-resolution biochronology, based primarily on conodont zonations, but supported in part by ammonoid, ostracod, and spore zonations. This detailed knowledge was gained by intensive biostratigraphic studies during the past two decades, inspired by the IUGS Subcommission of Devonian Stratigraphy and by IGCP Projects on Bio-Events and Mass Extinctions. Many Late Devonian events produced changes in the environmentally sensitive mudmound levels in Belgium [3].

The initial Late Devonian Stage, the Frasnian, was a time of general transgression during the Taghanic onlap that began in the late Middle Devonian. The final Famennian Stage was a time of general regression, probably due to Southern Hemisphere glaciation, interrupted by four major transgressions, probably related to interglacial episodes. Both the late Frasnian and late Famennian mass extinctions occurred during, not at the start of, rapid regressions that closely followed rapid transgressions. The stepwise late Frasnian mass extinction, one of the five greatest in Earth's history [4], is believed to have occurred as a result of environmental stresses that were related to not just one but to a series of multiple, non-critical impacts. The late Famennian mass extinction, on the other hand, is believed to have occurred at the culmination of stresses produced by alternating glacial and interglacial episodes.

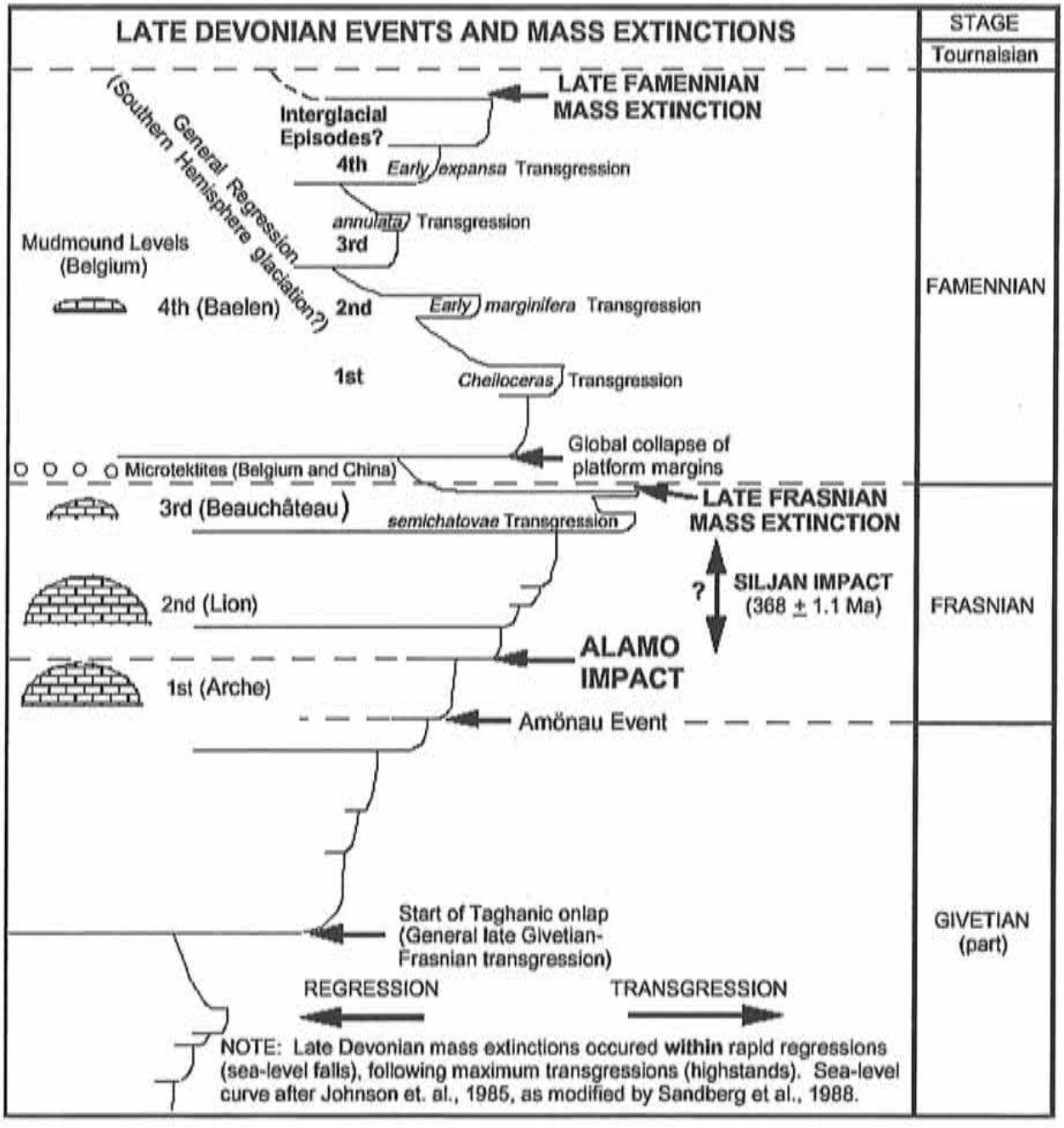
Frasnian: Some Frasnian events are closely related to or even may have produced significant transgressions. The enigmatic Amönau Event, which locally produced a megabreccia, can now be tied to the onset of volcanism across a 75-km transect of the Rheinisches Schiefergebirge in Germany and to a eustatic rise in sea level. It is dated as occurring within the Early *falsiovalis* conodont Zone at the first occurrence of *Ancyrodella rotundiloba*, the conodont used to define the start of the Frasnian. We are now trying to determine whether this volcanism resulted from an oceanic impact. The oceanic, sub-critical Alamo Impact in southern Nevada is at present the best evidenced Late Devonian impact, even though its crater is now buried or obliterated. Evidence of its ~1.5-km-deep crater derives from Middle Ordovician to possibly Late Cambrian conodonts that were blasted from the crater depths and redeposited in the resulting chaotic megabreccia and tsunami-related turbidites [5], along with carbonate impact spherules, shocked-quartz grains, and a locally high iridium concentration [6, 7]. This impact occurred in the middle of the *punctata* Zone and coincides with a major transgression and the demise of the first mudmound level in Belgium. Because of the current controversy in methodology for radiometric dating, we are now uncertain whether the Siljan Impact in southern Sweden coincides with the Alamo Impact, with the late Frasnian mass extinction, or was part of an intervening comet shower.

The late Frasnian mass extinction, commonly known as the Kellwasser Event, occurred not at the highstand of transgression [8] but within the regressive part of a thin transgressive-regressive black shale bed. Where well developed, this shale contains a detailed record of several stepped extinctions and introductions of shallow-water biota, culminating in an abiotic layer at its top. Researchers are still trying to locate an impact exactly coincident with this position. Possibly the Siljan Impact was the source of microtektites found within the extinction shale in Belgium. However, it seems more likely that the extinction occurred as a result of a series of sub-critical impacts or comet showers during the Frasnian. This scenario is supported by the stepwise extinction of several animal groups [9] and by the decreasing size and biotic diversity of the first three Belgian mudmound levels.

Famennian: To date, no direct evidence of any impacts has been found in Euramerica during the less turbulent Famennian Stage. A possible, closely post-extinction time of impact, however, is within the late part of the earliest Famennian Early *triangularis* Zone, when normal sedimentation was interrupted globally by deposition of coarse tsunami-related breccias. This event has been attributed, alternatively, to collapse of platform margins during continuing regression [2]. Only one local Famennian mudmound level, the Baelen [10] is known in Belgium, and this lacks the stromatoporoids and corals that were important to Frasnian mudmound construction. The Baelen mudmound was constructed during the later part of the second major Famennian interglacial? transgression. The late Famennian mass extinction, commonly known as the Hangenberg Event, occurred during a severe sea-level drop within the Middle *praesulcata* Zone, near the end of the Devonian.

LATE DEVONIAN EVENTS AND MASS EXTINCTIONS. C. A. Sandberg, W. Ziegler, and J. R. Morrow

References: [1] Johnson, J. G., Klapper, G. and Sandberg, C. A. (1985) *GSAB 96*, 567–587. [2] Sandberg, C. A., Ziegler, W., Dreesen, R. and Butler, J. L. (1988) *CFS 102*, 263–307. [3] Sandberg, C. A., Ziegler, W., Dreesen, R., and Butler, J. L. (1992) *CFS 150*, 1–87. [4] McGhee, G. R. (1996) *CUP*, 1-303. [5] Morrow, J. R., Sandberg, C. A., Warme, J. E. and Kuehner, H.-C. (1998) *JBIS 51*, 451–460. [6] Warme, J. E. and Sandberg, C. A. (1995) *CFS 188*, 31–57. [7] Warme, J. E. and Kuehner, H.-C. (1998) *IGR 40*, 189–216. [8] Hallam, A., and Wignall, P. B. (1999), *ESR 48*, 217–250. [9] Schindler, E. (1990) *GAGP 46*, 1–115. [10] Dreesen, R., Bless, M. J. M., Conil, R., Flajs, G. and Laschet, C. (1985) *ASGB 108*, 311-359.



CM EBERHARD SCHINDLER (FRANKFURT)

A big part of past year's research has been to contribute to the joint work on clastic Lower Devonian rocks in the Rhein/Mosel area of the Rheinisches Schiefergebirge. In this collaborative study a high number of colleagues from the Forschungsinstitut Senckenberg (FIS) and from other institutions are involved (see also previous SDS Newsletter). Investigations of facies and sedimentology as well as palaeontological studies of selected sections allowed for detailed analyses of palaeoenvironmental interpretations. Namely, the close interaction with the sedimentologists and actuopalaeontologist of the FIS department 'Senckenberg am Meer' in Wilhelmshaven lead the conclusion of an intertidal setting very similar to the Recent Wadden Sea of the German Bight. A number of features visible e.g. in the section at the famous Alken Quarry (strata regarded as late Lower Emsian Nellenkoepfchen Fm.) could be compared directly with Recent sediments during a joint field trip on the Senckenberg vessel. First results have been presented at the regional meeting of the IAS in Dublin (Wehrmann et al. 2000) and on a field trip connected with an EAP workshop on 'Biomarkers and Stable Isotopes in Palaeontology' that took place at the FIS from June 30 to July 2, 2000 (Jansen et al. 2000).

Research progressed on Upper Devonian sections of the western Urals (Russia). Together with TM W. Ziegler, TM K. Weddige, P. Koenigshof and G. Schraut (all Senckenberg resrarch group) and M. Snigireva, A. Bikbaev, L. Mizens and K. Ivanov from the Academy Institute at Ekaterinburg (Russia), two sections across the Frasnian/Famennian (F/F) boundary have been studied in detail. Features very similar to many F/F boundary sections worldwide have been recognized, e.g. shallowing features at the boundary, exactly equivalent development of conodont developments across the boundary.

Another contribution to a joint project of the FIS group has been forwarded within the collaboration of FIS and Moroccan colleagues from Marrakech University and Rabat Scientific Institute (CM A. El Hassani has been at the FIS for joint work). Additional samples have been taken by the group in sections of the Oued Draa during field work.

Contributions have been forwarded in connection with the two working groups of the German SDS (on the subdivision of the Late Devonian and on the inner-Emsian boundary). For details see documents concerning both working groups in this newsletter.

Other fields of research have been Upper Devonian sections of the Thueringisches Schiefergebirge (together with TM W. Ziegler, CM H. Blumenstengel, K. Bartzsch, H. Hueneke and M. Gereke).

The collaboration with the MSEC group (namely TM R. Crick and CM B. Ellwood) is ongoing.

Zircons of some selected samples from the Rheinisches Schiefergebirge have been forwarded to R. Tucker for radiometric analysis.

In connection with railway constructions between Frankfurt and Koeln, determinations of Tentaculites have been carried out (section at 'Aegidienberg Tunnel').

Last but not least, the beginning activities for the preparation of the forthcoming IGCP 421/SDS meeting in Frankfurt in May 2001 have to be mentioned (see separate announcement in this newsletter).

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WEHRMANN, A.; BROCKE, R.; HERTWECK, G.; JANSEN, U.; KÖNIGSHOF, P.; PLODOWSKI, G.; SCHINDLER, E.; SCHULTKA, S. & WILDE, V. (2000): Intertidal deposits in Lower Devonian siliciclastic sequences of the Mosel Region, Germany. – 20th IAS Regional Meeting, Dublin, Ireland, Abstracts: 62; Dublin.

CM HANS PETER SCHÖNLAUB AND SUSANNE M.L. POHLER (WIEN)

A new project on Devonian carbonates funded by the FWF (Fonds zur Förderung der wissenschaftlichen Forschung) started this year and deals with *sequence stratigraphy, platform evolution and paleoecology of Devonian carbonates in the Central Carnic Alps (Austria).* Project leader is H.P. Schönlaub (conodont biostratigraphy, paleogeography), together with B. Hubmann (tabulate corals, algae), project co-worker is S. Pohler (carbonate sedimentology). Collaborative work with Alan Pedder (rugose corals) is planned.

The Carnic Alps are particularly suited for this study because platform-, slope- and basin carbonates ranging through the entire Devonian occur here in close proximity. Previous work has established the framework of geological, structural and biostratigraphical data necessary for the application of modern sedimentological concepts such as sequence stratigraphy and basin anasyses. One of the chief interests is the correlation between the biostratigraphically well contrained strata of the basinal and slope facies and the poorly constrained shelf sequences. We hope to achieve tighter age-control by studying the changing composition of lithoclasts and bioclasts in the shelf-derived gravity flow deposits which are frequent in the slope sediments. Subsequently the application of sequence stratigraphy and basin analyses will be possible and enable a better understanding of the Carnic carbonate system.

Field work in the Carnic Alps commenced this summer with measuring of key sections and collection of samples for thinsectioning and conodonts

The meeting on Catastrophic Events & Mass Extinctions held in Vienna (July 9 – 12, 2000) was followed by a field trip to the Carnic Alps, where sections of the carbonate platform (Schönlaub & Pohler, 2000) were introduced to field trip participants. Cooperation with Andreas Braun and Heiko Hünneke on Devonian phosphatic microfossils and phosphatization "events" at the Givetian/Frasnian boundary, respectively was also initiated this summer.

Transgressive/regressive cycles expressed in the different facies belts were investigated in collaboration with Carl Brett and numerous events (e.g. Chotec-, Kacak-, Taghanic events) could already be identified in the well constrained distal slope sections.

Preliminary results of the project were presented at the Second Austrian Stratigraphy work shop (AUSTROSTRAT 2000) in Gossendorf/Steiermark. Additional results will be presented at the meeting in Frankfurt in May 2001.

The project of S. Pohler on Devonian Island arc carbonates of the Tamworth Belt in New South Wales, Australia which was initiated at Macquarie University in collaboration with John Talent, Ruth Mawson, Chris Herbert and Pat Conaghan and lateron funded by the DFG (German Research Foundation), is nearing completion. Results were presented at the NEO '99 in Armidale, N.S.W. (Pohler, 1999).

A manuscript connected with IGCP 421 "North Gondwana mid-Paleozoic bioevent/biogeography patterns in relation to crustal dynamics" (Coordinated by Raimund Feist and John Talent) on tabulate corals from the Tamworth Belt was published in 1999 (Brühl & Pohler, 1999). Three further manuscripts on Devonian tabulate corals from the Tamworth Belt were submitted for publication this year.

Another project by S. Pohler dealing with Middle Devonian carbonates in the Eifel Hills resulted in the documentation of mudmound facies discovered in the Hillesheimer Syncline (Pohler et al., 1999).

LITERATURE

Brühl, D. & Pohler, S.M.L. 1999: Tabulate corals from the Moore Creek Limestone (Middle Devonian: late Eifelian – early Givetian), Tamworth Belt (N.S.W., Australia). – Abh. Geol. B.-A. 54: 275-293.

Pohler, S.M.L. 1999: The puzzle from Tamworth: About the Devonian limestone bodies in the northern Tamworth Belt and their depositional history. – In: P.G. Flood (ed.): New England Orogen, eastern Australia; NEO '99 Conference Volume: p. 57-65. Printed at the University of New England, Armidale, New South Wales; ISBN 1-86389-532-9.

Pohler, S.M.L., Brühl, D. & Mestermann, B. 1999: Struve's Mud Mound am Weinberg – carbonate buildup facies im *otomari*-Intervall, Hillesheimer Mulde, Eifel. – Cour. Forsch. Inst. Senckenberg 79: 13-29.

Pohler, S., Brett, C.E. & Schönlaub, H.P. 2000: Sequenzstratigraphie, Platform Evolution und Palökologie devonischer Karbonate in den Zentralen Karnischen Alpen, Österreich. – Ber. Inst. Geol., K.F.-Univ. Graz 2: 15-16.

Schönlaub, H.P. & Pohler, S. 2000: The Seewarte Section – An Overview. – Field Trip Guidebook edited by C. Koeberl & H.P. Schönlaub: Catastrophic Events and Mass Extinctions: Impacts and Beyond, Vienna, July 9 – 12, 2000: p. 99-103.

CM MAURICE STREEL (LIEGE)

THE LATE FAMENNIAN AND EARLY FRASNIAN DATINGS GIVEN BY TUCKER AND OTHERS (1998) ARE BIOSTRATIGRAPHICALLY POORLY CONSTRAINED

(Maurice Streel, Rio SDS meeting, 07/08/2000)

Recently Tucker and others (1998) claimed to have obtained new U-Pb zircon dates from a series of volcanic ashes closely tied (supposed better than before) to biostratigraphic zones.

1) The Late Famennian new data which are assumed by Tucker and others (1998) to date the Fa2d part of the Belgian scale, i.e., the Late expansa conodont Zone, are not confirmed by facts. They are based on a palynological analysis of the Carrow Formation of the Piskahegan Group in southern New Brunswick made by McGregor and McCutcheon (1988). However these authors could not really distinguish between their pusillites-lepidophyta Zone (Fa2d) and flexuosa-cornuta Zone (Fa2c). Indeed one single specimen of one species only (R. lepidophyta?, pl.2, fig. 15, 16) has been found which might indicate the pusillites-lepidophyta Zone. But, with our present experience of the R. lepidophyta Morphon (Steemans and others, 1996), we believe that this specimen most probably belongs to R. cassicula (now R. macroreticulata) which first occurs in the Latest marginifera conodont Zone in Belgium (Streel & Loboziak 1996, text-fig. 3). In the absence of R. lepidophyta, the single specimen of V. pusillites (V. pusillites sensu lato, pl. 3, fig. 7) might belong to the pusillites-fructicosa Zone of Richardson & Ahmed (1988), the base of which is in the uppermost part of the Ellicott Formation or in the lowermost part of the Cattaraugus Formation in New York State (USA), i.e., within the Latest marginifera Zone, thus 4 to 5 millions years earlier than the DCB.

2) The new Early Frasnian data are claimed by Tucker and others (1998) to characterize the punctata to Late hassi conodont Zones. It is based on an unpublished determination by them of P. punctata from the Chattanooga Shale at Little War Gap, east Tennessee (USA), formerly attributed by Dennison & Boucot (1974) to the Eifelian on the basis of brachiopod data. However the presence of the brachiopod Leiorhynchus limitare in the Tioga tuffaceous beds at the base of the Chattanooga Shale still supports an Eifelian age (a late Eifelian age according to P. Sartenaer, personnal communication, December 1999).

Consequently we believe that the Late Famennian (363.6 ± 1.6 Ma) and Early Frasnian (381.1 ± 1.3 Ma) dates given by Tucker and others (1998) are poorly constrainted biostratigraphically.

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CM LADISLAV SLAVIK (PRAGUE)

In 2000 continued my work on conodont biostratigraphy of the Pragian stage in Barrandian area which is closely connected with my Ph.D. thesis. The purpose of Ph.D is to refine the conodont zonation of the Pragian stage in the stratotype area where this stage has been defined. I hope this work will be finished next spring (2001) so now I am hardly finishing. During last spring and summer were taken additional samples for conodont investigation (about 100) from six Barrandian sections of the Pragian. Till present I have consequently 11 localities treated with total of 180 picked samples. The sections for conodont sampling (Bacin, Certovy schody, Homolak, Stydle vody, Na Branzovech, Karlik Valley, Mramorka, Na Pozarech, Cikanka, Velka Chuchle and Barrandov) are almost regularly distributed throughout the entire Prague Basin due to the different facial development. Considerable spectrum of carbonate facies ranging from oceanic slopes to deep lagoonal basins represents contrasting environment (proximal or distal ramps, reefs or deep sags) in Pragian of the Barrandian area where abundance and composition of conodont assemblages significantly differ. Majority of picked samples are already worked up and yielded about 2000 conodont elements. But several samples taken especially from lime-mud calciturbidites such as Dvorce-Prokop Ls. and Reporyje Ls. are often almost barren as regards conodonts. Therefore I still have to fight against problems dealing with low diversity and low abundance of conodont elements within some levels. Accordingly I started with measurement using standard gamma spectrometry with kind help of Dr. Hladil in order to find another underpinning points for stratigraphic correlation. We have already first gamma-ray log from one continuous Pragian sedimentary succession in Praha-Barrandov section (174 m in thickness). The conodont material obtained from the Pragian revealed many interesting results that will be presented and published next year and in the meantime it is too early to list them here. Excepting Barrandian, I have already some conodont data from Moroccan eastern Anti-Atlas. A few samples were taken during spring 1999. Conodont assemblage from the bed No. 10 at Jebel Issimour section yielded among others Latericriodus steinachensis Al-Rawi eta morph., that confirms the beginning of the Pragian at this level. I look forward to correlate my completed conodont data from Barrandian with those from Morocco (especially from north-western Moroccan Messeta), that seem to provide good possibility for correlation between these areas.

CM V. ST. TSYGANKO (SYKTIVKAR, KOMI REPUBLIC)

During the year 2000 I did analysis of the subdivision and correlation of the Devonian in the western slope of the North, Subpolar, and Polar Urals and Pai-Khoy.

This work is to be completed next year. Besides, I did field work in the Subpolar Urals (basin of the Kozhym River), where I sampled for conodonts and microfauna different intervals of the Devonian, promising for establishing the D2/D3 boundary and subdividing the Famennian.

In July, the Devonian section of the Kozhym River was visited by participants of the field excursion of IGCP Project 406 International Meeting. The final point of the excursion was in South Timan (Ukhta Region), where for two days I acquainted the participants of Project 406 with Domanik sections and under- and overlying deposits. The excusion was attended by Project 406 leaders.

In addition to the information about my work as a Corresponding Member of SDS, I intended to send you a letter of information about the International Symposium on the Devonian to be held in Syktyvkar in 2002. Professor P.Bultynck, however, has not yet given his opinion about the content of the letter.

LIST OF PUBLICATIONS

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Telnova O.P., Tsyganko V.S. 2000. Palynostratigraphy and correlation of Frasnian deposits in the Ukhta Region (South Timan). In: Pan-Arctic Palaeozoic Tectonics, Evolution of Basins and Faunas. Ichthyolith Issues Special Publication 6:112-115 5. Tsyganko V.S. 2000. Stop 7. Devonian succession in the Kozhym River region. In: Pan-Arctic Palaeozoic Tectonics, Evolution of Basins and Faunas. Subpolar Urals Field Trip Guidebook.

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TM SUE TURNER (SOUTH BRISBANE) [see also IGCP 328 achievements pg]

REVIEW: UNESCO-IUGS IGCP 406 PAN-ARCTIC PALAEOZOIC TECTONICS, EVOLUTION OF BASINS AND FAUNAS

THREE NEW VOLUMES GREATLY INCREASE OUR KNOWLEDGE OF THE NORTHERN REGIONS OF THE WORLD:

ANTOSHKINA, A., MALYSHEVA, E. & WILSON, M. V. H. eds (2000) - Pan-Arctic Palaeozoic Tectonics, Evolution of Basins and Faunas.- *Ichthyolith Issues*, Special Publication **6**: 166 p; Syktyvkar.

ANTOSHKINA, A., MALYSHEVA, E. & MÄNNIK, P. eds (2000) - Subpolar Urals Field Trip Guidebook, July 16-23, 2000.- Supplement to Special Publication 6 of *Ichthyolith Issues*, 119 p.

BELYAEVA, N. V. & IVANOV, A. O. eds (2000).- South Timan Field Trip. Guidebook, July 6-11, 2000.- Supplement to Special Publication 6 of *Ichthyolith Issues*, 85 p.

The latest and last in a series of Symposium volumes devoted to IGCP 406: Circum Arctic Palaeozoic Vertebrates has been published in Syktyvkar in northern Russia following a successful symposium and field trips. There are many useful papers in the latest Special Publication of *Ichthyolith Issues* edited by Antoshkina, Malysheva and Wilson dealing with Palaeozoic especially Silurian and Devonian stratigraphy and the use of certain invertebrate groups (such as graptolites, ammonoids, scolecodonts and ostracodes), radiolarians, conodonts, miospores and vertebrates in biostratigraphy. I can certainly recommend it to the members of the Silurian and Devonian subcommissions as well as to geologists and sedimentologists interested in Palaeozoic geology, especially reefs and shelf deposits. In addition, the field guides provide valuable records of this remote region building on the trips held earlier under the auspices of IGCP 328 and the SDS.

This volume is somewhat disappointing, however, for the international working group of vertebrate specialists, especially those interested in the use of fish microfossils. Of the 45 contributions less than half mention or are devoted to vertebrate remains. Of those only three are on Silurian deposits and of these there is only one paper, by Märss on the enigmatic fish *Lophosteus*, where any taxonomic or biostratigraphic information is given. However, 13 are on Devonian fish and do provide much useful new information especially on the Russian Arctic. Of the remaining four which touch on the later Palaeozoic, one by Ivanov presents new Permian fish data. Conodonts get a mention in many papers but as we all know (or at least many of us contend), conodonts are NOT vertebrates. And, despite many successful years working together, it seems the message has not yet got across to all workers - that we need to know and would like to see even a mention of whether vertebrate remains are present with the conodont elements and vice versa, of course!

In terms of the aims of the IGCP project, the paper by Obukhovskaya on Late Devonian miospore zonation in the Timan-Pechora Province and northern Canada firmly addresses the problem of correlation across the circum-arctic region, with that by Wilson, Hanke and Soehn on the fascinating MOTH locality also considering biostratigraphical distribution of faunas to some extent. Several papers provide regional correlation schemes. Sadly, there will be no synthetic volume from IGCP 406 and neither is a dedicated successor project on fish microvertebrates in the pipeline (see Wilson et al. on CAPV-2000). Partly this is the inevitable consequence of the prevailing economic climate, which does not greatly encourage cooperation in science nor foster the long hours and volunteer work such as that needed to run a large-scale international research. What a shame that many politicians still don't realise that for very little money they can get such high-quality results (as the volumes here reviewed contest). But let us hope for many more papers analysing the large amounts of new vertebrate and other data which has come from the fieldwork in the Circum-arctic in the last 6 years.

ANTOSHKINA, A., MALYSHEVA, E. & WILSON, M. V. H. eds (2000) - Pan-Arctic Palaeozoic Tectonics, Evolution of Basins and Faunas.- *Ichthyolith Issues*, Special Publication **6**: 166 p; Syktyvkar.

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Susan Turner (September 2000)

CM CHUCK VER STRAETEN (ALBANY, NEW YORK)

I've had a busy time of Devonian studies since this past June (2000), when I began a new position as Devonian Stratigrapher at the new "Center for Stratigraphy and Paleontology" at the New York State Museum/Geological Survey. The position replaces long retired Silurian-Devonian Stratigrapher Lawrence V. Rickard, who was an SDS member in the past. An additional stratigrapher, Dr. Langhorne (Taury) Smith, joined the staff this past summer to work on Oil and Gas and Ordovician-Silurian stratigraphy. With Dr. Ed Landing (New York State Paleontologist, Cambrian and Lower Ordovician worker) and a present technical support staff of three+, it represents a solid start for the new Center for Stratigraphy and Paleontology here at the New York State Museum. We are hoping to add another scientist position over the next year, a macroinvertebrate paleobiologist with interests in a major Lower to Middle Paleozoic fossil group and additional technical staff.

Research over the recent months has been focused dominantly in four areas. First, a continued stratigraphic and sedimentologic synthesis of the Emsian and Eifelian across the Appalachian Basin in eastern North America. Previous work has been supplemented by extending the study interval into the upper Pragian below, but more significantly, extending the work to the southern margin of the basin in the states of Virginia and West Virginia and westward to the cratonward margin of the basin in the central part of the state of Ohio. Many key marker beds have been found that are traceable across much of the basin for the Emsian & Eifelian, permitting correlation of a relatively high resolution event stratigraphy across the entire basin. This also permits a basinwide sequence stratigraphic analysis of Late Pragian - Eifelian strata. Next season will bring more detailed work in the southern and western parts of the Appalachian Basin. I also plan (with CMs/Drs. Eberhard Schindler, Carlton Brett and others) to begin to examine and compare the Late Pragian-Eifelian event and sequence stratigraphic/sea level history of eastern North America with other Devonian successions.

The biostratigraphy of the Emsian and part of the Eifelian succession in eastern North America is very poorly documented at this time. Associated with the work of the Emsian Working Party of the SDS, and with the collaboration of Gil Klapper, I collected a lot of rock this past summer, most notably from the Emsian succession. Much of the succession consists of clastics and argillaceous to silty carbonates, or shallow marine carbonates of *Icriodid* biofacies. Focusing on the argillaceous to silty carbonates from the deeper, central portion of the basin, large samples (30-100 kg) have been collected and are being processed in the pursuit of polygnathid conodonts. We hope to have a report for the SDS meeting in Frankfurt in May. In addition, new work on Devonian palynology was started with CM Dr. Kenneth Higgs and Gareth Hughes, his graduate student at the University of County Cork, Ireland.

Work on the sequence stratigraphy and depositional history of Eifelian to Famennian mudrock-dominated facies in the Appalachian Basin (with CM Dr. Carlton Brett and Dr. Bradley Sageman) continues, as does a continuing search for more datable Devonian K-bentonites. A new project examines oldest Devonian (uppermost Eifelian or lowest Givetian facies) terrestrial facies in the New York succession. Other current work includes collaborative work with CMs/Drs. Carlton Brett, Jeff Over, Gordon Baird, and others.

I extend to you all, on behalf of myself and the new Center for Stratigraphy and Paleontology at the New York State Museum, an invitation to come to New York and the Appalachian Basin to further examine the classic Devonian succession that many of you saw at the 1997 SDS meeting out of Rochester, New York.

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YEAR 2000 RESEARCH PAPERS:

Ver Straeten, C.A., and Brett, C.E., 2000, Bulge Migration and Pinnacle Reef Development, Devonian Appalachian Foreland Basin: Journal of Geology, vol. 108, p. 339-352.

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YEAR 2000 ABSTRACTS:

Ver Straeten, C.A., and Brett, C.E., 2000, A unified basin-wide stratigraphy and sequence framework, Lower and Middle Devonian (Pragian, Emsian, & Eifelian) of the Appalachian Basin: Geological Society of America, Abstracts with Programs, vol. 32, no. 7, p. 155.

Ver Straeten, C.A., submitted abstract, Acadian Orogeny and Sequence Development in the Upper Lower• Lower Middle Devonian (upper Pragian• Eifelian), Appalachian Foreland Basin and Comparison with North Gondwana Successions: Invited Abstract for Symposium, "Early and Middle Paleozoic Sequence Stratigraphy---Tectonic and Eustatic Signatures in Eastern Laurentia", Northeastern Section meeting of the Geological Society of America, March, 2001.

CM NIAN-ZHONG WANG (BEIJING)

In last summer. I had a continuative cooperation with my British colleaques: Prof. M. M. Smith, King's College of the University of London and Dr. I. Sansom, School of Earth Science of the University of Birmingham to study Early Silurian and Early Devonian fish material from both Tarim, Xinjiang and Qujing, Yunnan of China including morphological, histological and paleogeographical research of Early Silurian chondrichthyan microfossils of Tarim Basin and morphological and histological research of Early Silurian and Early Devonian Galeaspida (Agnatha). Two Papers about upper studies will publish in next year.

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TM K. WEDDIGE (FRANKFURT, FORSCHUNGSINSTITUT SENCKENBERG)

THE DEVONIAN CORRELATION TABLE (DCT)

IN FUTURE ISSUED AS INTERNATIONAL VERSION AND AVAILABLE VIA INTERNET

The Devonian Correlation Table (DCT), as an innovative project of the editor originally sponsored by the German Subcommission on Devonian Stratigraphy, was introduced in 1996 as a German version ("Devon Korrelationstabelle"). The basic idea was to initiate a correlation table as a continuously updatable medium which should be technically easy to amend and reproduce in order to support a feedback and an evolution of stratigraphic knowledge. Updates and supplements to the DCT were to be published occasionally in the journal Senckenbergiana lethaea which since 1996 has published supplements of the DCT for the years 1997, 1998 and 2000, with 256 DCT-columns in all (WEDDIGE [Ed.] 1998a, 1998b, 2000).

Up to now, not only nearly all German Devonian regions have been summarised in DCT-columns, but also the bulk of the important Devonian biostratigraphies world-wide. These biostratigraphical DCT-columns were created by a remarkable number of international experts as authors/compilers resulting from an increasing international interest in the DCT and its supplements (see below the list of DCT issues and annotations). At present, the DCT is regarded as a superior, topical, complete and exact compendium of the Devonian chronologies, and therefore international users have increasingly called for an English introduction of the DC Table and explanation of the DCT-column system in English. (Moreover, following the pattern of the DCT, it is initiated by Prof. J. W. SCHNEIDER, Freiberg/Germany, and a responsible working group, to apply the same table-column-system with its "time-ruler" for Carboniferous-Permian stratigraphies!).

The DCT directives, preliminarily distributed as flyer and as a note in SDS Newsletters 14, 1997, have now been formulated in English accompanied discussion and review of the implications, the prospect of complex and adaptive information, of exact and reproducable communication, and of calibrating Devonian time intervals (WEDDIGE 2000). Morever, the directives and particularly the DCT-columns (as CorelDRAW8-files) will be available in future electronically via Internet http://senckenberg.uni-frankfurt.de/publ.

CALL FOR COLUMN CONTRIBUTIONS

The introduction of an English resp. international DCT version is to demonstrate that anyone may submit Devonian data to the editor, independent of commissions and nations. A creator of a DCT-column has to be regarded primarily as a compiler. He must not be necessarily the author of the stratigraphy of the responsible DCT-column. If somebody is willing to contribute, he should firstly contact the DCT editor by email who will offer his full assistance (kweddige@sngkw.uni-frankfurt.de). Thus, it will do in many cases to provide the editor only with the responsible most recent stratigraphic charts or literature citations. In return, a draft of DCT-column(s) will be sent back to the contributor, who has to check and to clean up the details finally.

Biostratigraphic columns have to be created, prior to the mass of lithostratigraphic columns reflecting regional geology. Global biostratigraphies have mostly been considered in the published DCT-columns up to now (except the chitinozoans and megafloras). There are, however, still many data on benthic and even endemic faunas and floras unpublished. Regional Devonian (litho-)stratigraphies of North Gondwana (e.g. Australia in particular), Europe (e.g. UK, France, Poland), Asia (e.g. China, Russia, Central Asia) and America (Canada, New York District etc.) are expected. Holostratigraphic DCT-columns have to be promoted due to the dynamic increase of non-biostratigraphic research, methods and conclusions, e. g. in event-, chemo- or magnetostratigraphy. The DCT time- ruler in particular will be a great aid to function such as a numerical x-axis for plotting T-R-, anoxia-logs and other measurements (e. g. thicknesses, cyclicities, sequences, evolutionary or sedimentation rates). This recent trend in research, on the other hand, corresponds with a less critical usage of hitherto existing bio- and lithostratigraphies by the non-biostratigraphers. It is thus a duty for each competent and responsible bio- and lithostratigrapher to build up and complete a stratigraphic scheme like the DCT-column system, with all its advantages in regard to immediacy, communication, reproducability and quantifiability for the non-palaeontological specialists.

DCT ISSUES AND ANNOTATIONS

for 1996

WEDDIGE, K. [Ed.] (1996), compiled by G. K. B. ALBERTI, G. BECKER, TH. BECKER, P. CARLS, H. GROOS-UFFENORDE, D. KORN, J. MALETZ, A. MAY, H. G. MITTMEYER, A. RABIEN, E. SCHINDLER, W. STRUVE, O. H. WALLISER, K. WEDDIGE & W. ZIEGLER: Beiträge zu Gemeinschaftsaufgaben der deutschen Subkommission für Devon-Stratigraphie, 1: Devon-Korrelationstabelle. - Senckenbergiana lethaea, 76 (1/2): 267-286, 7 text-figs, 43 table-columns; Frankfurt am Main.

for 1997

WEDDIGE, K. [Ed.] (1998), compiled by G. BECKER, H. BLUMENSTENGEL, A. BRAUN, D. BRÜHL, I. CHLUPÁC, M. GINTER, U. JANSEN, S. LOBOZIAK, P. LUKEŠ, B.-P. LÜTTE, K.-H. RIBBERT, P. SARTENAER, G. SCHRAUT, S. SCHRÖDER, M. STREEL & O. H. WALLISER: Devon-Korrelationstabelle. Ergänzungen 1997. - Senckenbergiana lethaea, 77 (1/2): 289-325, 3 text-figs, 86 table-columns; Frankfurt am Main. - [1998a]

Annotations in Senckenbergiana lethaea, 77 (1/2):

BLUMENSTENGEL, H.: Anmerkungen zur Devon-Korrelationstabelle, B094ds97: Ostracoden-Zonen, Thüringer Ökotyp: 263-264, 1 tab.

BRAUN, A.: Anmerkungen zur Devon-Korrelationstabelle, B200ds97: Radiolarien-Zonierungen im Devon: 265-266.

BRÜHL, D.: Anmerkungen zur Devon-Korrelationstabelle, B140di97 - B140dm97: Tabulata; Eifel: 267-268.

JANSEN, U.: Anmerkungen zur Devon-Korrelationstabelle, B122di97, R120di97: Brachiopoden-Stratigraphie und Formationen in der Dra-Ebene (südlicher Anti-Atlas, Marokko): 269-272.

LÜTTE, B.-P. & SCHRÖDER, S.: Anmerkungen zur Devon-Korrelationstabelle, B141dm97: Rugosa; Eifel: 273-275.

RIBBERT, K.-H.: Anmerkungen zur Devon-Korrelationstabelle, R001di97 - R020di97, R001dm97 - R017dm97, R001ds97 - R017ds97: Devon Nordrhein-Westfalen: 277-278, 1 text-fig.

SCHRAUT, G.: Anmerkungen zur Devon-Korrelationstabelle, B102di97, B104 - B111di97: Kompilation unterdevonischer Trilobiten-Stratigraphien: 279-286.

WALLISER, O. H.: Anmerkungen zur Devon-Korrelationstabelle, H022di-ds97, H100di-ds97: globale Events und Meeresspiegel-Kurve: 287.

Annotations in Senckenbergiana lethaea, 78 (1/2):

BECKER, G.: Anmerkungen zur Devon-Korrelationstabelle, B092di97: Ostracoden, N-Spanien: 217-221, 2 text-figs.

BECKER, G.: Anmerkungen zur Devon-Korrelationstabelle, B093ds97: Ostracoden; Thüringer Ökotyp, N-Sauerland, Dill-G., Harz: 223-226, 1 text-fig.

for 1998

WEDDIGE, K. [Ed.] (1998), compiled by C. CORRADINI, U. JANSEN, H. REQUADT & G. SCHRAUT: Devon-Korrelationstabelle. Ergänzungen 1998. - Senckenbergiana lethaea, 78 (1/2): 243-265, 50 table-columns; Frankfurt am Main. - [1998b]

Annotations in Senckenbergiana lethaea, 78 (1/2):

CORRADINI, C.: Annotations to the Devonian Correlation Table, R320di98: SW Sardinia - formations and conodonts: 227-228.

JANSEN, U.: Anmerkungen zur Devon-Korrelationstabelle, B123di98: Strophomenida, Rheinisches Schiefergebirge: 229-233.

REQUADT, H.: Anmerkungen zur Devon-Korrelationstabelle, R021di98 - R047di98, R022dm98 - R046dm98, R022ds98 - R046ds98: Devon Rheinland-Pfalz: 235-236, 1 text-fig.

SCHRAUT, G.: Anmerkungen zur Devon-Korrelationstabelle, B113 - B115di98, R150di98, R240 - R241di98, R300di98: Unterdevon-Trilobiten und deren Fundschichten in Österreich (Karnische Alpen), Türkei (Bithynien) und Algerien (Ougarta): 237-241.

for 2000

WEDDIGE, K. [Ed.] (2000), compiled by M. BASSE, P. BENDER, A. BLIECK, H. BLUMENSTENGEL, P. BULTYNCK, C. J. BURROW, M. COEN-AUBERT, M. HORN, M. A. MURPHY, A. E. H. PEDDER, G. SCHRAUT, P. STEEMANS & S. TURNER: Devon-Korrelationstabelle. Ergänzungen 2000. - Senckenbergiana lethaea, 80 (2): 77 table-columns; Frankfurt am Main.

Annotations in Senckenbergiana lethaea, 80 (2):

BASSE, M.: Anmerkungen zur Devon-Korrelationstabelle, B150dm00 - B154dm00: Mitteldevon-Trilobiten in Teilen des Oberbergisch-Sauerländischen und der Eifel-Kalkmulden (Rhenohercynikum).

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BLIECK, A.: Annotations to the Devonian Correlation Table, B701di00 - B704ds00: Vertebrate Zonations of the Old Red Sandstone Continent.

COEN-AUBERT, M.: Annotations to the Devonian Correlation Table, B142dm00 - B142ds00: Stratigraphic distribution of the Middle Devonian and Frasnian rugose corals from Belgium.

HORN, M. †: Anmerkungen zur Devon-Korrelationstabelle, R058di00 - R060ds00: Kellerwald (Rheinisches Schiefergebirge).

MURPHY, M. A.: Annotations to the Devonian Correlation Table, B032-, B052-, B072-, B082-, B095-, B116-, B143-, B169-, R900di00: Nevadan guide fossils and formations.

SCHRAUT, G.: Anmerkungen zur Devon-Korrelationstabelle, B801di00 - B806di00, R801di00 - R804di00: Unterdevonische Trilobiten-Stratigraphien und Formationen von New South Wales (Australien).

STEEMANS, P.: Annotations to the Devonian Correlation Table, B501di00: Miospore Palynology, Western Europe.

TURNER, S. & BURROW, C. J.: Annotations to the Devonian Correlation Table, B705di00 - B705ds00: Microvertebrate zonations of East Gondwana

TM K. WEDDIGE (CONTINUED)

THE ABSOLUTE TIME PROPORTIONING OF BIOCHRONS AS A PROJECT OF CURRENT INTEREST

One of the main implications of the Devonian Correlation Table (DCT) is the potential of calibrating the relative time scale (WEDDIGE 2000: 685 ff.). The projected iterative total DCT-revisions (compare WEDDIGE 2000: text-fig. 3) have to be based on considering more and more the "true" (i. e. absolute time) proportions of zonal and formation intervals within the 20 cm time-ruler frame. The current DCT still demonstrates the first phase where the vertical proportions of the "left-hand chronology" – in the Devonian stratigraphy, that is the conodont "standard" zonation – were introduced arbitrarily by the editor in 1996. The Upper Devonian conodont zones, for instance, with their regular, rather linear vertical intervals follow predominantly the pattern of SANDBERG & ZIEGLER (1996). This vertical pattern of the Upper Devonian, of course, and those of the Lower and Middle Devonian as well, are still hypothetical imitations of the true absolute time proportions. Although the 20 cm. time ruler of each Devonian series (proportional to 100% – see WEDDIGE 1996; 2000: 687) demonstrates a linear subdivision, it is most probably not proportional to the absolute time subdivisions by the "natural" astronomical time units of days or years during the Devonian time, or:

1 time ruler cm = 5 % of the 20 cm time ruler = **w** × Devonian years = **w** × **c** × Devonian days

where **w** is an inconstant factor, and **c** is a constant nearly which indicates the amount of Devonian days per one Devonian year. The final target of the DCT revisions is the definition of **w** as a constant proportionality factor.

There are obviously three practicable methods of searching empirically for data on absolute time proportions. The methods could be practised rather independently from one another, or could be regarded as three (chronological) phases of a systematic project.

(1) The first phase appeals any Devonian stratigrapher to search for absolute time proportions in fine stratigraphic details, the frame of which is based on the following rule:

If the same kind of (continuous) time beats is recognizable in at least two vertical Devonian intervals,
the absolute time proportion of both intervals is calculatable.

In a continuous lithofacies for instance, because of regular sedimentation rates, the thicknesses (could) reflect "absolute time beats". If, for instance, two conodont zones are identifiable in such a lithofacies, the absolute time proportions could be concluded, e.g. that zone A is not only two times thicker but also two times longer than zone B. This has to be regarded in our project as one of the constructive data which empirically lead to the absolute time proportioning of biochrons – and thus has to be published!

The implication of phase 1 is that

The finer the vertical stratigraphic units are,
the better the chance to find two units in a facies with the same kind of time beats, e.g. with the same sedimentation rate.

As a consequence, the DCT-table column system will be a great aid, because vertically diffentiatable data are assigned to different time ruler heights. That means that at least three DCT-data (with different DCT-heights) in a facies with the same kind of time beats permit the calculation of the absolute time proportion of two vertical units. If, for instance, a tentaculite entry within a conodont zone permits the differentiation of three different DCT-heights (the lower and the upper conodont zone boundaries and the tentaculite entry), the proportions of two vertical units (a lower and a upper part of the condont zone) are differentiatable and could be calculated. Only based on our current knowledge of biostratigraphic ranges and on eventstratigraphic data, a high resolution scale with finest truely proportioned units could already result as a standard.

(2) The second phase concerns the methods and experiences of Graphic Correlation (e.g. MANN & LANE [Eds] 1995). With a resolution rougher than phase 1, these are predominantly able to compare more or less complete sections, not depending on a strictly continuous facies. Results by Graphic Correlations are conclusive if different overregional sections demonstrate comparable proportions of vertical intervals, i. e. of the same identified biochrons. Data of phase 1 would be a great aid in controlling the Graphic Correlation results.

(3) The third phase concerns the last control by the DCT when empiric data of phases 1 and 2 are considered in form of a total DCT-revision (see above respectively WEDDIGE 2000). After such a revision, the DCT data should demonstrate a more harmonized regular distribution, without distinct contradictions by obvious zones of data dilution or data condensation within the table columns – and the probality of defining a constant factor **w** will have iteratively become better!

CALL FOR DATA CONTRIBUTIONS

Anyone may submit data on absolute time proportions of Devonian intervals. In accordance with our current stratigraphic methods, data on biochrons, particularly on the conodont zones, but also on any range of Devonian guide fossils which could be correlated with 20 cm. time ruler heights, are of current interest. Thus, it is within the interest of the DCT – and the editor (contact e.g. via **kweddige@sngkw.uni-frankfurt.de**) will consequently publish such papers on Devonian biochron proportions (and even brief notes as well) as "Annotations to the Devonian Correlation Table: ..."!

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TM K. WEDDIGE (CONTINUED)

REDEFINED OR NEW NAMES FOR THE DEVONIAN SUBSTAGES?

Commissionary redefinitions once started with the term "Devonian", and most probably nobody at that time proposed a new name instead of this traditional and globally introduced name. The following redefinitions of stage terms (including series names), however, concerned less traditional and less globally introduced terms and thus were accompanied by a foregoing official selection of one name among different (regional) choices (e.g. Emsian-Zlichovian, Eifelian-Couvinian, etc.). And again nobody(?) proposed new names.

All these traditional names were originally based on lithostratigraphic changes (often in connection with Events, often diachronous, or uncertain by transitional layers). The redefinitions, in accordance with commissionary demands, concern updates and refinements by biostratigraphic data, although, however, the fundamental contradiction is implicated, that the occurrences of guide fossils, even those like conodonts, in the stratotypes could be controlled by facies. That means that the biostratigraphic boundary index should better have been selected from a continuous facies, distinctly apart from the traditional boundary uncertainties. But, if the redefinition (by a newly defined GSSP-level) follow this logic consequence, it could be criticized – the more different the new level is, the harder (and more sensational) the criticism is. This is the case, for instance, for the new Emsian base which is said to be distinctly lower than the traditional Emsian base (a "shame!" – although the correlation is still speculative, and, although a same lowering concerned the redefinition of Givetian base, surprisingly nobody cares for this.)

Moreover, the current confusions are actually caused by two redefinitions with the consequence that an exact terminology has to differentiate carefully three terms now: "traditional Emsian", "Ulmen-Emsian" (the result of a former redefinition) and the "GSSP-Emsian" (compare DCT-1996). The same is due for three contents of the Givetian term after two redefinitions.

Not only such lowering rouses to indignation, but also the behead of the underlying stage, necessary by the same redefinition – in the case of the new Emsian, the Pragian. The base of the Pragian, however, has already been redefined by itself so that the recently "reduced new Pragian" is actually identical neither with the original (lithostratigraphically defined) "traditional Pragian" nor with the "GSSP-Pragian", because of three different contents (=time-lengths)! Obviously, it is confusing, that each of the recent redefinitions by GSSPs only concerns the base of a stage and does not save the whole contents of a formerly introduced stage term!

Last not least, it is argued against the reduction e.g. of the Pragian by absolute time estimations. These, of course, could be decisive when more objective and reliable data on absolute time proportions of vertical intervals will be at hand – (compare my other note herein referring merely to this). The Pragian time probably appears to be too brief, in comparison not only with the GSSP-Emsian time, but also with the Lochkovian time which – after my "feeling" – could have been even longer than the Emsian time (but this latter argument I have never heard). (And, by the way, nobody cries for the reduced and possibly too short Eifelian stage!)

Thus, the foregoing statements should demonstrate that redefinitions as a method of commissionary boundary definitions has to be regarded as a source of misunderstandings, and – in my opinion – the redefinition method itself is a misunderstanding on exact and logic methods in stratigraphy!

It is proposed therefore, to avoid redefinitions, at least in connection with the Devonian substage definitions. New names should be introduced each of which indicates the defining GSSP, and, as a consequence, the names of the first substages of GSSP-defined stages could already be introduced without complications. A as a proposal:

"Klonkian" (1. substage of the Lochkovian, because of the Klonk GSSP)
"Chuchlian" (1. substage of the Pragian, because of the Velka Chuchle GSSP)
"Zinzilbanian" (1. substage of the Emsian, because of the Zinzilban GSSP)
"Schoeneckian" (1. substage of the Eifelian, because of the Wetteldorf GSSP near Schoenecken; "Wetteldorfian" concerns already an upper Emsian formation)
"Irdanian" (1. substage of the Givetian, because of the Mech Irdane GSSP)
"Suquian" (1. substage of the Frasnian, because of the Puech de la Suque GSSP)
"Coumiacian" (1. substage of the Famennian, because of the Coumiac GSSP)

As far as the GSSP of a substage is not established, an informal name like "upper Emsian substage" or "2. substage of the Eifelian" should be used.

TM K. WEDDIGE (CONTINUED)

A DEVONIAN BIBLIOGRAPHY VIA INTERNET

As one of the team tasks of the German Subcommission on Devonian Stratigraphy, this bibliography was introduced in 1995 by myself in my capacity as the Subcommission chairman at that time. The main intention was to register primarily the literature on the German Devonian. Each year since then, Subcommission members have been asked to contribute citations on Devonian matters – e.g. the titles of their own recent papers and particularly the therein included files of references, or even of their whole Devonian research. Up to the year 2000 about 1,600 citations have been collected, which in print would fill about 150 pages. The bibliography, however, is still under construction, and therefore with rough editorial revisions only, e.g. not sorted strictly in accordance with bibliographic directives, and intentionally (as long as possible) not depending on a data base program. Thus, Internet under http://senckenberg.uni-frankfurt.de/publ/ and the attached WINZIP-file in Rich Text Format (rtf) permit a more general access to this Devonian Bibliography for each user who, on the other hand, is gently appealed to contribute citations on any Devonian aspects by himself – as a best way, via E-mail to kweddige@kw.uni-frankfurt.de

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CM MEHDI YAZDI (ISFAHAN)

Regarding to my group (I and my students) related to research on Devonian and Carboniferous sequences in Iran, I and an American Group (Prof. Gary Webster, WSU and Dr. Chris Maples, Indiana Univ.) did a research and a collection on the Palaeozoic and Mesozoic crinoids in Iran.

I completed a research on a Key bed in the Carboniferous sequences in Iran. Data out of this research will be publish in near future. Vachik Hairapetian is going to start his big research on Late Devonian Conodonts and Microvertebrates in Central Iran (With Dr. M. Yazdi, Dr. M. Ginter and Dr. J. A. Long).

One of my student (Mr. Sedghi) who is submitted his thesis on the Khush-Yeilagh section, northern Iran. Based on his conodont biostratigraphy, most of his section has an age-range from Late Givetian-Frasnian to Famennian. Base of the section will be checked in more details, future.

Leila Karimi is going to submit her thesis on Late Devonian conodont biostratigraphy in Mighan area. Conodonts and Microvertebrates out of her section is similar to Dalmeh section (A interesting section in Central Iran, NE of Ardekan). Devonian ammonoids from mentioned section (Famennian V) had been reported to Prof. Thomas Becker.

Miss Rabley, who is working on Darchaleh area, South of Esfahan will be completed the thesis on the Carboniferous-Permian sequences in that area. Regarding to Devonian I would like to inform you that remains of Devonian sequences can be traced within the Sardar Conglomerate (pebbles) in Darchaleh area.

Miss. Shirani who is working on Permian-Triassic transitional boundary, close to the Esfahan city and Abadeh section will submit her research in future.

TM E.A. YOLKIN (NOVOSIBIRSK)

During this year I was involved in many reports that you can find in the list of publications. The most time I had devoted together with my colleagues to a preparation of the book "Paleozoic of West Siberian Lowland" in series "Stratigraphy of Siberian oil and gas basins". That is why I went down to the Cambrian. The special paper on this topic is in press. Much time I spent with editing of "News of Paleontology and Stratigraphy". Its combined 2 and 3 issues will be published in late of this December.

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INFORMATION FOR CONTRIBUTORS

There are several ways to provide contributions to the Newsletter. Listed in order of preference, they are:

1. **Computer file on disk** — If you wish to prepare files for inclusion in the Newsletter please request from the editor a template file in either MS Word for WINDOWS or for the MACINTOSH. The template file contains the requisite style categories used to produce the Newsletter. It is too time consuming for the editor to reformat contributions in an attempt to reach a consistency of presentation. Graphic files are acceptable in any standard format **BUT** if the desire is to retain the image's original appearance, image files should be created with Adobe Illustrator or if created by another graphic package, they should be submitted in encapsulated postscript (eps) format.

2. **E-mail** — Text material is acceptable when contained within the body of the e-mail message. In most cases, however, this results in the loss of italics, etc. To prevent the loss of such formatting, it is suggested that contributors attach formatted text material and graphics to e-mail messages after being archived (ZIP or SIT). Check with your systems administrator or computer specialist if you are unsure how to accomplish the attachment of text or graphics.

3. **Anonymous ftp** — Contact the Editor for details.

4. **Original typewritten copy** — Please use a common *sans serif* font throughout and keep the number of pages to a minimum to facilitate the scanning and optical character recognition process. Please DO NOT fax this material. The quality of most faxes precludes the use of optical character recognition programs.

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