

INTERNATIONAL  
SUBCOMMISSION ON  
**JURASSIC**  
STRATIGRAPHY

Newsletter 31

Edited by Nicol Morton and Paul Bown

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## FROM THE CHAIRMAN

Nicol MORTON

This year (2004) brings the end of the four-year period of the "official" mandate of the Jurassic Subcommittee from I.U.G.S. We are appointed at a meeting of I.U.G.S. during an International Geological Congress and serve until the next Congress, which will be the 32nd IGC in Florence, Italy, in August 2004. Of course, arrangements for the Subcommittee membership for the 2004-2008 period have to be made nearly a year in advance and details of the new Subcommittee, to be confirmed in Florence, are given later in this Newsletter. The two Pauls and I are honoured to be re-elected to the Executive for a second term.

So this is an appropriate occasion to review the progress made by the Jurassic Subcommittee during 2000-2004 and look forward to the 2004-2008 term.

### Membership:

For 2000-2004 twenty Voting Members, including the Executive, were appointed, of which nine continued from the previous term and eleven were new. In mid-term one member died (Bill SARJEANT) and was replaced by bye-election. For 2004-2008 there will be twenty Voting Members *in addition to* the Executive (continuing) so that fourteen continuing members will be joined by six new members. Only three members retire on this occasion.

The Corresponding Members are equally important to the success or otherwise of the Subcommittee, especially in lines of communication. The number of these is not defined by the Constitution and was expanded to forty-seven (subsequently increased slightly) for 2000-2004, with nearly half being new. Arrangements for 2004-2008 have still to be made but further expansion as well as some revision of membership is envisaged. Nominations can be made to the Executive.

### Jurassic Symposia:

The Jurassic Symposia, sponsored by the Subcommittee but organised independently, are by far the most important event and activity for most of us. These are now arranged on a four-year cycle and fall in the middle of a Subcommittee's term of office. The 6th Jurassic Symposium was held in Mondello, Sicily, in September 2002 and a report on this was given in the ISJS Newsletter no.30 (2003). The Proceedings of this Symposium have now been published. At Mondello the decision was made that the 7th Jurassic Symposium/Congress will be held in Kraców, Poland in 2006. The First Circular has been distributed and details are given in this Newsletter.

### GSSPs of Jurassic Stages:

The primary task of the Jurassic Subcommittee for I.C.S. and I.U.G.S. is the definition of the internationally recognised Standard Stages by means of a Global Stratotype Section and Point (GSSP). In terms of ratification of proposals the term 2000-2004 saw limited progress, with only one proposal (Pliensbachian) approved by the Subcommittee to

add to the three previously ratified by I.U.G.S. However, a lot of work has been undertaken within the various Working Groups (see Reports in this and previous Newsletters) and progress is being made towards agreed proposals. The deadline of 2008 set by I.U.G.S. for completion of this project is looming but should be met.

Many of the remaining problems reflect difficulties of precise correlation between different faunal provinces. The correlations available are already more precise in most cases for the Jurassic Stages than for those of many other Systems, but we all seek the best which can be achieved. I.C.S. list a series of "ideals" for a GSSP but recognise that these will almost never all be met. The "best available" is the usual description of ratified GSSPs.

For Jurassic Stages, unlike those of many other Systems, a hierarchical principle of defining the Stages in terms of the contained Standard Zones (and Subzones if appropriate) has long been accepted. This should be respected but some flexibility in definition may be necessary. The GSSP for the Bajocian Stage is a good illustration. This was (and is) defined with the Discites Zone at the base. The Discites Zone in turn was recognised as based on the first appearance of the ammonite genus *Hyperlioceras* (including *Toxolioceras* etc.). However, as a result of detailed studies it became evident that the best correlations, and therefore definition, could be achieved using the first appearance of *Hyperlioceras mundum* and associated species. Earlier *Hyperlioceras* species (e.g. *incisum*) are Aalenian.

Historical precedent is also an important factor in the establishment of Stage boundaries. Definition of the base of a Stage at a GSSP should respect this as far as possible, but it cannot be an over-riding factor which makes wider correlation impossible. The goal is a succession of chronostratigraphic units which will provide a single global standard as far as possible.

### Other Activities:

The activities of the Subcommittee are undertaken by the Working Groups, the Convenors of which are the key personnel. Most of the Working Groups were established in order to prepare agreed proposals for GSSPs. This work continues for most of the groups. For the future, consideration will be given as to whether achieving a GSSP for the Stage means the end of a Working Group. Personally, I do not think it should. I would like to see the Stage Working Groups remain active with the tasks of defining, on the same multidisciplinary basis, Substages (but as Lower/Middle/Upper as appropriate rather than as named Substages) and the Standard Zones and Subzones. I.U.G.S. may not be interested in ratifying these for its International Stratigraphical Scale, but why should the Jurassic Subcommittee not take on this task?

Other Working Groups were set up with the aim of broadening the range of activities undertaken within the Jurassic Subcommittee. Generally, the intention was to encourage collaboration with reference to a particular theme. The success of this has been mixed -

perhaps for the future more specific targets should be set. By contrast thematic sessions during the Jurassic Symposia, notably in Mondello, have been popular and successful, and will be included in the programme for the next Jurassic Symposium/Congress in Kraców. Similarly, the Symposium being organised by the Jurassic Subcommittee for the 32nd International Geological Congress in Florence has several themes (see this Newsletter).

Two "thematic" Working Groups have been successful. The Geoconservation WG convened by Kevin PAGE organised a special session during the Mondello Jurassic Symposium that brought out interesting international comparisons. The Liaison WG with Bob CHANDLER as Convenor has continued to expand and become more international, encouraging collaboration and integrating the work of non-professionals with professional stratigraphers and palaeontologists. The reports in this and the last Newsletters summarise extensive and ongoing research.

#### **Distribution of the Newsletter:**

Publication of the Jurassic Newsletters electronically and circulation by email should ensure that they are widely available. The Newsletters are sent to all listed Voting and Corresponding Members and one of their specified responsibilities is to ensure onward distribution to others who are interested. Onward forwarding of the email attachment(s) should make this much simpler than the previous method of photocopying and collating extra copies. Again the success of the distribution has been variable and we will seek to improve this. Please forward this Newsletter to anyone you know to be interested.

#### **ISJS Directory:**

A Directory of Members and Working Groups of the Jurassic Subcommittee was produced and circulated in 2001. A new Directory will be prepared and distributed during the coming year. It is extremely important that all of you keep the Chairman and Secretary informed and up-to-date with your address and any other details.

As previously, I close this report by thanking all the contributors and Paul Bown for putting it all together to produce the final version and for its distribution.

Nicol Morton, Chairman ISJS,  
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## **NEWS ITEMS**

### **MEMBERSHIP OF THE JURASSIC SUBCOMMISSION, 2004-2008**

*Nicol MORTON, Chairman*

In accordance with the Constitution of the International Commission on Stratigraphy (which applies also to the Jurassic Subcommittee), the Executive and Voting Members are appointed for a four-year term, which dates from/to an International Geological Congress. Voting Members can normally

serve a maximum of three four-year terms, and the Chairman and Vice-Chairman for two terms. To fulfill the "timetable" requirements of the process before the 32nd International Geological Congress in Florence, August 2004, nominations were sought and, subsequently, votes from the Voting Members of the Subcommittee during Autumn, 2003.

The current Executive were unanimously re-elected for a second term and six new Voting Members elected. Three replace retiring members and recent clarification of the Constitution, indicating that there can be 20 Voting Members *in addition* to the Executive, meant that three additional members could be elected.

It is with great regret that I report the retirement of three members. I am especially sad to lose two valued long-serving members, Jai KRISHNA and Alberto RICCARDI, who both retire to enable renewal of the membership. The third retirement is Peter BAUMGARTNER because of the pressure of his teaching and administration load. On behalf of the Subcommittee I thank them for their service.

The following have agreed to serve as Voting Members of the Jurassic Subcommittee for the term 2004/2008. The new membership, subject to approval by ICS and IUGS, will become effective in September 2004, after the 32nd International Geological Congress, until the 33rd International Geological Congress in 2008.

#### **Executive:**

Chairman	Nicol MORTON, France
Vice-Chairman	Paul SMITH, Canada
Secretary	Paul BOWN, UK

#### **Continuing Voting Members:**

Elizabeth CARTER, USA  
Fabrizio CECCA, France  
Gerd DIETL, Germany  
Sixto FERNANDEZ-LOPEZ, Spain  
James OGG, USA  
Kevin PAGE, UK  
Jozsef PALFY, Hungary  
Giulio PAVIA, Italy  
Jingeng SHA, China  
Xiaoying SHI, China  
Boris SHURYGIN, Russia  
Geoffrey WARRINGTON, UK  
Andrzej WIERZBOWSKI, Poland  
Akira YAO, Japan

#### **New Voting Members:**

Susana DAMBORENEA, Argentina  
Serge ELMI, France  
Bouaza FEDAN, Morocco  
Stephen HESSELBO, UK  
Axel von HILLEBRANDT, Germany  
Francis HIRSCH, Japan

#### **Members retiring 2004:**

Peter BAUMGARTNER, Switzerland  
Jai KRISHNA, India  
Alberto RICCARDI, Argentina

The next task is to review the list of Corresponding Members. It is very important that, through them, we have an effective network of communications (in BOTH directions) between the Subcommittee and all those who have an interest in Jurassic geology. Your assistance in this, for example, by suggesting names, would be greatly appreciated. A new Directory will be distributed during the next year.

Finally, I would like to add that ALL who have an interest in Jurassic geology have a voice in the activities of the Jurassic Subcommittee, NOT just those who are formally listed as Voting or Corresponding Members. You should receive the Newsletters. They are distributed electronically to all members, who should then forward them in the same way to anyone in their area who is interested. Please ask!

Nicol Morton,  
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### **INTERNATIONAL COMMISSION ON STRATIGRAPHY PRIZE AWARDS**

*Felix GRADSTEIN and Nicol MORTON*

The International Commission on Stratigraphy has announced its first Stratigraphy Prize awards, for 2004:

#### **DIGBY McLAREN MEDAL**

to **Dr. Jan Hardenbol**, GSC Inc., Houston, USA

The Digby McLaren Medal is awarded to honour a significant body of internationally important contributions to Stratigraphy sustained over a number of years.

The 2004 medal is awarded to Jan Hardenbol for his penetrating and philosophically masterful insights into many stratigraphic issues, including:

1. Contributions to the development of the science of sequence stratigraphy and especially the chronostratigraphic calibration of sequences in the Mesozoic and Cenozoic;
2. Leadership in Palaeogene biostratigraphy and chronostratigraphy, notably guidance on the selection and documentation of GSSPs;
3. Initiation of collaboration on and senior authorship of chronostratigraphic charts and integrated time-scales for the Mesozoic and Cenozoic.

Dr Hardenbol graduated from the University of Utrecht in 1964 and his career was mainly with Exxon Production Research from which he retired in 1994. He then established Global Sequence Stratigraphy Inc. and collaborates internationally in research on mechanisms causing sequences and cycles.

#### **ICS MEDAL**

to **Dr Stephen Peter Hesselbo**, University of Oxford, UK

The ICS Medal is awarded to honour high quality research in Stratigraphy by recognising a singular major achievement in advancing stratigraphical

knowledge.

The 2004 medal is awarded to Stephen Hesselbo for the quality and breadth of his research, in collaboration with others, on the Lower Jurassic of Britain:

1. Documentation of the sequence stratigraphy of classic Lower Jurassic sections and interpretations founded firmly on precise correlations based on the detailed ammonite biostratigraphy available;
2. Development of integrated approaches to stratigraphical calibration, notably integrating stable isotope stratigraphy with chronostratigraphy based on ammonite zones and biozones.

Dr Hesselbo graduated from the Universities of Aberdeen (BSc 1983) and Bristol (PhD 1986) before joining the University of Oxford as Postdoctoral Research Fellow then Lecturer in Stratigraphy.

The medals will be awarded during the Opening Ceremony of the 32nd International Geological Congress in Florence, Italy, August 2004.

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Nicol Morton, Chairman ICS Awards Committee  
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### ***FUTURE MEETINGS***

#### **32nd INTERNATIONAL GEOLOGICAL CONGRESS, FLORENCE, AUGUST 2004 GENERAL SYMPOSIUM G-22.07: JURASSIC WORLD (OUTSIDE THE PARK)**

*Nicol MORTON, Giulio PAVIA, Paul SMITH,  
Convenors*

As reported in last year's Jurassic Newsletter (no. 30), the Jurassic Subcommittee is arranging a Symposium during the 32nd International Geological Congress in Florence, Italy. This is Symposium **G.22-07: Jurassic World (Outside the Park)**. The date for this has been fixed as Tuesday 24th August, but whether morning or afternoon is not yet known at time of writing.

By the deadline for submission, 35 abstracts had been submitted, covering various aspects of the geology of the Jurassic, enough for the proposal for the Symposium to be accepted. These were checked by the Convenors for relevance and accepted (subsequently another abstract was received). The Symposium is time-tabled as a half-day meeting, so that not all the abstracts submitted for oral presentation could be accepted. The timetable allows only eight oral presentations, with possibly a little time for discussions. Those not accepted for oral presentation were proposed for poster presentation and most authors have agreed to this. In fact, the poster session will probably be the more significant of the two.

Of the themes suggested in Jurassic Newsletter 30, Theme 1 (on dating, correlation, etc.) has proved the

most popular, followed by Theme 4 (Tectonic events) and Theme 7 (General topics).

We hope that in spite of the very high cost of the Congress a significant number of you will be able to participate, and we look forward to seeing you in Florence.

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**7th INTERNATIONAL CONGRESS ON  
THE JURASSIC SYSTEM,  
KRAKÓW, POLAND, SEPTEMBER 6-18  
2006**

*Andrzej Wierzbowski, Chairman of Organising  
Committee*

The 7th International Jurassic Congress will be held in Poland, a country located right in the centre of Europe, at the crossroads of religions, cultures and empires, and blessed or tormented with a changing fate throughout her history. Poland is also located at a geological crossroads – where three major structural units, the East-European Craton, the Palaeozoic West-European Platform and the Alpine Orogenic Belt, meet. Similarly, the Jurassic System in Poland is very diverse: from siliciclastic continental and marginal-marine deposits, through thick epicontinental carbonates to the deep marine facies of the Tethys. This unique position resulted in mixing of Boreal and Mediterranean faunas, crucial for understanding Jurassic palaeobiogeography and biostratigraphy. Research on the Jurassic System has a very long tradition in Poland, which is the homeland of many classical works on Jurassic stratigraphy, facies and palaeobiology.

Kraków (Cracow) is an ideal place for the Congress. This magnificent city, the old capital of Poland, has been recognised by UNESCO as a gem of the world's cultural heritage. Equally magnificent is the venue – Jagiellonian University, the oldest university in Poland. Field trips through the Polish Uplands and Carpathians (also across the border into Slovakia with the help of our Slovakian colleagues) will show both the most interesting Jurassic successions and the beauty of Poland – a country rich in culture, with magnificent natural landscapes and friendly people.

**PROVISIONAL PROGRAMME**

September 6-10 Pre-Congress field trip  
September 11-14 Scientific sessions  
September 15-19 Post-Congress field trips

The Congress is organized under the auspices of the International Subcommittee on Jurassic Stratigraphy.

All scientific sessions will be held at the Conference Centre of Jagiellonian University in Kraków, Poland. Special sessions devoted to different subjects related to the Jurassic System will be organized and the Subcommittee, and its Working Groups, will meet during the Congress. Field trips will present different aspects of the Jurassic System in Poland – from the Middle Polish Uplands (Holy Cross Mts., Polish Jura Chain) to the Carpathians.

**FIELD TRIPS**

**Pre-Congress (6-10 September 2006)**

**Field Trip A, 4 or 5 days: From Tethyan to epicratonic facies**

The route of the trip begins in the Pieniny Klippen Belt – a highly complex tectonic zone of the Carpathians, which includes diverse sedimentary successions from condensed carbonates of the submarine Czorsztyn Ridge to deep marine basinal radiolarites. The classical Carpathian Flysch will be seen in the outcrops of the Cieszyn Beds with calcareous turbidites of latest Jurassic-earliest Cretaceous age, and related volcanics. In the Cracow Upland of the foreland, diverse Callovian deposits will be demonstrated, from highly condensed to non-condensed, as well as the overlying Oxfordian sponge megafacies - representing deposits typical of the northern shelf of Tethys. The excursion will continue north to the Holy Cross Mts in order to show the Late Oxfordian-Kimmeridgian shallow-water carbonate platform deposits. The results of palaeomagnetic studies in the Pieniny Klippen Belt and the foreland will be presented.

**Post-Congress (15-19 September 2006)**

**Field Trip B1, 3 or 4 days:  
Biostratigraphical framework from Bajocian to Oxfordian**

The trip will demonstrate the biostratigraphical and sedimentological problems of the Middle Jurassic (Bajocian to Callovian), and Oxfordian deposits, with localities rich in fossils, in the Polish Jura Chain between Cracow, Czstochowa and Wielu. Bajocian and Bathonian black clays and the varied, highly condensed to non-condensed Callovian deposits, well characterized by micro- and macrofossils, will be visited in the Czstochowa Upland. The Oxfordian sponge megafacies deposits will be seen along the whole Jura Chain, from massive limestones built of biohermal complexes to basinal deposits, rich in ammonites of Submediterranean type, and at some levels also of Boreal/Subboreal affinity.

**Field Trip B2, 3 or 4 days: Upper Jurassic shallow-water carbonate platform and open shelf facies**

The field-trip will focus mainly on sedimentological aspects of progradation of a shallow marine carbonate platform over open shelf sponge facies in epicontinental Poland (Holy Cross Mts., Polish Jura Chain) during Late Oxfordian/Early Kimmeridgian times. Sedimentary environments represented include lagoons, oolitic barriers, platform external slope with oncolitic/micritic sediments. Related successions of benthic faunal assemblages will be shown. The architecture of the sponge bioherm complexes,

establishment of coral reefs on top of the sponge bioherms, and mass movements into the interbioherm areas will be demonstrated.

#### **Field trip B3, 4 days: Inside Tethys**

The Jurassic deposits of different palaeogeographic units in the Inner Carpathians in Poland and north-western Slovakia will be demonstrated during this trip. These include especially the deposits of the Pieniny Klippen Belt with different facies zones - from intra-oceanic submarine swell successions, with typical ammonitico-rosso type limestones and the famous Rogonik lumachelles, to basinal successions. The more inner Carpathian Jurassic facies will be seen in the Tatra Mts in Poland, mostly in the Kri\_nna unit (Fatricum). A transition from synrift to postrift stages in development of the Tethys passive margin, with condensed deposits and manganiferous facies of submarine hydrothermal springs will be presented. The inner Carpathian facies of the Tatric, Fatric and Hronic units, consisting of contrasted shallow and deep water deposits will be seen in Mala Fatra and Strázovské Vrchy Mts in Slovakia.

#### **Field trip B4, 3 days: Lower Jurassic marginal-marine and continental deposits - sedimentation, sequences and ecosystems**

Alluvial, deltaic, barrier-lagoon and nearshore successions of Hettangian, Sinemurian and Pliensbachian age, will be shown in several exposures on the northern slopes of the Holy Cross Mountains. Detailed depositional architecture, sequence boundaries, flooding surfaces and non-marine correlatives of transgression surfaces will be presented along with a high-resolution sedimentological and sequence stratigraphic analysis. Sedimentation in the shallow, epeiric Early Jurassic basin of Poland was particularly sensitive to changes in sea level. Well-preserved plant and animal trace fossils (including dinosaur footprints) will be shown in their palaeoenvironmental context.

**Organizing Committee:** Andrzej Wierzbowski (Chairman), Roman Aubrecht, Andrzej Boczarowski, Ewa Glowniak, Jan Golonka, Jacek Gutowski, Michal Krobicki, Marek Lewandowski, Bronislaw Matyja, Grzegorz Pienkowski, Alfred Uchman, Jaroslaw Zacharski.

**Correspondence:** The first circular was mailed in May 2004 to all those who attended the Jurassic Symposium at Mondello. You may know of other colleagues who could be interested in participating, and we ask you to forward a copy of the circular to them. October 31<sup>st</sup> 2004 is the deadline for reply to the first circular.

**Secretaries:** Dr. Marcin Barski, Dr. Magdalena Sidorczuk, Institute of Geology, University of Warsaw Al. Zwirki i Wigury 93, 02-089 Warszawa, Poland. Tel. +48 (22) 5540490; fax +48 (22) 5540001; e-mail: secretary.isjs7@uw.edu.pl  
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Andrzej WIERZBOWSKI,  
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## **REPORTS OF WORKING GROUPS**

### **TRIASSIC-JURASSIC BOUNDARY (HETTANGIAN) TASK GROUP**

*Geoff WARRINGTON, Chairman*

#### **1. Organisational matters**

The Chairman, Geoff Warrington, retired from the British Geological Survey at the end of July, 2003. An application for him to remain there in an honorary capacity to continue his ICS subcommission and other activities under the aegis of the BGS was unsuccessful. This has impeded progress in the selection and proposal of a preferred candidate GSSP for the base of the Hettangian (see *ISJS Newsletter 30*: 8-11; July 2003). The Chairman is now an Honorary Visiting Fellow in the Geology Department at the University of Leicester where he is working on the material necessary for the first vote by the TJBGTG, to select a preferred candidate GSSP from the four proposed (see *Newsletter 30*: 9-10).

New contact information for the Chairman is as follows and replaces the directions given in *Newsletter 30* (p.13):

Postal address: Dr G. Warrington, 3 Lamcote Gardens, Radcliffe on Trent, Nottingham NG12 2BS, UK  
E-mail: gw47@le.ac.uk

Under ICS rules the Chairman ends his term as Secretary of the Subcommission on Triassic Stratigraphy (STS) in September 2004. He will remain a member of the STS in addition to being involved with IGCP Project 458 (Triassic-Jurassic Boundary Events) and, as the UK National Correspondent, with IGCP Project 467 (Triassic Time and Correlations).

#### **2. Obituary: Karl Mädlar (1902-2003)**

It was with great sadness that I learnt of the death, on 22 October 2003, of the palaeobotanist and palynologist Karl Mädlar. Mädlar was one of the pioneers of Triassic and Jurassic palynology in Germany.

Mädlar commenced palaeobotanical studies in 1931, working on Tertiary floras with Professor R. Kräusel at the University of Frankfurt am Main. He continued palaeobotanical studies, of Permian, Cretaceous and Tertiary material, throughout his life. After joining the Niedersächsisches Landesamt für Bodenforschung in Hannover he also worked on charophytes and Mesozoic megaspores and commenced palynological studies of the German Trias and Lower Jurassic. His palynological publications include one on the Upper Triassic and lower Lias (Mädlar, 1964) and others on beds higher in the Lower Jurassic, such as the Posidonienschiefer (Toarcian).

An obituary of Karl Mädlar by Volker Wilde (Frankfurt am Main), which appeared in *A.A.S.P. Newsletter 37* (1) (March 2004), cites further sources of information.

**Reference:**

MÄDLER, K. 1964. Bemerkenswerte Sporenformen aus dem Keuper und unteren Lias. *Fortschritte in der Geologie von Rheinland und Westfalen*, **12**: 169-200.

**3. Meetings**

The Chairman attended a special three-day session on "Extinction Events, Faunal Turnovers and Natural Boundaries within and around the Late Triassic", organised by the STS and IGCP projects 458 and 467 as part of the joint Geological Association of Canada – Mineralogical Association of Canada – Society of Economic Geologists Annual Meeting in Vancouver, Canada, in May 2003. The programme comprised 15 oral and five poster presentations on subjects relating to biochronology, diversity and extinction analyses within Late Triassic and Triassic-Jurassic successions, and geological, geophysical and geochemical events in the Late Triassic and Early Jurassic. Abstracts of these presentations appeared on the IGCP 458 website (<http://paleo.cortland.edu/igcp458/index.html>).

The annual meeting of the Ussher Society was held in Taunton, Somerset, UK, in January 2004 and included a thematic session on Mesozoic stratigraphy. Taunton is close to one of the candidate GSSPs for the base of the Hettangian, at St Audrie's Bay on the west Somerset coast. The Chairman made a presentation to the meeting on the four candidate GSSPs under consideration, using the tables published in *Newsletter* **30** (pp.9-10).

The Secretary attended the third IGCP 458 field workshop at Stara Lesna, Slovakia, in October 2003, where he made a presentation on the problems of correlation in relation to the Triassic - Jurassic system boundary. A summary of this presentation appears elsewhere in this newsletter (p.19).

A thematic session on Triassic – Jurassic boundary events is planned by IGCP Project 458 as part of the 32<sup>nd</sup> International Geological Congress in Florence, Italy, in August, 2004 (see the IGCP 458 website: <http://paleo.cortland.edu/igcp458/index.html>).

**4. New literature relevant to the TJBGTG**

AHLBERG, A., OLSSON, I. & SIMKEVICIUS, P. 2003. Triassic-Jurassic weathering and clay mineral dispersal in basement areas and sedimentary basins of southern Sweden. *Sedimentary Geology*, **161** (1-2): 15-29.

AHLBERG, A., SIVHED, U. & ERLSTRÖM, M. 2003. The Jurassic of Skåne, southern Sweden. *Geological Survey of Denmark and Greenland Bulletin*, **1**: 527-541.

ANDSBJERG, J. & DYBKJAER, K. 2003. Sequence stratigraphy of the Jurassic of the Danish Central Graben. *Geological Survey of Denmark and Greenland Bulletin*, **1**: 265-300.

BALDWIN, S., WHITE, N. & MÜLLER, R. D. 2003. Resolving multiple rift phases by strain rate inversion in the Petrel Sub-basin, northwest Australia. *Geological Society of America Special Paper* **372**: 245-263; (also: *Geological Society of Australia Special Publication* **22**).

BOULVAIN, F., BELANGER, I., DELSATE, D., GHYSEL, P., GODEFROIT, P., LALOUX, M., MONTEYNE, R. & ROCHE, M. 2001. Triassic and Jurassic lithostratigraphic units (Belgian Lorraine). *Geologica Belgica*, **4** (1-2): 113-119.

BRANDON, A. 2003. Excursion 10. The Liassic of the Vale of Belvoir. In: Gutteridge, P. (ed.) *The Geology of the East Midlands*. Geologists' Association Guide No.63: 92-102. London, The Geologists' Association.

BRUNSDEN, D. (ed.). 2003. *A Walk through Time. The Official Guide to the Jurassic Coast, Dorset and East Devon's World Heritage Coast*. Wareham, Coastal Publishing, 64pp.

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### 5. Contact information

Members of the TJBGTG are asked to inform the TG Chairman and Secretary immediately of any changes in their contact details (postal address, telephone and/or fax numbers (including national and area codes), or e-mail address), in order to ensure that they continue to receive notices and information from the TG.

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### PLIENSBACHIAN WORKING GROUP

*Christian MEISTER, Convenor*

#### GSSP proposal:

The proposal of the Wine Haven section, Robin Hood's Bay (Yorkshire, UK) as the best outcrop for defining the Global boundary Stratotype Section and Point (GSSP) of the Stage is now published (Meister et al., 2003).

The proposal having been accepted by members of the Pliensbachian Working Group and the Voting Members of the Jurassic Subcommittee (ISJS) (January 2003), will now be submitted to the International Commission on Stratigraphy (ICS). If accepted it will be submitted to the IUGS for ratification. This is now the main objective of the Working Group.

### Some recent publications on the Sinemurian and Pliensbachian:

- BLAU, J., MEISTER, C., SCHLATTER, R. & SCHMIDT-EFFING, R. 2003. Ammonites from the Lower Jurassic (Sinemurian) of Tenango de Doria (Sierra Madre Oriental, Mexico). Part III: Echioceratidae. *Revue de Paléobiologie*, **22/1**: 421-437.
- DOMMERGUES, J.-L. 2003. Nouvelles données sur les ammonites du Carixien basal (Jurassique inférieur) en Europe du Nord-Ouest: les faunes de Corbigny (Nièvre, Bourgogne, France). *Bulletin Scientifique de Bourgogne*, **51/1**: 12-36.
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- MEISTER, C., BLAU, J., DOMMERGUES, J.-L., FEIST-BURKHARDT S., HART, M., HESSELBO S.P., HYLTON, M., PAGE, K. & PRICE, G. 2003. A proposal for the Global Boundary Stratotype Section and Point (GSSP) for the base of the Pliensbachian Stage (Lower Jurassic). *Eclogae Geol. Helv.*, **96**: 275-297.

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### TOARCIAN WORKING GROUP

*Serge ELMi, Convenor*

A field meeting of the Toarcian Working Group will be held at Peniche (Portugal) during the spring of 2005 (April or May). Colleagues interested in the definition of the Toarcian GSSP can contact either Serge ELMi (Lyon) [email Serge.Elmi@univ-lyon1.fr] or Rogério ROCHA (Portugal) [email rbr@fct.unl.pt].

Please indicate what period is the best for you.

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### CALLOVIAN WORKING GROUP

*John Callomon, CONVENOR*

There is little new to report on the Callovian. Efforts continue to sharpen the correlations between the western European, Russian and East Greenland successions, largely on the basis of the most sensitively time-diagnostic ammonites, those of the genus *Kepplerites*. It seems increasingly likely that the Bathonian–Callovian boundary lies a little higher in East Greenland than assumed hitherto. Otherwise, it is pleasing to see the first modern description of the Bathonian–Callovian succession in the Boulonnais by Jacques THIERRY. There are pictures of many old

friends. The Discus Zone of the Upper Bathonian is well represented by *Clydoniceras* and the Koenigi–Calloviense Zones of the Lower Callovian by *Cadoceras*, *Proplanulites*, *Kepplerites* and *Sigaloceras*. But the basal Herveyi Zone can be only sketchily recognized and then mainly by brachiopods, like the Upper Cornbrash in England. The biofacies as a whole puts the Callovian of the Boulonnais firmly in the Normanno-British Subboreal camp: barely a sniff of the Med.

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#### Reference:

THIERRY, J. 2003. Les ammonites du Bathonien-Callovien du Boulonnais: biodiversité, biostratigraphie et biogéographie. *Geobios*, 36: 93-126.

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### OXFORDIAN WORKING GROUP

Guillermo MELENDEZ, *Convenor*

The work of the Group continued during 2003, following recent reports the situation is that the most suitable known sections in Europe lie in two classical areas - SE France (Provence) and S England (Dorset). Both are known for expanded sections in the Terres Noires and Oxford Clay facies, respectively.

#### (1) S England (Dorset). Redcliff Point (Ham Cliff section):

After brief visits, re-examination and sampling, carried out in recent years by several colleagues (N. Chapman and subsequently John Callomon, Kevin Page, John Wright, Malcolm Hart and colleagues from University of Plymouth, Richard Edmonds and others) this locality emerged in 2002 as a possible candidate section for the GSSP (Global Stratotype Section and Point) of the base Oxfordian Stage (and therefore also for the base of the Upper Jurassic Series). It could, therefore, become an important international reference section (possibly the only one of this type in Dorset). The section has been obscured by slumping in recent years.

Further work on several topics is still under way on this section, including Malcolm Hart (foraminifera and other microfossil groups), Paul Bown (calcareous nannofossils), Stephen Hesselbo/Angela Coe/Darren Gröcke (sedimentology and geochemistry including C, O and Sr isotopes etc.), Mark Hounslow (palaeomagnetic stratigraphy). Preliminary results of these studies were presented by Page *et al.* (in press).

A field trip was organized in July 2003 by Kevin Page (Plymouth) and Richard Edmonds (Dorset WH Group), with the participation of John Wright (Royal Holloway), Guillermo Melendez and Julia Bello (Zaragoza). This led to the compilation of a fairly large collection of ammonites from the uppermost Callovian-earliest Oxfordian interval, i.e. Lamberti to Mariae Zones, around the Paucicostatum Horizon - Scarbursgense Subzone. This stratigraphic interval, in

the Oxford Clay facies, is represented at this point by a 2-3 m thick sequence of marly, somewhat calcareous, siltstone followed by 4-5 m of thick black marls. The lithological change seems to fall within the uppermost Callovian Paucicostatum Horizon, the chronostratigraphic boundary (the base of Scarbursgense Biozone) lying within the upper marly unit. The question of the presence of true representatives of the species *Cardioceras woodhamense* Arkell at the base of this subzone is still being evaluated based on newly collected specimens. A further interesting point is the relatively high representation of Submediterranean groups such as the Perisphinctinae and Peltoceratinae. The genus *Alligaticeras* is replaced by *Properisphinctes* at the boundary. The state of preservation of the specimens, despite being fossilized in a black marly or silty matrix and somewhat crushed, is to some extent favourable. They quite often have the body chamber preserved and can be subject to detailed study after careful collecting and solidifying with *paraloid*. The good results of the ammonite succession appear to be further re-inforced by promising data on other fossil groups (micro- and macro-) currently being studied, such as foraminifera, nannoplankton, dinoflagellates, and possibly belemnites, bivalves and other invertebrate groups. Magnetostratigraphic, radiometric and chemical isotope studies are still in progress.

It seems, therefore, that the section of Ham Cliff, at Redcliff Point (Weymouth) might represent a potentially good candidate for the Callovian-Oxfordian boundary GSSP.

#### (2) SE France (Provence):

Classical outcrops in the Vocontian Basin (Provence), showing an expanded and well exposed upper Callovian - lower Oxfordian succession occur around the small town of Serres (near Sisteron), in the villages of Thuoux and Savournon. The Thuoux section was quickly recognised as especially convenient due to the extremely expanded uppermost Callovian Lamberti Zone and lowermost Oxfordian Mariae Zone. The first information on the Savournon sections came from Atrops, who discovered and recorded the sections, gathering large collections of ammonites. Fortwengler (1989) gave a general overview of the stratigraphy and ammonite successions in the region, in "Terres Noires" facies. Later Fortwengler & Marchand (1994 a, b) and Fortwengler *et al.* (1997) provided a detailed description of both sections.

The ammonite succession in both sections was regarded as appropriate for defining the Callovian-Oxfordian boundary, more especially those at Thuoux, due to the more expanded development of this stratigraphic interval. Problems at this locality, such as the poor preservation of ammonites (mainly as small pyritic nuclei) and poorer dinoflagellate results at Thuoux (cf. Savournon), as well as the scarcity of other invertebrate groups, were considered as insignificant. Both sections were proposed as complementary in a sort of "composite" GSSP proposal.

The proposal of Thuoux, however, failed to gain

unanimous support as a suitable GSSP candidate. The main contrary opinions noted difficulties in identifying the ammonites, especially cardioceratids, due to the generally incomplete state of preservation as pyritic nuclei. The poor representation of other fossil groups was also emphasised. Therefore, re-examination of the Savournon area as a possible alternative candidate to Thuoux was undertaken.

In favour of the Savournon section is the greater abundance of ammonites and their better preservation in concretions within thin limestone intercalations. The dinoflagellate analyses also gave better results, as did the presence (although minor) of other invertebrate fossil groups (bivalves, belemnites). Sampling for nannoplankton, foraminifera and chemical isotope analyses were also made and prepared in a field campaign during July 2003 by F. Atrops and G. Melendez. A preliminary report was presented to the annual meeting of the Spanish Palaeontological Society (SEP) in Morella, October 2003, included as an appendix to this report. Chemical isotope and nannoplankton analyses will be carried out by Anna Chiara Bartolini (Paris University) and collaborators whilst bivalves and other benthic groups will be revised by Graciela Delvene (University of Zaragoza). For the study of the ammonite successions participation of specialists from different areas and countries will enable detailed comparisons with those from southern England. This should allow the integration of ammonite collections and results of colleagues involved in the proposal of Thuoux (D. Marchand, D. Fortwengler and others). The final aim of this process would be to present an "inclusive" (not excluding at all) proposal of the section of Savournon as widely as possible, and supported by the highest possible number of OWG members.

**Acknowledgements:** This report has been prepared by the convenor of the OWG after very kindly receiving opinions and views, and using information from many colleagues, mainly: François Atrops, John Callomon, Richard Edmonds, Raymond Enay, Dominique Fortwengler, Malcolm Hart, Didier Marchand, Nicol Morton, Kevin Page and John Wright. In some cases, few words or sentences from previous letters or reports have been picked up and included here. I do express my warm thanks to all of them, wishing they all feel in some way, as a part and co-authors of it, although we are all conscious that debates will still be long open. Any errors or imprecision in the text are entirely the author's.

**Appendix:** Text of the note presented by Atrops & Meléndez at the XIXth annual Meeting of the Spanish Palaeontological Society (SEP) in Morella (Castellón) in October 2003.

(contains a modified, enlarged reference list to include references quoted in this report).

**The section of Peyral at Savournon, Provence SE France, as a potential GSSP candidate for the Callovian – Oxfordian boundary at a global scale**

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The section of Peyral, by the small village of Savournon (Haute Provence, SE France) displays some particular features that make it a valuable alternative GSSP candidate for the basal Oxfordian stage to the recently proposed section of Ham Cliff in Dorset, S. England (Page *et al.*, *in press*). Early references to this section include Fortwengler and Marchand (1994 a; *in*: Atrops, (1994, ed.) and Fortwengler & Marchand (1997) whilst recent references to Ham Cliff sections include Page (1994), Chapman (1999) and Page *et al* (*loc. cit.*)

The stratigraphic sequence covering the Callovian-Oxfordian transition (Lamberti-Mariae zones) is represented by the "Terres Noires" facies. The recorded section from the lower Lamberti Zone to middle-upper Mariae Zone, Praecordatum Subzone (levels 1 to 43) forms a 63-65 m thick homogeneous, black, shaley-marly succession punctuated by thin, 5 to 10 cm thick nodular limestone bands. Ammonites are common, and may be locally abundant throughout the whole sequence, allowing the definition of a detailed biostratigraphic and palaeontologic succession. Besides the common occurrence of representatives of the suborder Phylloceratina, the best-represented groups of Ammonitina are the Peltoceratinae, Cardioceratidae, Perisphinctidae, with representatives of the Oppeliidae (subfamily Hecticoceratinae) appearing slightly less common. Other invertebrate groups, such as belemnites, bivalves and brachiopods, are scarce to exceptional. However, their more or less continuous record should provide potential stratigraphic value. On the other hand, micropalaeontological studies have proved fruitful, with the dinoflagellate analysis yielding excellent results at this section. Lithological samples for foraminifera, nannoplankton and isotope geochemical analyses have been already taken and studies are now under way. Magnetostratigraphic analyses have yielded no positive results so far.

The succession of ammonite associations has allowed recognition of a detailed biostratigraphic sequence from upper Athleta Zone, in the nearby outcrop of Peyral-south, some 200 m away from the main outcrop, to the upper Mariae Zone in the main outcrop (Peyral-east). The Callovian-Oxfordian boundary is marked by the replacement of "Cardioceras" of the *paucicostatum* (Lange) group by true *Cardioceras* of the *scarburgense* Young & Bird group. The first 21 m belong undoubtedly to the upper Callovian Lamberti Zone, Lamberti Subzone, characterized by common *Quenstedtoceras* of the *lamberti* (J. Sowerby) group, as well as scarce specimens of *Poculispinctes* and

*Alligaticeras*. Within this interval, the upper 10 m has yielded common specimens of “*Cardioceras*” *paucicostatum* (Lange), hence characterising the uppermost Callovian Paucicostatum Horizon. Above this level a c. 10 m thick marly interval with thin nodular limestone intercalations has yielded few ammonites, mainly *Hecticoceras suevum*. The record of some typical specimens of “*Cardioceras*” *paucicostatum* (Lange) indicates a probable uppermost Callovian, Paucicostatum Horizon age for this interval. The next 10-11 m (levels 26-29) contain a rich ammonite assemblage yielding common *Peltoceras* sp. and *Hecticoceras* spp. (including *Brightia thuouxensis* Fortwengler). This association might in fact characterise the basal Oxfordian Thuouxensis Horizon (Fortwengler & Marchand, 1994c, 1997). However, the record of scarce specimens of *Cardioceras* still showing the dominant morphology of “*Cardioceras*” *paucicostatum* (Lange) with no evidence of the typical *Cardioceras scarburgense* Young & Bird would rather suggest this interval belongs to the terminal interval within the uppermost Callovian, rather than in the basal Oxfordian.

Problems still remaining to be solved would be, besides further progress on invertebrate and micropalaeontological analyses, the definition of the basal *Cardioceras* assemblage allowing the delineation of the precise position of the Callovian-Oxfordian boundary and the eventual recognition of the basal Oxfordian Woodhamense Horizon.

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## KIMMERIDGIAN WORKING GROUP

Andrzej WIERZBOWSKI, *Convenor*

### New results:

In June 2003 field studies carried in Staffin Bay, Isle of Skye by B.A.Matyja, A.Wierzbowski and J.K.Wright were completed. These studies make possible very precise recognition of the Pseudocordata/Baylei = Rosenkrantzi/Bauhini zonal boundary in the Subboreal and Boreal zonal schemes. They also enable precise recognition of the Bauhini/Kitchini zonal boundary. Both these boundaries in the studied section at Flodigarry could be considered as GSSP candidates for the Oxfordian/Kimmeridgian boundary (cf. e.g. comments by B.A.Matyja & A.Wierzbowski in ISJS Newsletter no.30, 2003). The detailed study on the biostratigraphy and ammonite faunas of the uppermost Oxfordian-lowermost Kimmeridgian at Flodigarry section, Staffin Bay, Isle of Skye, is nearly finished and it will soon be submitted to *Transactions of the Royal Society of Edinburgh*.

### Ballot:

An informal ballot (sounding out opinions of the Kimmeridgian W.G. members) was held. It involved suggestions on the possible Oxfordian/Kimmeridgian GSSP. Only thirteen answers were returned (50%) which may indicate that the problem is not easy. Of these who answered, 8 (62%) preferred the Submediterranean base of the Galar Subzone as potentially the best level for the Oxfordian/Kimmeridgian boundary. On the other hand, 5 persons (38%) indicated the base of the Subboreal Baylei Zone as the primary standard for the base of the Kimmeridgian Stage.

**Comments on ballot results:**

The first solution (base of the Galar Subzone) is in general accordance with the ICS Guidelines (e.g. looking for a universal boundary defined by the GSSP, selecting a GSSP according to its correlation potential, and not historical value, looking for the section fulfilling basic requirements for detailed studies – mostly by representing the continuous succession of deposits). The base of the Galar Subzone could be selected because it corresponds well to the Bauhini/Kitchini zonal boundary in the Boreal Succession, and thus it is recognizable in most of the Boreal Realm; selection of the Galar Subzone is also in accordance with the general importance of the Submediterranean Succession for global correlations.

On the other hand, placing of the Oxfordian/Kimmeridgian boundary at the base of the Baylei Zone, and especially at the base of the Densicostata horizon (as interpreted by the majority of those indicating the second solution) is supporting the “Primary Standard Chronostratigraphical Kimmeridgian” after the Subboreal ammonite succession recognized in the Dorset sections. Such interpretation means also that “the Submediterranean secondary standard, being independently defined by its base, should be also independently named” (e.g. Crussolien), and what is an obvious consequence “a change of name for the secondary standard stage would present also a good opportunity to redefine its lower boundary more closely in line with what is now believed to be a closer correlation with the primary standard” (J. Callomon in a letter to the members of W.G.; see also this Newsletter, p. 21). Defining the base of the Kimmeridgian at the base of the Baylei Zone – the closest level of the Submediterranean Succession would be the base of the Hauffianum Zone (which should be treated as an independent Zone, and included together with the Planula Zone into the Submediterranean “secondary standard”).

Although the general correlation of the Submediterranean, the Subboreal, and the Boreal zonal schemes is rather clear, some additional studies in parts of the Submediterranean Succession seem necessary. These should include the detailed documentation of the Submediterranean ammonite succession in the still stratigraphically poorly known interval from the upper part of the Hypselum Subzone to the Bimmamatum Subzone. The studies should involve also the Galar Subzone, an interval especially important for selecting the Oxfordian/Kimmeridgian boundary. These studies could also yield some additional collections of Subboreal/Boreal ammonites, enabling more precise correlation between the Submediterranean and the Subboreal/Boreal zonal schemes. Then, a final decision on the Oxfordian/Kimmeridgian boundary should be made easier than it is now.

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**TITHONIAN WORKING GROUP**

Federico OLORIZ, *Convenor and Günter*  
SCHWEIGERT, *Secretary*

**KI-TI boundary news:**

Since the Symposium volume of the Jurassic meeting in Sicily has only just been published, we still have to wait for the important results, including those dealing with Kimmeridgian and Tithonian stratigraphy, e.g. the presentation of the Fornazzo section in W Sicily.

The presentation of the French sections of Canjuers and Crussol is still in preparation (F. Atrops, G. Schweigert, J. Ogg, and others). We hope to finish the study this year so that it should be accessible for the next Working Group meeting scheduled for May/June 2005 in Stuttgart, Germany (as a joint meeting with the Oxfordian/Kimmeridgian group). An earlier date for the meeting, planned for 2004, was not possible because it was not in accordance with other scientific group activities in Stuttgart.

**Further activities:**

Very interesting Kimmeridgian/Tithonian boundary sections in Tunisia dated by means of ammonites have been studied by Enay, Hantzpergue, Soussi & Mangold and will be published.

In Russia, there are further activities to report by V. V. Mitta and M. Rogov (Moscow) studying Volgian sections and ammonites.

Very late Kimmeridgian ammonites including some *Hyboniticeras* were collected from the Imiadani Group of SW Japan by M. Takei, Niigata.

In southern Spain, fine biostratigraphy and taphonomy from horizons encompassing the Kimmeridgian/Tithonian boundary are in progress within the research framework of project BTE2001-3029, which has been developed by F. Olóriz and collaborators. New data will be available during 2005.

**New literature:**

References of new papers concerning K/T boundary, Tithonian stratigraphy or containing information on these topics are listed below. These papers are only those that have been communicated to the Convenor or to the Secretary.

ROGOV, M. A. 2003. Changes in the latest Kimmeridgian-Middle Volgian molluscan faunas of the Russian Platform and Siberia versus sea level change, paleoclimate and regional tectonic patterns. In: Danelian, T. et al. (eds.): *Paléocéanographie du Mésozoïque, Séance spécialisée de la SGF*, 10-11 juillet 2003, p. 38; Paris.

SCHERZINGER, A. & SCHWEIGERT, G. 2003. Ein Profil in der Usseltal- und Rennertshofen-Formation der südlichen Frankenalb (Unter-Tithonium). *Zitteliana*, A, 43: 3-17, 6 figs., 4 pls.; Munich.

SCHLÖGL, J. 2002. Sedimentology and biostratigraphy of the “ammonitico rosso” deposits in the Czorsztyn Formation of the Czorsztyn Unit, Pieniny Klippen Belt (Western Carpathians,

Slovakia). Unpublished PhD Thesis, Faculty of Sciences, Bratislava, 196 pp., 28 pls. – [Slovakian]

- ZAKHAROV, V. A. & ROGOV, M. 2003. Boreal-Tethyan Mollusk Migrations at the Jurassic-Cretaceous Boundary Time and Biogeographic Ecotone Position in the Northern Hemisphere Stratigraphy and Geological Correlation, Vol. 11, No. 2, pp. 152-171. Translated from Stratigrafiya. Geologicheskaya Korrelyatsiya, Vol. 11, No. 2, pp. 54-74.
- ZEISS, A. 2003. The Upper Jurassic of Europe: its subdivision and correlation. Geological Survey of Denmark and Greenland Bulletin, 1: 75-1145, figs.; Copenhagen (GEUS).

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### GEOCONSERVATION WORKING GROUP

*Kevin PAGE, Convenor*

There is nothing in particular to report for the Geoconservation Group at this stage, though plenty of news elsewhere.

The forthcoming volume of *Rivista Italiana Paleontologia e Stratigrafia* in which will be published the Proceedings of the 2002 Jurassic Symposium in Palermo will contain a novel slant on Jurassic geology and palaeontology - a set of papers covering aspects of the conservation issues affecting Jurassic sites, with reviews of management practices in place. This set includes the proposed classification of palaeontological heritage as a guide to conservation measures, as presented during the meeting.

For those attending the IUGS Congress in Florence later this year - note that geological conservation is now high on the global agenda and the meeting includes an entire session dedicated to the subject!

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### LIAISON WORKING GROUP

*Robert CHANDLER, Convenor*  
*with contributions by Colin PARSONS, Volker DIETZE, John HUXTABLE,*  
*Wolfgang FISCHER and Armin SCHERZINGER*

I am very pleased to be able to report considerable progress concerning collaboration between museum and university based ammonitologists and those of us who spend our spare time perusing further refinement in to the subdivision of Jurassic strata by ammonites. The first of the contributions to follow below results from a field trip to Dorset I ran for the Geologists' Association last year. Looking at the reserve list of those wishing to join the trip I noted the name of Colin Parsons. Could it be the same Parsons that

worked on the Inferior Oolite in the 1970s I wondered? It turned out to be exactly that man! Colin is now back as a retired researcher and he and my colleagues hope to collaborate on future projects. On that same trip I met up again with John Whicher who gave an account of the Osborne Wood site with Phil Palmer in the 70s. John has a splendid collection of Middle Jurassic ammonites and is very happy to work with us.

In the spirit of international cooperation Volker Dietze provides an account of the work conducted by him and Guenter Schweigert. John Huxtable, an amateur collector and resident of Taunton gives an account of his collecting and the sale of his important collection of ammonites to Oxford University Museum.

I have continued my biostratigraphic work on the Inferior Oolite of Dorset and Somerset. John Callomon and I are busy preparing some work for publication on the South Main Road quarry at Dundry. A manuscript on *Hyperlioceras* is also in production and Volker Dietze and I have had a paper accepted for the Proceedings of the Geologists' Association on the genus *Mollistephanus*. Much of this research came about as a product of my work with English Nature and the FACELIFT initiative. Through my role as Liaison coordinator I have tried to involve those interested in areas of the science outside of ammonites. I am delighted to report that Wolfgang Fischer has contributed below an article on gastropods. He is an enthusiastic fossil collector whose main interest in recent years has been the Pleurotomariidae. Wolfgang's collecting is driven by an enjoyment in fieldwork and an exquisite standard of preparation. His work is described in a delightful book published by Wolfgang. Copies can be obtained from him (or from [www.Conchbooks.de](http://www.Conchbooks.de)). I invited Wolfgang along to a research dig kindly granted by Sherborne Castle Estates at Frogden quarry. The material collected and beautifully prepared by Wolfgang will be donated to the Sedgwick Museum.

The success of this project has been due to the efforts of Jonathan Larwood and Helen Powell of English Nature and Edward Digby and William Beveridge of Sherborne Castle Estates. We have even found a highly skilled digger driver on hire through me to groups wishing to undertake research projects involving a digger.

The highlight of the year involved a research dig at the famous Sandford Lane quarry resulting in new discoveries and refinements to the work conducted by Colin Parsons in the 1970s.

Finally I welcome a new contributor to the Newsletter. Armin Scherzinger presents a short report of his work on the Tithonian of Germany.

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## A FEW WORDS OF INTRODUCTION

Colin PARSONS

After a 20 year gap, in which I taught from secondary to post-graduate students, I have finally retired, and got back into palaeontology, mainly thanks to a GA field trip, led by Bob Chandler, where I met many new, as well as long lost acquaintances, in the ammonite world. I have now got a volunteer position at the Natural History Museum and hope to use their library facilities to close my interregnum in bibliographic knowledge! Recently dug new sections at Dundry and Sherborne have re-kindled my collecting zeal, and I hope to restart my work on revising the Stephanoceratid ammonites, which was abandoned so many years ago! To help close this gap, I have created a new web site, which at first only contains material produced either for, or at the same time, as my PhD thesis: <http://www.drcolinparsons.org.uk/geology.htm> I intend to start putting a lot more original material there in the near future including Quicktime VR, fully rotatable images of ammonites in my collection.

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## CLASSICAL BAJOCIAN-BATHONIAN SITES IN SOUTHERN GERMANY

Volker DIETZE

Southern Germany is one of the classical areas for Jurassic stratigraphy and ammonites. In the second half of the 19th century many types of important ammonites were published by OPPEL, QUENSTEDT, and WAAGEN from this area. For a short period in the early 20th century the centre of scientific interest in German Middle Jurassic stratigraphy and ammonite studies shifted to northern Germany. Later, starting with HAHN's splendid investigations on the Bathonian, southern Germany once again became the focus of study in my country. More recently, G. DIETL and W. OHMERT have contributed much to the knowledge of the Middle Jurassic of southern Germany, especially in the Swabian Alb and the Wutach and Rhine Graben areas.

Summaries provided for the Lower Bajocian, Ovale/Laeviscula zones and the Upper Bajocian Garantiana/Parkinsoni zones lacked a modern revision. Two very important key sections are located in eastern Swabia, around Gingen/Fils and around Ipf (adjacent to the world-famous Miocene Ries impact crater). I have collected ammonites carefully bed-by-bed in these areas. First results are already published in collaboration with G. SCHWEIGERT, J. H. CALLOMON, R. B. CHANDLER, and G. DIETL.

The highly condensed beds of the Upper Bajocian in the Ipf area yield extremely rich ammonite faunas, allowing a high-resolution biostratigraphy of faunal horizons and a better understanding of the phylogeny of some important ammonite groups, especially of the genera *Garantiana* MASCKE, 1907 and *Parkinsonia* BAYLE, 1878. To date, the main results are as follows:

(a) The Garantiana and Tetragona subzones of the Garantiana Zone and the Acris Subzone of the Parkinsoni Zone can be subdivided in 6 faunal horizons. The Ipf area is a favorite candidate for a definition of the Garantiana/Parkinsoni zonal boundary.

(b) The type horizons of some important taxa erected by QUENSTEDT are reconstructed from the rock matrix of the types and by help of newly collected topotypes. The ammonite taxon *Ammonites Parkinsoni densicosta* QUENSTEDT, 1886 represents a *Garantiana* from the Tetragona Subzone, not a *Parkinsonia* from the Parkinsoni Zone. Thus, the use of a Densicosta Subzone within the Parkinsoni Zone (by French authors) must be refused.

(c) The phylogenetic development of the genera *Garantiana* and *Parkinsonia* is best interpreted as a chronocline, with only one bio-chronospecies in each faunal horizon. Both genera evolved by a shift of range of variation through time, splitting into two new chronoclines at the end of their evolution.

(d) The genus *Parkinsonia* is now also recorded from the Tetragona Subzone.

Description of the Lower Bathonian ammonite fauna and stratigraphy is in progress; those of the Parkinsoni and Bomfordi Subzones will follow.

Re-description of the sonniiniids and stratigraphy of the Fils and Lauter area, from where most of the types of WAAGEN's and QUENSTEDT's come, is nearing completion. Four faunal horizons can be distinguished in the Ovale Zone and Trigonalis Subzone of the Laeviuscula Zone. Further details will follow in the next Newsletter, when the investigation, in collaboration with other German (V. DIETZE, G. SCHWEIGERT) and English researchers (J. H. CALLOMON, R. B. CHANDLER), is published. A summary of the genus *Wichellia* BUCKMAN, 1889 from the Trigonalis Subzone of the Fils/Lauter area (eastern Swabia) is already published.

Investigations of some key sections in southern England have yielded further, as yet unpublished, results. Productive cooperation in recent years between German and English researchers has resulted in other publications on early stephanoceratids from southern England and southern Germany, on the Lower Bathonian morphoceratid genus *Berbericeras* (in collaboration with Ch. MANGOLD, France) and on the Astarte and Zigzag Beds of southern England.

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## THE EVOLUTION OF AN AMATEUR PALAEONTOLOGIST

*John HUXTABLE*

I was invited to write these notes primarily to relate my collecting activity in the Aalenian/Bajocian and highlight fossil material in my collection. My interests started over 50 years ago as a hobby. I lived closest to Viséan reef limestones in the north of England, the crinoids, corals and shelly fauna of which formed the basis of a collection that grew to many thousands over the years. I collected every fossil I could find, simply enjoying the outdoor life and the excitement of a 'nice' find. I am sure that most researchers will admit to some empathy with this simple pleasure, particularly when constrained by academic necessities. During these years I was fortunate to live within access of deposits ranging in

age from early Palaeozoic to early Eocene so specimens from trilobites to the shelly fauna of the London Clay soon resulted in a formidable collection.

Although I had no formal geological training, early guidance from friends at the Liverpool Museum, then various departmental heads at the Natural History Museum helped to point me in the right direction - to at least always record locations. Although somewhat undisciplined, my collecting benefited a number of museums including the NHM, Liverpool and Cardiff. My personal development was helped in the late 1970's (whilst dividing my time between the Inferior Oolite and the Chalk) when I came under the guidance of C.W.(Willy)Wright who encouraged me to take more note of the provenance of all collected specimens and to consider reporting my findings. The Cenomanian material I subsequently provided was kindly acknowledged in the Monograph of the Ammonoidea of the Lower Chalk (Wright & Kennedy) and focused my efforts on the disciplines needed to maximize the scientific value of my collected fossils.

The amateur collector has long been a valued source of important fossil specimens that might otherwise have been lost to science due to coastal erosion or mechanical quarrying and, whilst a degree of protection of important exposures has become necessary, I think it will be a sad day for all branches of Geology if the direction conservation has been taking continues to a time when fieldwork becomes unavailable to the amateur hobbyist. The surge in interest in fossils has taken its toll on many sites, but today there are many more opportunities to learn of how the fossil record should be preserved. Expanding the Dorset World Heritage Site 'Code of Conduct' to the national scale will surely bring far greater benefits than trying to legislate to limit collecting. As David Norman (then Head of Palaeontology of the Nature Conservancy Council) wrote to me in 1989 "...collecting *per se* is for the most part not likely to damage fossil sites, provided it is done in a responsible way. Collecting from sites is the very basis upon which the scientific value of the site has become established (and used to merit where appropriate its status as an SSSI) so in many cases it seems inappropriate to even try to restrict access to sites for this purpose". Whilst some caveats are included in his letter, I believe this is the best philosophy for the future to ensure that all those interested may continue to participate and so benefit our knowledge in the years to come.

However, an alternative which I have employed for over 12 years (since becoming involved in the renewed Inferior Oolite researches) is to open temporary sections, subject to permission, and keeping the landowners goodwill by returning the site to its original state. This activity has resulted in much new information that often complements previous records. The major part of the Jurassic fossil material in my collection, of Aalenian, Bajocian and Bathonian age, was collected from such sites within the classic areas around Sherborne, Dorset and Milborne Wick, Somerset. Descriptions of these projects and the collected fossils, mainly ammonites, are published in the Proceedings of the Dorset Natural History and

Archaeological Society. Included are many ammonite topo- and chorotypes, large numbers of the Otoitidae, Stephanoceratidae and the Sonniniidae together with interesting material from the Green-grained Marl of Osborne.

I have benefited from the expertise and support of many specialists but take this opportunity to thank again Willy Wright, and especially Hugh S. Torrens and John H. Callomon. My complete collection as at end 2002 was acquired by the Oxford University Museum of Geology, Park Street, Oxford.

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**INFERIOR OOLITE GASTROPODS FROM GREEN MARL AT FROGDEN**  
Wolfgang FISCHER



Left to right – Bob Christian (Dorset GA), Helen Powell & Jonathan Larwood (English Nature), John Huxtable, Richard Edmunds, Chris Pamplin (with *Stephanoceras*) (Dorset County Council), Christian Sinn, Wolfgang Fischer.

Frogden Quarry, near Sherborne (Dorset), is the type locality of numerous ammonites described by S. S. Buckman in the 19th century. With the agreement and support of Sherborne Castle Estates and English Nature, excavations to refine the ammonite faunal horizons were carried out and provided an opportunity to collect gastropods and other fauna, previously ignored by most.

The monograph on Inferior Oolite Gasteropoda by W. H. Hudleston (1887-1896) contains numerous descriptions of specimens collected at Frogden, so my purpose was to collect *in situ* the gastropod fauna of the Green Marl bed in order to confirm the levels of published specimens. Representative material collected will be deposited in the Sedgwick Museum, Cambridge.

The gastropod fauna of the Green Marl is of particular interest, with well-preserved specimens of several genera. Careful extraction techniques were used to ensure minimum damage and preserve relationship of shells within the bed. The specimens are now being developed using air abrasion and other modern techniques and will be included in a projected pictorial

atlas of Inferior Oolite gastropods, with a particular reference to the Pleurotomariidae. It might take some years to reach this target, but with the ongoing help of English Nature and the Liaison Group of the ISJS I am confident that it will be a worthy contribution.

Parkinsoni-zone, continued.	
Parkinsoni-zone.	3' 0" Pale fissile Limestones of the Parkinsoni-zone, with few fossils.
	5' 0" Alternations of brownish Limestone and brash, <i>Elyach. spinosa</i> , &c. Lower down, small var. of <i>T. spheeroidalis</i> , peculiar form of <i>Climaceras</i> , &c.
The CADOMONIA-bed. GASTROPODA.	
Hampshire-zone.	1' 0" $H_3$ <i>Ter. spheeroidalis</i> abundant in the lower part.
	4' 0" $H_2$ Ironshot Oolites in strong blocks, especially characterised by large specimens of <i>Am. Humphriesianus</i> and <i>Bledius</i> . A few Gasteropoda.
	0' 0" $H_1$ The Srazei-bed, or Marl with green grains. GASTROPODA.
1' 0"	Solid block of bluish-grey Limestone.
15' 0" Total.	Calcareous grits, with fossils of the Lower Division.

Hudleston's profile



Excavated section

**History:** Hudleston wrote in his monograph, "Osborne (Frogden Quarry). ...in this quarry we possess the best example which England affords of the beds of Bayeux – the "oolithe ferrugineuse", which is mainly characterised by *Stephanoceras* and *Sphaeroceras* – in other words, the zone of *Am. Humphriesianus*. The traveller from Normandy by the route we have taken might well wonder what had become of D'Orbigny's

typical Bajocian, but here it is at last. ...The Gasteropoda in the *Sauzei*-bed are abundant and well preserved, and the matrix is on the whole favourable for extraction, being a soft, whitish limestone with green (? glauconitic) grains, passing into the ironshot Oolite of the beds above. For the sake of distinction I call this bed H<sub>1</sub>. The Gasteropoda seem to present forms that are intermediate between the “*Sowerbyi*-bed” of Bradford Abbas and the more recognised species of the *Humphriesianus*-zone. It is very rich in Pleurotomariae, another characteristic which it shares with the beds of Bayeux; in some other respects it seems to possess features of its own.”

**Preliminary record of the Green Marl gastropods:** The Green Marl is Bed 3 of Callomon and Chandler (1990). Hudleston’s profile (see fig. 2) records some 15 cm of green marl. In the new section the thickness was highly variable, wedging down to almost nothing at some points. The Green Marl occurs in lenses on top of a bluish hard limestone, the Blue Bed. It was possible to collect from an area of about 2 square meters of sediment with consistent thickness up to 8 cm.

In the area of our excavation the bed was rather brownish and weathered, even softer than described by Hudleston. The excavation was conducted close to the natural surface of the valley, so strongly weathered. Most fossils found showed evidence of dissolution; calcite was very fragile and partly dissolved. Only very few gastropods could be collected, and the condition of preservation was disappointing.

**Summary:** The initial collection is disappointing but this is an on-going study with the major objective of a complete section, especially of the ammonite fauna. Therefore, we hope another, thicker, section of less weathered Green Marl can be examined in future.



*Purpurina* sp.,  $\phi$  20mm

**Gastropods recorded from the Green Grained Marl:**

Miscellaneous genera: *Purpurina* spp, *Spinigera* spp, *Pseudomelania* spp., *Natica* spp., *Amberleya* spp.  
Pleurotomariidae: *P. elongata*, *P. actinophala*, *P. yeovilensis*.



*Pl. yeovilensis*, Hudleston, Plate XXXIX fig. 8 a-c



*Pleurotomaria* cf. *yeovilensis*,  $\phi$  35mm, apex not preserved

**Acknowledgements:** Thanks are due to Edward Digby and William Beveridge of the Estate, English Nature, Dorset County Council, and the hard-working volunteers who helped in every aspect of the work, not least Mike Higgins whose skill and professionalism with the digging machine saved many specimens from destruction. This report benefited from assistance by Robert Chandler; the pictures are by Christian Sinn.

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## THE LOWER TITHONIAN OF SW GERMANY - PAST, PRESENT, FUTURE

Armin SCHERZINGER

Apart from the famous lithographic limestones of Solnhofen, the sediments of the Lower Tithonian of SW Germany have, until recently, received relatively little attention compared with that given to the rest of the Jurassic. In the 19th century, a few ammonite species were described by ZIETEN (1830), OPPEL (1863), SCHLOSSER (1882) and QUENSTEDT (1888). More numerous publications in the 20th century, include SCHNEID (1915, 1916), BERCKHEMER & HÖLDER (1959), GEYER (1962), BARTHEL (1959, 1962), HAHN (1963), BARTHEL & GEYSSANT (1973), ZEISS (1968, 1977), BARTHEL & SCHAIRER (1977), SCHAIRER & BARTHEL (1979, 1981) and OHMERT & ZEISS (1980). Yet despite all this work, our knowledge of large parts of the succession have remained highly incomplete. In the Hangende Bankkalke Formation of Swabia, for instance, a few years ago only some 100 specimens of ammonites were known altogether, and most of these had not been collected bed by bed.

Since 1990, large new collections made bed by bed have been assembled by the myself and G. SCHWEIGERT from the higher parts of the Upper Jurassic of Swabia. Our knowledge of the ammonites from the Hangende Bankkalke and neighbouring formations grew rapidly, to a point at which it became possible for the first time to attempt a more precise description of the ammonite biostratigraphy of the local development of the Hybonotum Zone. Four distinct successive ammonite faunal horizons could be resolved (SCHWEIGERT & SCHERZINGER, 1995; SCHWEIGERT, 1996; ZEISS et al., 1996). Most of these can be recognized also in Franconia, Spain (area of Calanda), SE France (Canjuers, Crussol) and in the Balkans.

Since 1998 I have been engaged on a revision of the ammonites of the Neuburg Formation (Lower Tithonian, Franconia) in collaboration with G. SCHWEIGERT. The fine collections made bed by bed by K.W. BARTHEL, now in the Bayerische Staatssammlung, Munich, combined with our own new material, led to the recognition of five faunal horizons in the formation (SCHERZINGER & SCHWEIGERT, 1999). In this context it became important to establish the exact type horizons of the species published by SCHNEID (1915, 1916), in the type section in the former quarries near the railway station south of the village of Unterhausen, near Neuburg-an-der-Donau. Details may be found in SCHERZINGER & SCHWEIGERT (1999, 2000) and SCHWEIGERT & SCHERZINGER (2004). The ammonite fauna includes mainly perisphinctids with Submediterranean affinities: the dimorphic pairs *Sublithacoceras* [M]/ "*Lemencia*" [m], *Franconites* [M]/ *Paraberriasella* [m] and *Danubisphinctes* [M]/ *Parapallasiceras* [m]. The base of the Neuburg Formation (Penicillatum horizon) can be correlated with the Mediterranean Fallauxi Zone by the occurrence in both of *Virgatosimoceras rothpletzi*, *Volanoceras*

*schwertschlageri*, "*Pseudolissoceras*" *concorsi* and *Richterella* cf. *richteri*; and with the top of the lower part (Palmatum horizon) of the Subboreal Tenuicostata and Scythicus Zone in Central Poland (SCHERZINGER & SCHWEIGERT, 1999; SCHWEIGERT, SCHERZINGER & PARENT, 2002; SCHWEIGERT & SCHERZINGER, 2004) by *Danubisphinctes palmatus* and *Parapallasiceras spurius*. Completion of the description of the results is imminent (SCHERZINGER & SCHWEIGERT, in preparation).

For the last three years I have also been working on new stratigraphic results from the Mucronatum and Vimineus Zones of Franconia. Previous descriptions of the ammonites were by SCHNEID (1915), BERCKHEMER & HÖLDER (1959) and ZEISS (1968). There is now a new and fossiliferous exposure in a quarry near the village of Ammerfeld (Franconia), which shows the most complete section through the Mucronatum and Vimineus Zones ever seen in SW Germany. It is now possible to recognize three faunal horizons in these Zones. The Vimineus Zone is demonstrated by the discovery for the first time of the rare ammonites *Sutneria* and *Protancyloceras*. A brief review of the complete ammonite fauna has been given by SCHERZINGER & SCHWEIGERT (2003). The Mucronatum and Vimineus Zones correlate with the Mediterranean Darwini and Semiforme Zones. Further details will be published soon.

The revision of the fauna from Neuburg (Lower Tithonian) is nearly complete (SCHERZINGER & SCHWEIGERT, in preparation). Additional information on the ammonites of the Mucronatum, Vimineus and Hybonotum Zones and their lithostratigraphy in Franconia will follow. Accounts of the precise taxonomic position of *Perisphinctes constrictor* SCHNEID and closely related rare forms are also in preparation (SCHERZINGER, ATROPS & SCHWEIGERT). A section near the village of Liptingen (W Swabia, Lower Tithonian) is currently under study. Revision of the Lower Tithonian ammonite genera *Euvirgalithacoceras*, *Subplanites*, *Lithacoceras* and *Silicisphinctes*, based on material from SW Germany, SE France, Spain and Bulgaria, is also in progress (SCHERZINGER, in preparation).

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## **CORRESPONDENCE**

### **TRIASSIC/JURASSIC SYSTEM BOUNDARY – THE ASPECT OF GLOBAL CORRELATION BY FOSSILS** *Gert BLOOS*

For the formal definition of the T/J system boundary in a GSSP, the problem of global correlation must be considered according to the principle “Correlation precedes Definition” (Remane et al., 1996). At present, an ideal solution does not appear possible, and therefore a solution, that would be most acceptable in the present state of knowledge, must be determined. Some considerations are presented here.

Four candidates for the GSSP have been formally proposed: the base of the Planorbis Zone near Watchet in Britain (Warrington et al., 1994), the first appearance of *Psiloceras tilmanni* and *Psiloceras spelae* in New York Canyon, Nevada, USA (Guex et al., 1997; see also Taylor et al., 1998), and the same in Chilingote, Utcubamba Valley, Peru (v. Hillebrandt, 1997). The fourth candidate is the spectacular change in radiolarians on Kunga Island, Queen Charlotte Islands, Canada (Carter and Tipper in Warrington, 1999: 20; see also Carter et al., 1998).

These sections generally meet the main requirement for a GSSP, the continuous and diverse record of the timespan across the proposed boundary. That means continuity of sedimentation, of facies and, realized only in part, of time-diagnostic fossils, absence of gaps and other breaks, sufficient thickness and presence

of fossil groups of different types.

In three of the four candidates ammonites are used to define the boundary, as with most other boundaries in the Mesozoic. For this time, ammonites are amongst the most precise fossil markers of time, and certainly, a convincing definition by ammonites would find a high degree of acceptance.

The only candidate at present with an almost continuous succession of ammonites from the Triassic into the Jurassic is that of the New York Canyon in Nevada. Two intervals of early psiloceratids can be distinguished in this succession: a lower interval in which psiloceratids co-occur with last forms of Triassic affinity, as *Rhacophyllites* and *Choristoceras*; and a higher interval without elements of Triassic affinity (Guex et al., 1997 and 1998). Further collecting in the South American candidate GSSP in the Utcubamba Valley in Peru would most probably yield a similar situation, and, moreover, the preservation of the ammonites would be better there.

The co-occurrence of the earliest psiloceratids and last ammonoids with Triassic affinity is so far unique worldwide. It indicates that this interval is earlier than the earliest psiloceratids in other regions where there is always either a gap or an ammonite-barren interval below the first appearance of psiloceratids. This ammonite-barren interval is known in Europe as the Pre-planorbis Beds. Most probably it is coeval, at least in parts with the lower psiloceratid interval in New York Canyon.

There are two alternatives to define the system boundary in Nevada, either at the base of the psiloceratid-bearing interval without elements of Triassic affinity, that means at the first appearance of *Psiloceras pacificum*, or at the first appearance of *Psiloceras tilmanni*. The first case has two main disadvantages, one of which is the difficulty in correlating psiloceratids of different parts of the world.

In NW Europe, a succession of four intervals of smooth-shelled psiloceratids is developed (Bloos and Page, 2000), and it is not known which is contemporaneous with the American *Psiloceras pacificum*. The correlation with *Psiloceras planorbis* is difficult to prove. The correlation of the European *Neophyllites* with *Choristoceras minutum* in Nevada is also questionable because in the Alps *Neophyllites* is not associated with elements of Triassic affinity (Bloos, 2004). The occurrence of *Neophyllites* in New York Canyon (Guex et al., 2003) is not unequivocally proved. So, the correlation of psiloceratids within the successions of different regions is not possible with certainty.

There is still another difficulty of correlation; early psiloceratids do not occur in vast areas of the world. In such areas one is forced to use changes in other fossil groups, such as palynomorphs. In most cases these changes are considerably earlier than the first appearance of psiloceratids because they are related to the end-Triassic extinction event. Thus, two different system boundaries would exist; the formally defined

one, situated considerably above the end of the extinction process, and, where the formally defined boundary cannot be identified, a different one based on changes in other fossil groups.

In this connection some remarks on the end-Triassic extinction are necessary. In the late Triassic, two aspects of extinction can be distinguished. One is the more or less extended process of decline of diversity in different groups of fossils, beginning in the ammonoids in the Norian, then, during the Rhaetian, in other groups, such as the pelecypods, and finally in the radiolarians at the end of the Rhaetian.

All these processes, though beginning at different times, ended in a rather short time interval. This is the second aspect of the end-Triassic extinction. The almost simultaneous end of decline of diversity could indicate that a short-lasting event caused the extinction of the fossil groups concerned, the majority of which had already been significantly weakened. It might have been something like a final stroke. The end of decline resulted in a minimum of diversity that could be regarded as the beginning of the Jurassic. However, one factor renders it difficult to formally define the system boundary at the end of this decline.

This factor is the sea-level fall in the transitional interval causing either a gap or a conspicuous change of facies in shallow seas. Since many fossil groups are sensitive to facies changes, these changes obscure the final phase of decline and render the minimum of diversity too indistinct for recognition of an exact time plane.

The first appearance of psiloceratids in New York Canyon, is close to the end of the decline and therefore also close to the changes in other fossil groups. Thus, the distance between the formally defined boundary and the conventional boundaries used in practical work in many regions would be less than in the case of a formal definition in higher levels.

Additionally, there is still another aspect of correlation. As already mentioned, in many parts of the world there is a gap in the transitional interval, indicating a fall in sea level. Normally, in these regions, the beds below the gap are undoubtedly Triassic and those above show the low diversity of the earliest Lias, even if ammonites are not present, indicating that the end-Triassic extinction process had already ended. In such cases the boundary, as defined in New York Canyon by the first appearance of *Psiloceras tilmanni*, would be situated in the gap. It should be kept in mind that only the GSSP requires continuous sedimentation; this is not a requirement for other sections.

The boundary level proposed in the Utcubamba Valley in Peru is similar to that in New York Canyon. The turnover in radiolarians on Kunga Island in Canada most probably is situated at the end of the late Triassic decline of diversity, so that also this level would be in a similar stratigraphic position and similarly suitable as a system boundary.

In some respects, the situation in the Triassic/Jurassic transitional interval is comparable with that in the Permian/Triassic transitional interval in which few cosmopolitan species occur. Thus, the Permian/Triassic boundary was defined by the first cosmopolitan species, the conodont *Hindeodus parvus*, above the transitional interval. However, such a cosmopolitan marker species does not exist in the case of the Jurassic and, in this less than optimal situation, a pragmatical solution is inevitable.

In three of the four candidate GSSPs, the boundary level is situated near the end of the late Triassic decline of diversity. This stratigraphical position would offer three advantages:

1. It would meet most requirements for a GSSP;
2. There would be the least distance between the formally defined system boundary and the conventional boundaries used in most regions of the world to which there is no alternative; and
3. All psiloceratids would be Jurassic and the problem of correlating exactly the endemic evolutionary trends of psiloceratids in different regions of the world would be avoided.

It is difficult to determine which is the most suitable candidate. The section in New York Canyon offers the most diverse ammonoid fauna, but the preservation is not optimal, the ammonoids being crushed and suture lines not preserved. The Chilingote section in the Utcubamba Valley in Peru is, as known at present, of rather low faunal diversity, but the preservation is much better. The spectacular change in radiolarians on Kunga Island, Canada, is the most distinct boundary level. The fact that radiolarians are less widely used than ammonoids in the Mesozoic would not be a major disadvantage, because neither group can be correlated exactly with other fossil groups across the boundary interval.

So far, discussion has been focussed on properties of the candidate GSSPs, but the question of correlation should not be neglected. If a decision is not to be postponed to an uncertain future, a vote must decide on a preferred candidate on the basis of present knowledge.

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### SOME COMMENTS ON THE PROPOSALS FOR THE GSSP OF THE KIMMERIDGIAN STAGE

John CALLOMON

I fear there may be some confusion in the debate on this subject, arising as usual from the conflicting objectives set in the ICS *Guidelines*. As I see it, there are two questions to be considered at the outset, relating to the choice of procedure:

A. Do we want to define a universal, "Global" Kimmeridgian Stage Boundary in a type section (GSSP) as called for in the *Guidelines*, irrespective of the current standard chronostratigraphical units of lower rank that this Stage contains, i.e. its Standard Zones and Subzones? If so, on what grounds?

Or,

B. Following the hierarchical principle, re-explained over the years now so many times, do we want to define a Primary Standard Chronostratigraphical Kimmeridgian Stage in terms of the lower boundary time-plane in the type section (PSSP) of its lowest Zone or Subzone? If so, there are some additional principles that will have to be considered. They follow the rules of *stratigraphical taxonomy* arising from the hierarchical principle and hence, separately, the rules of *stratigraphical nomenclature* that follow from the attempt to avoid ambiguity on grounds of homonymy [e.g. 'Kimmeridgian s.s.' and 'Kimmeridgian s.l., *sensu popolare*], synonymy [see e.g. Arkell's list of 'Stages' in his *Jurassic System in Great Britain* (1933)] and priority. (Does this sound familiar?).

#### Primary and secondary standards

**(1) Taxonomy: primary standard.** There is only one *primary* standard Kimmeridgian Stage, clearly defined in terms of its contained Zones by Salfeld (1913): his Baylei - Cymodoce - Mutabilis - Yo - Pseudomutabilis Zones. This, brought up to date, is what today we call the *Subboreal* zonation. The lower boundary of the Kimmeridgian Stage is therefore that of the Baylei Zone. The Primary Stage Section and Point (PSSP) is therefore that of the Baylei Zone. (We will leave aside for the moment the question of the upper limit of the Kimmeridgian Stage: the age-old problem of Kimmeridgian *sensu anglico*, ranging up to the base of the Portlandian, and Kimmeridgian *sensu gallico* ranging up to the base of the Tithonian. It will be considered briefly further below).

[*Comments:* The use of the concept and word 'Zones' is here unambiguously in the Opeian, standard chronostratigraphical, hierarchical sense, as opposed to so many other 'zones' in the literature, particularly German, used in a merely biostratigraphical sense. Re-reading Salfeld, nothing could be clearer. "The Kimmeridgian ... would comprise (*sic*) the following zones, taken in ascending order: ... ". There is a clear distinction between Kimmeridgian Stage and Kimmeridge Clay Formation. There is no "classic d'Orbigny's Oxfordian/Kimmeridgian boundary" in any modern chronostratigraphical sense. And although the ICS has not seen fit to define any rules of stratigraphical nomenclature, so that there formally exists no "law of priority", all who have attempted to codify modern zonations have tried to follow, consciously or unconsciously, Arkell's *Code* of 1946 and to identify earliest use, i.e. priority, in a recognizably chronostratigraphic sense (at least, in the Jurassic they have)].

**(2) Submediterranean secondary standard.** The Subboreal primary standard Kimmeridgian zonation cannot be "applied" (in the words of the ICS) in the Submediterranean Province (even less the Big G: "globally") - on which we are all agreed. There has therefore been constructed an independent, parallel zonation, of finesse and geographical applicability at least as good as the primary Subboreal standard: a *Submediterranean, secondary standard* Stage.

[*Comments:* another familiar procedure, as previously applied to the age-old problem of the Tithonian-

Portlandian-Volgian trinity, which is as practically necessary and useful today as it was in the past; and which too is under continuing pressure to sweep the real problems under the carpet and to impose the primary standard, the Tithonian, on successions in which it cannot be recognized - at least, with anything approaching the precision of time-correlations to which we in the Jurassic are accustomed. But here at least the concepts of primary and secondary standards seem to be slowly becoming accepted. For a recent review, see Cope (1996; 2003)].

In its more refined, post-Oppelian form the Submediterranean secondary standard post-dates the primary standard by at least thirty years. Its origins lie in the Franconian - Swabian White Jura and the history of its development is confused by the widespread mixing of bio- and lithostratigraphical units (Quenstedt, - - ...). The first attempt to bring order into the confusion seems to have been by Arkell (1946, 1956, Tables 9, 10). One senses his frustration in the texts. The 'Oxfordian/Kimmeridgian boundary' was drawn between the Planula Zone (still 'Oxfordian') and the Galar/Platynota Zone ('Kimmeridgian'). This boundary was chosen not on any locally independent grounds but on what was presumed to be the closest *correlation* with the primary standard, the Pseudocordata/Baylei boundary. All the subsequent confusion has arisen because, following traditional loose usage, this independently-defined secondary standard Stage was given the same name as the primary standard: Kimmeridgian. To say that this secondary standard is roughly, *within the precision of correlation*, of the same age-range as the Kimmeridgian is not the same as saying it *is* the Kimmeridgian. And we all know how imprecise a correlation can be: in the present case, how downright incorrect it was (- and even so, after 50 years, nobody dead). And we also know how the miscorrelation arose: through an example of the one great weakness to which our beloved ammonites used as clocks are vulnerable, namely heterochronous homoeomorphies - in this case, the (mis)identification of a group of Swabo-Franco-Pomeranian '*Ringsteadiae*' and '*Pictioniae*' found in the Planula Zone, with the real thing, the English forms, which they do resemble up to a point. The problems were clearly stated in Sykes & Callomon (1979, p.842, text-fig.2) and, slightly higher, in Birkelund & Callomon (1985, p.40).

**(3) Nomenclature.** The Submediterranean secondary standard, being independently defined by its base, should therefore be also independently named (different type, different name: familiar in zoological nomenclature?). Two existing names seem to present themselves as possible candidates: the Crussolian of Rollier, 1909, and the Sequanian of Marcou, 1848. I am indebted to Raymond Enay for pointing out that the histories, contents, chronostratigraphies, boundaries, correlations, subdivisions and subsequent modifications of these units have already been fully set out by our French colleagues (Enay, 1980, Enay & Atrops, 1984, Enay, Contini & Bouillier, 1988). Each of these Stages would require some redefinition relative to its original and subsequent senses if now to be pressed into service as Submediterranean secondary standard, but the same could be said for almost all of

the standard Stages in use today - recall the evolution of the Bajocian, for example, through the partition of the Aalenian. What is at stake in the end however is merely the use of a name as an index, as a label.

The 'Crussolian' has connotations pointing to Crussol, in the Ardèche, and that at least has the merit of referring to a locality at which the Submediterranean 'Kimmeridgian' is classically developed and described. It was introduced in a rather obscure publication but this ensured that it has not collected a large baggage of subsequent interpretations. The 'Sequanien' predates the starting-date for standard stratigraphical nomenclature of 1850 proposed by Arkell (1946), which is no cause for great concern, but its subsequent use has been more extensive and varied in connotation. It is part of the Argovien-Rauracien-Sequanien triplet introduced for the Jura of the Franche-Comté and tied more to differences of facies than of age. The other two have long been abandoned for this reason. It was however adopted by Spath (Kutch, 1933, p.864, Correlation Table I) in a standard Stage sense, as part of a Sequanian - Havrian/Virgolian doublet whose boundaries coincide closely with those of the 'Lower Kimmeridgian - Upper Kimmeridgian' used for the Submediterranean Province since Luxembourg 1962. It is however still included in the Oxfordian in the more recent discussions (Enay *et al.* 1988), which attempt to define its chronostratigraphy in terms of the modern Submediterranean zonation, and that is perhaps where it should stay.

**(4) Basal boundary stratotype (SSSP: Secondary Standard Section and Point).** A change of name for the secondary standard Stage would present also a good opportunity to redefine its lower boundary more closely in line with what is now believed to be a closer correlation with the primary standard. This correlation - still approximate but now at the higher precision of ammonite faunal horizons rather than that of whole Subzones or Zones - is currently based on the occurrence of *Amoeboceras bauhini* in Britain and in Swabia (Schweigert & Callomon 1997). It relies on the comparisons of whole *assemblages* of ammonites from precisely defined stratigraphical horizons rather than on sporadic specimens from only roughly known levels (in the White Jura). How precise the implied time-correlation is remains itself somewhat uncertain, for in Britain, *A. bauhini* occurs as an immigrant slightly above the base of the Baylei Zone and the range of the species is not yet well known anywhere. In Swabia, it occurs in the top of the Hauffianum Subzone, the highest of three Subzones of the Bimammatum Zone. One solution - the nomenclaturally most conservative - would therefore be to promote the Hauffianum Subzone to full Zone and to make it the lowest Zone of the Crussolian. That would leave the main body of the now restricted Bimammatum Zone still in the Oxfordian, below. The lowest faunal horizon in the Hauffianum Zone and hence of the Crussolian Stage would then be that of *Orthosphinctes tizianiformis* (Choffat). But there are other solutions: I cannot myself become involved in the details.

That presents the logic of the problem and the outline of a solution. It may not be widely popular. But



attempts to compromise by shifting the primary standard away from Kimmeridge for the sake of a single unified GSSP *sensu* ICS would be worse: the preference for theoretical tidiness over practical scientific reality. And the problems of precise correlation between Subboreal and Submediterranean successions would remain as before, unchanged and unresolved.

**(5) The Boreal Secondary Standard.** The standard zonation based on the evolution of the genus *Amoeboceras* introduced for the Boreal Province (Sykes & Callomon, 1979) is driven by the same problems as those discussed above for the Submediterranean Province, created by the bioprovincial endemism of the ammonites used as geological clocks. The standard zonal succession used in the Arctic differs from that of the primary Subboreal zonation and hence, in principle, a new name should be found for it also. But there is sufficient biogeographical overlap for its base to be taken to coincide with that of the primary Kimmeridgian, to be that of the Baylei Zone, and no confusion should then arise through miscorrelations of the bases. No harm would come, therefore, from referring to the Boreal succession as also ‘Kimmeridgian’ in broad terms, if no closer dating in terms of a specified Zone is intended, or as ‘Boreal Kimmeridgian’ to be a little more precise if needed. The selection of a Boreal SSSP at the base of the *Pictonia densicostata* horizon at Staffin, in the Isle of Skye, would therefore be perfectly acceptable but little more than a formality.

**(6) Further secondary standards.** Lest we think solutions of our European problems are the end of the matter: not so. They are of limited interest to those working for instance in Mexico (see Callomon in Westermann (ed), 1992, p.261, Table 12.3) or in Kutch and Madagascar. But we need not worry about these here. Further secondary standards can always be set up as needed. The criterion is usefulness.

**(7) The upper limits of the primary and secondary standards.** By the convention now generally accepted, the top of a standard chronostratigraphical unit is defined to be the base of the overlying unit. The top of a secondary standard Crussolian Stage is therefore unambiguously and automatically the base of the overlying Stage, the Tithonian, which takes over the role of primary standard for the top Stage of the Jurassic System. (How that base is itself to be defined is of course a separate problem that we need not consider here). But what of the primary Kimmeridgian itself?

Here we run into the old problem alluded to above, arising from the misunderstanding of the term ‘Portlandian’ as applied to the French and English successions by d’Orbigny, based on a misidentification of yet another homoeomorphic pair of ammonite species, this time those of the genera *Gravesia* and *Titanites*. The confusion was clearly recognized already by Blake (1881) and subsequently by Salfeld (1913). It was partially resolved by general agreement arising out of proposals put forward at Luxembourg (Maubeuge (ed) 1962, p.79 et seq.), that ‘Kimmeridgian’, ranging

up to the base of the Tithonian, should be used in the restricted sense (*‘sensu gallico’* of authors) at least in the Submediterranean Province. That makes it the very Stage whose redefinition as Crussolien has been discussed above. In Britain, a compromise was retained in that the Kimmeridgian Stage was divided into Lower and Upper Kimmeridgian Substages (see Cope in the Geological Society’s *Correlation Charts*, 1980), the boundary to lie at the base of Blake’s bed 42 at Kimmeridge, the base of the *Pectinatites elegans* Zone. This brings us back to original problem: how does the Lower Kimmeridgian *sensu anglico* correlate with the Kimmeridgian *sensu gallico*, the Upper Kimmeridgian *sensu anglico* with the Tithonian – all these Stages as defined by their boundaries?

A solution was proposed already by Blake himself and has been revived by Cope (1993, 2003). It is to recognize the Upper Kimmeridgian of Britain as an independent secondary standard Stage, to be identified by an independent name: the Bolonian Stage. All that would be needed to bring this solution up-to-date would be the formal designation of a boundary stratotype, the SSSP. The practical designation has already been made: the base of Blake’s bed 42. The definition of the Stage in terms of its contained Zones and Subzones is also already complete. The problem of the correlation of the base of the Bolonian with that of the Tithonian remains of course unchanged. But it becomes clearly seen as a practical problem of correlation, unbedevilled by confusion and uncertainties arising from problems of nomenclature.

Additional reasons for re-naming the Upper Kimmeridgian *sensu anglico* come from the subdivision in the meantime of the Kimmeridgian *sensu gallico* (*alias* Crussolian) itself, into ‘Lower Kimmeridgian’ and ‘Upper Kimmeridgian’ Substages. Clearly, there are several nomenclatural problems that the ISJS could usefully attempt to regulate, besides those of primary stage boundary stratotypes.

#### **Stage boundary stratotype sections: action**

**(1) The primary standard (PSSP):** Dorset, east of Weymouth. There are several sections from which one could be selected, all of them described in considerable detail: Ringstead, Osmington Mills, Black Head. But what matters above everything else is the ability to *recognize* the *means of correlating* the boundary more widely. This is the faunal horizon of *Pictonia densicostata*. It is present in all these sections: forget the ability also to recognize the horizon of *Ringsteadia evoluta* below and all those sedimentological arguments about how “complete” the sections are, how “continuous” sedimentation was across them. Select one, by toss of a coin if all else fails.

The *densicostata* horizon is in fact one of the finest markers in the Jurassic of Europe: it can be followed precisely in a bed never more than a metre thick from Dorset through Wiltshire (especially around Swindon) to Oxfordshire, Buckinghamshire and then to South Ferriby, just south of the Humber; thence to Staffin Bay in Skye. But not in Normandy: non-sequence, the lowest horizon seen there is that of *P. baylei*, distinct,

above *P. densicostata*. (For illustrations of *P. baylei*, see Hantzpergue 1989, pls. 20-24). And not in Poland: the specimens from there compared with *P. densicostata* may be close but are not identical. Excellent reference sections could be designated at Swindon, which has yielded immense collections of ammonites and other invertebrates (now in the Oxford University Museum); at South Ferriby, which has a more close to continuous succession across the boundary but a less abundant and restricted ammonite fauna; and Staffin, which has a stronger representation of the Boreal elements of the ammonite fauna but sparse other invertebrates. The clay-facies at South Ferriby and Staffin may be good for micro- and nanofossils.

**(2) The Submediterranean secondary standard (SSSP).** Decide the solutions to be adopted of the Stage problems analysed above, then select a type-section. Plettenberg? Crussol?

**(3) Reference sections and their correlations:** Poland? Southern France? Iberia?

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**GERMAN STRATIGRAPHIC  
COMMISSION – SUBCOMMISSION ON  
JURASSIC STRATIGRAPHY:  
Report of the year 2003  
Gert BLOOS, Gerd DIETL, Eckhardt MÖNNIG and  
Michael SCHUDACK**

After eight years (two terms of office) the Chairman and Secretary of the Subcommission were changed (in accordance with the regulations) at the end of 2003 by voting of the 15 Ordinary Members of the Subcommission. The new chairman is Dr. Eckhard Mönnig, Naturkunde-Museum Coburg, Park 6, 96450 Coburg, Germany; email [e.moennig@naturkunde-museum-coburg.de](mailto:e.moennig@naturkunde-museum-coburg.de). The new secretary is Dr. Michael Schudack, Institut für Geologische Wissenschaften, Freie Universität Berlin; email [schudack@zedat.fu-berlin.de](mailto:schudack@zedat.fu-berlin.de). See also the website of the Subcommission: <http://jurasubkom.pal.uni-erlangen.de/>

In 2003, the annual meeting of the German Subcommission on Jurassic Stratigraphy took place from May 28 - 31 in Kirchheim unter Teck, a town about 20 km southeast of Stuttgart at the foot of the Swabian Alb. It was organized by G. Dietl and G. Schweigert, both from the Natural History Museum in Stuttgart, and 30 colleagues attended. The area is in the

middle part of the Swabian Alb, with classical sections such as the historical site of Pliensbach (Pliensbachian), the quarries of Holzmaden (Toarcian) with its famous Posidonienschiefer, and important sequences of Middle and Upper Jurassic. For many of the younger members of the Subcommittee, and also for those from the eastern part of Germany (formerly GDR), this was the first opportunity to see this region in detail.

The annual meeting of 2004 will be held May 19 - 22 in Nördlingen im Ries (Bavaria). Nördlingen is an old town near the western border of Bavaria, situated in the famous impact crater of the Nördlinger Ries. The crater, 25 km in diameter, is the result of an asteroid impact 15 million years ago. The significance of the Ries region with respect to the Jurassic is its transitional position between the Swabian and the southern Franconian Jurassic. These two regions of the Jurassic in South Germany are different in several aspects, the best known of which is the widespread occurrence of lithographic limestones in the southern Franconian Jurassic.

The annual meeting of 2005 will be held in Regensburg (Bavaria) in the southeasternmost part of the Franconian Alb (Oberpfälzer Jura). New sites of Upper Jurassic lithographic limestones of different ages and different ecologies will be shown.

Work on the monograph of the Jurassic in Germany continued; it is not yet finished.

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## MEMBERSHIP AND WORK PLAN

*Eckhard MÖNNIG*

The German Jurassic Subcommittee consists of 35 corresponding members and 15 voting members. Our work plan for the next years is the preparation of a monograph on the Jurassic stratigraphy of Germany in three volumes. A first step has been taken by a contribution to the "Stratigraphische Tabelle von Deutschland (DST 2002)" <sup>\*)</sup>, where a revised lithostratigraphy chart of the German Jurassic has been published.

<sup>\*)</sup> Mönning, E. et al. (2002): Jurassic - in: German Stratigraphic Commission (ed.), Stratigraphic Table of German 2002.

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## NEWS OF TWO PROJECTS ON THE GERMAN JURASSIC

*Michael SCHUDACK, Secretary 2004-2007*

### 1) Monograph project "The Jurassic of Northern Germany"

I have started – in cooperation with Eckhard Mönning, Coburg - to coordinate and promote a monograph project called "The Jurassic of Northern Germany" (translated, the book will – must - be published in German language!). This is part of an official series of monographs on the various systems in our country, published by the Stratigraphical Commission of Germany. Up to the present, monographs about the Cretaceous, part of the Lower Permian (Rotliegendes), and the Proterozoic, Cambrian and Ordovician (in one volume) have been published. Others, such as monographs on the Devonian, Mississippian, Pennsylvanian, Triassic, and Quaternary are close to completion.

Compared to most of these stratigraphers, Jurassic workers in Germany have somewhat fallen behind, as far as this formal project of monographs is concerned. This especially refers to the Jurassic of Northern Germany, because a monograph about the Jurassic of Southern Germany is already scheduled for 2005. For Northern Germany, however, we have only just begun, but we are optimistic of catching up during the next 2-3 years.

The basis and main division of these monographs are the different regional areas with their own geological and palaeogeographic stories, and then the lithostratigraphical units within. Other correlation methods such as biostratigraphy, magnetostratigraphy, sequence stratigraphy, etc., are merely a help and additional (though very important and interesting) information. Therefore, two monographs for the Jurassic rocks in Northern and Southern Germany makes sense. In fact, there are no outcrops linking these two areas. The similarity of rocks between both parts of Germany is gradually reduced from the Lower Jurassic (with many similarities, e.g. "Posidonia shale formation" and others in both areas) up to the Upper Jurassic with its very strong lithologic and paleogeographic differentiation (e.g. Süntel formation vs. Treuchtlingen formation and others).

The principal lithologic succession of the Northern German Jurassic is subdivided into three units: the Lias, Dogger, and Malm Groups. These are not – as most people might suggest – correlated chronostratigraphically with the Early, Middle, and Late Jurassic. Instead, the uppermost part of the Lias group is earliest Aalenian in age, the uppermost part of the Dogger group is earliest Oxfordian in age, and the uppermost part of the Malm group is earliest Berriasian (i.e. Cretaceous) in age. As a consequence, this Jurassic monograph will also deal with some rocks of Cretaceous age.

Our major task will now be to plan the main chapters (regional areas, special chapters) and subchapters (groups, formations, etc.), and the recruitment of authors specialised in these topics. Besides the main

part of the book (i.e. regional areas, main lithostratigraphic units and their chronostratigraphic assignment by different stratigraphical correlation methods), there will be special chapters about various stratigraphical aspects such as biostratigraphy (summaries of different groups), magnetostratigraphy, radiometric dating, sequence stratigraphy/sea-level changes or log correlations. We then hope to bring together all this information during the next 2-3 years and publish the monograph in 2007 or so.

## 2) Research project “Sequence stratigraphy of the Jurassic in Eastern Germany”

The proposal for a research project named “Sequence stratigraphy of the Jurassic in Eastern Germany in its supraregional context, as based upon existing data“ (translated) was sent to the “Deutsche Forschungsgemeinschaft” (German Research Foundation) in February 2004 by M. Schudack (Berlin) and E. Mönning (Coburg). We hope for a start of the studies – in case the money, also for a scientist position, should be granted – in autumn 2004. In that case, the project will last until autumn 2007, for a period of three years. The research project will be an important part of our monograph project “The Jurassic of Northern Germany” (see above).

The main focus of these studies will be on a sequence stratigraphic reinterpretation of a vast quantity of existing data (incl. microsamples) from boreholes that have been drilled in eastern Germany between the years 1962 and 1990. As there are only few outcrops of Jurassic rocks in the eastern part of Germany, around 63 boreholes, which have penetrated the Jurassic in the federal states Brandenburg, Mecklenburg-Vorpommern, and Sachsen-Anhalt, have been selected for our studies. One advantage of these data is their free availability of data, relatively uncomplicated as compared to areas in the western parts of Germany. Besides the established methodology of sequence stratigraphy (to be carried out by the scientist to be hired), biostratigraphy – both micro and macro – will play an important role (to be carried out by Mönning and Schudack).

The primary goal of this research project is to filter out regional factors, such as halokinesis, tectonics, and subsidence from supraregional influences, such as global sea level fluctuations. We are totally aware of the problems we will encounter during our studies, but we expect only a few problems in the Lower Jurassic, and only some more in the Middle Jurassic. The most problematic part – in this respect – will be the Upper Jurassic (mostly Malm group), deposited at a time of a rapidly increasing individualization of regional basins, stronger local tectonics, and increasing regressive trends.

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## JURASSIC RESEARCH IN JAPAN 2003

Akira YAO

### 1. Stratigraphy and geologic structure of the Jurassic

(1) A new upper Lower Jurassic to Upper Jurassic stratigraphic unit, the Ashikita Group, was defined in the Uminoura area, western Kyushu, Southwest Japan, based on lithology and fossils (Ohta and Sakai, 2003). The newly found fossils are a late Toarcian ammonite *Haugia* cf. *variabilis* and Middle to Late Jurassic radiolarian fossils. These facts indicate that the previous stratigraphical assignment to the Permian to Cretaceous should be revised.

(2) The Chichibu Superbelt in East Shikoku, Southwest Japan, is newly subdivided into 5 belts with particular respect to the composition, oceanic plate stratigraphy of the accretionary complex (AC) and the stratigraphy of the slope-basin formations (SL) (Ishida and Kozai, 2003). The Jurassic AC is included in the Yoshigahira and Nakagawa belts, and the Jurassic SL is distributed in the Sakashu and Nakagawa belts.

(3) The Ryokami-yama Jurassic chert unit in the Kanto Mountains, Saitama Prefecture, central Japan, is divided into three subunits (Yoshida and Matsuoka, 2003). This unit is characterized by a pile-nappe structure of chert-clastics sequences. Middle Jurassic (Bajocian to Bathonian) radiolarian fossils were found from the uppermost chert horizons of Subunits 1 and 2.

### 2. Occurrence of Jurassic fossils

(1) Sato et al. (2003a) found an Early Jurassic (late Pliensbachian) ammonite *Canavaria* sp. from the Jurassic accretionary Mino Terrane, Neo-mura, Gifu Prefecture, central Japan. *Canavaria* is known from the normal Jurassic Toyora and Kuruma Groups in the Inner Zone of Southwest Japan. This fact suggests a close palaeogeographical connection between the accretionary Jurassic and the normal Jurassic.

(2) Sato et al. (2003b) reported Latest Jurassic – Early Cretaceous ammonites, *Delphinella* cf. *obtusenodosa*, *Berriasella* sp., etc. from the Tetori Group, Gifu Prefecture, central Japan. This fact indicates that the marine sediments of the Tetori Group range to Latest Jurassic – Early Cretaceous in age.

(3) Kamata et al. (2003) discovered an Early Jurassic ammonite *Cleviceras* cf. *chrysanthemum* from a limestone conglomerate in the accretionary Jurassic Ashio Terrane, Kuzu Town, Tochigi Prefecture, central Japan. The siliceous shale as matrix of the ammonite-bearing limestone conglomerate carries Middle Jurassic radiolarian fossils.

(4) Zeiss et al. (2003) studied Late Kimmeridgian ammonites, *Virgataxioceras* sp. and *Hemihaploceras mobile*, from the Yura Formation of Kii, Southwest Japan. *H. mobile* is a Tethyan ammonite species typical of the Beckeri Zone.

(5) Jurassic radiolarian fossils were discovered from the Northern Chichibu Terrane, western Kii Peninsula,

Southwest Japan (Kashiwagi and Kurimoto, 2003) and from the North Kitakami Terrane, Rikuchu-Seki area, Northeast Japan (Nakae and Kamata, 2003).

### 3. 2003 Session on The Jurassic System

A topical session, "The Jurassic System", was organized by A. Matsuoka, A. Yao, T. Komatsu and Y. Kondo in the annual meeting of the Geological Society of Japan held in Sept. 19-21, 2003, in Shizuoka University, see the report by Matsuoka in this Newsletter.

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### THE JURASSIC SYSTEM A session of the 2003 annual meeting of the Geological Society of Japan

Atsushi MATSUOKA

A topical session, "The Jurassic System", was organized during the 110th annual meeting of the Geological Society of Japan (Sept. 19-21, 2003) in Shizuoka University. The following seven papers were presented in the session and summaries are included in the abstract volume. A similar topical session is being planned for the next annual meeting of the society (Sept. 18-20, 2004) in Chiba University.

- HORI, R.S., AITA, Y., TAKEMURA A., YAMAKITA, S., KODAMA, K., SAKAKIBARA, M., KAMATA, Y., SUZUKI, N., TAKEMURA, S., OHGANE, K., KOYANO, T., SATAKE, A., SAKAMOTO, S., NAKAMURA, Y., SAKAI, T., CAMPBELL, H.J., J. A. GRANT-MACKIE & SPÖRLI, K.B. 2003. Triassic/Jurassic boundary sequences from the Northland, New Zealand.
- KOMATSU, T., NAGATA, K. & CHEN, J. 2003. Bivalve assemblages from the Lower Jurassic Xintianmen Formation in the Guangdong Province, China.
- SHIBASAKI, H. & KONDO, Y. 2003. Various limestones and the depositional environment in the Upper Jurassic Torinosu Group and the corresponding formations in Shikoku, Southwest Japan.
- ISHIDA, N. 2003. Radiolarians from Torinosu-type limestone bodies in the Southern Chichibu terrane, Outer Zone of Southwest Japan.
- TAKEI, M. & MATSUOKA, A. 2003. Stratigraphy and Geologic age of the covering strata of the Jurassic accretionary complex, in the Shirokawa area, Ehime Prefecture.
- MATSUOKA, A. & TAKEI, M. 2003. Biostratigraphic correlation of the Torinosu Group in western Shikoku.
- YAO, A. 2003. Formational site of the Jurassic of Southwest Japan.

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#### BOOK ANNOUNCEMENT: THE JURASSIC OF DENMARK AND EAST GREENLAND. GEOLOGICAL SURVEY OF DENMARK AND GREENLAND BULLETIN VOL. 1

Niels POULSEN

The Jurassic rocks of Denmark and East Greenland record the evolution of two discrete portions of the Mesozoic rift complex, now separated by the North Atlantic Ocean. The Jurassic of Denmark and adjacent areas occurs mostly in the subsurface and research has thus focussed on the wealth of borehole and reflection seismic data resulting from over thirty years of hydrocarbon exploration. The Jurassic of East Greenland, in contrast, is exposed in spectacular cliffs along fjords and mountainsides and has come to be regarded as a unique 'field laboratory', particularly amongst those working on the Norwegian shelf - the

conjugate margin of East Greenland. This bulletin contains 28 articles, preceded by a short overview article, presenting the results of a period of intensive research into the Jurassic in the late 1980s and 1990s. Following detailed chronostratigraphic and biostratigraphic reviews of the Jurassic of Northwest Europe, the successions of Denmark and East Greenland are subjected to a range of stratigraphic, sedimentological, structural and geochemical studies that together provide the basis for a detailed comparison of the Jurassic evolution of the East Greenland and Danish sedimentary basins.

### **Preface**

The Jurassic sedimentary successions of Denmark and East Greenland accumulated on opposite sides of a complex rifted seaway between present-day Greenland and Northwest Europe. The Mesozoic-Cenozoic sedimentary basins created along this seaway are of major importance both scientifically, as they preserve a record of the early evolution of the North Atlantic region, and economically as one of the rift arms contains the North Sea petroleum province. The Jurassic System, in particular, has been the focus of intensive study in Northwest Europe and Greenland. Not only has this system, since the days of William Smith, been at the forefront of stratigraphic research but it also forms a critical component of the North Sea hydrocarbon province, yielding both the most important source rocks and a wide range of sandstone reservoirs.

Although the stratigraphic development of the Jurassic in Denmark and East Greenland can be compared at a number of levels, the nature of the occurrences in the two regions is very different. The Jurassic of East Greenland is one of the world's best-exposed ancient rift basins and is widely regarded as a classic 'field laboratory'. The Jurassic strata are exposed in spectacular cliff sections that provide unique opportunities for detailed research into process sedimentology, genetic stratigraphy and 3D sedimentary architecture. The Danish Jurassic strata, in contrast, have limited outcrop but are well known from the subsurface, both on land and beneath the waters of the North Sea. The papers collected in this volume reflect this contrast - the stratigraphic evolution of East Greenland has been deciphered primarily on the basis of detailed outcrop geological studies whereas the corresponding stratigraphic analyses of the Danish Basin and the Danish sector of the Central Graben are largely dependent on 'remote' subsurface data. Jurassic stratigraphic research in Denmark over the last two decades has benefited immensely from the interaction between these two contrasting yet complementary approaches.

The origins of this book go back to the early 1990s when the idea was mooted for a book on the 'Jurassic of Denmark and adjacent areas', initially with a view to publication of the main results of Ph.D. studies that were underway at the Geological Survey of Denmark (DGU) at that time. In 1995, with the amalgamation of DGU with the Geological Survey of Greenland (GGU) to form the Geological Survey of Denmark and Greenland (GEUS), the conceptual framework of the

book expanded to include the Jurassic of East Greenland, a research area that was under sharp focus both at GGU and at the University of Copenhagen. As the editing of the book entered the final phase, the Geological Survey relocated to the new Geocenter Copenhagen - a centralized amalgam of the Survey (including the Danish Lithosphere Centre) and the Geological and Geographical Institutes and the Geological Museum of the University of Copenhagen. From conception to publication, therefore, the book charts the changing structure of some of the central geological research bodies in Denmark, and its completion coincided with the inception of a new integrated natural science research centre.

The central aim of the book is to present the results of an intense period of research activity in Denmark on the Jurassic System over the last fifteen years - and, where relevant, to present these results at a comprehensive level that is almost impossible in modern scientific journals. Although covering a range of subjects, the common thread that runs through the book is the detailed documentation of the history of the Jurassic rift system as recorded in the sedimentary basins of Greenland and Denmark. Particular areas of focus include: (1) the sedimentary and stratigraphic signatures of syn-rift successions, whether revealed by detailed outcrop study or on the basis of integrated reflection seismic, petrophysical and core data; and (2) testing and application of sequence stratigraphic models and concepts at a variety of scales and in different structural settings.

Although focussing on broad geoscientific topics of general relevance, the book also provides data of specific value to the hydrocarbon industry. The Danish Basin and, in particular, the Danish Central Graben are prospective basins with exploration histories stretching back nearly fifty years. A number of Jurassic fields are under development and production in the Danish Central Graben, and exploration interest remains high. The structural, sedimentological and stratigraphic papers in this volume thus represent a direct source of essential data for the hydrocarbon industry. The onshore East Greenland basins, in contrast, are not prospective per se, yet the detailed sedimentological and stratigraphic analyses included here will be of particular interest to petroleum geologists both as direct stratigraphic analogues of the succession on the conjugate margin (mid-Norway shelf) and as reservoir analogues or case studies applicable particularly to the North Sea region but also valid elsewhere.

### **Introduction**

Introductory chronostratigraphic reviews of the Lower, Middle and Upper Jurassic were planned from the outset, and contributions were solicited from three international authorities in this field, together with a paper on the Jurassic of southern Sweden. Furthermore, a review of the Jurassic of the Netherlands was invited from the Geological Survey of the Netherlands (RGD) for comparative purposes, building on previous close stratigraphic co-operation between DGU and RGD in the late 1980s.

The aim has been to produce a book that is as balanced and consistent as possible, in terms of content, terminology and appearance. Given the range of subjects covered, however, a certain degree of heterogeneity is inevitable and full consistency in terminology cannot be achieved. The Gradstein et al. (1994) time-scale is used in most cases but the Haq et al (1988) and Harland et al. (1990) time-scales are employed by some authors; in all cases, the origin of the time-scale used is clearly indicated. Several forms of chronostratigraphic terminology are in common use, all being inherently logical and fully acceptable; particularly prevalent are the 'Standard Zone' nomenclature (Callomon & Donovan 1974) and the 'chronozone' terminology, as laid down in the International Stratigraphic Guide (Salvador 1994). Editorial flexibility has been exercised here, although consistency within individual articles was required. To enhance uniformity, a common graphical style has been imposed wherever possible; detailed sedimentary logs are somewhat variable, however, being dictated by different individual styles and demands.

In an enterprise of this type, undertaken over a number of years, there are clearly many people both in Denmark and abroad who have helped us towards publication. The research projects that formed the initial stimulus behind the book were supported both by state funding - the Danish Energy Agency (Energy Research Program, EFP), the Danish Natural Science Research Council (SNF), the Danish Research Academy and the Norwegian Petroleum Directorate (NPD) - and by the private sector, including Amerada Hess, Amoco, British Petroleum, the Carlsberg Foundation, Conoco, Mærsk Olie og Gas, Norsk Hydro, Saga Petroleum and Statoil. The long-term support of Danish geological research by these funding bodies and companies is gratefully acknowledged. We are also indebted to a long list of international referees; their contribution is acknowledged elsewhere but their importance in upholding the international standard of the papers bears repetition. During the scientific and technical editing phase, we have leaned heavily on three key personnel: Hanne B. Sørensen, who converted editorial hieroglyphics into ordered manuscripts; Birgit Eriksen, who meticulously checked final manuscripts and proof copies; and Stefan Sølberg whose skilled graphical imprint is engraved on almost every illustration in the book. On editorial matters, we have also benefited greatly from close co-operation with Peter R. Dawes and Esben W. Glendal in the editorial office at GEUS. In the latter stages we have been increasingly reliant on the professional layout work by Carsten E. Thuesen. To all the above, we offer our heartfelt thanks.

Jon R. Ineson Finn Surlyk - On behalf of the 'Jurassic book' convening group: Jon R. Ineson, Finn Surlyk, Karen Dybkjær, Lars. H. Nielsen, Niels E. Poulsen.

### Contents

The book contains important articles on stratigraphy (ammonite and dinoflagellate cyst biostratigraphy and correlations, palaeogeography, geochronology, chronostratigraphy, subdivision by non-ammonite fossil groups, dinoflagellate palaeoecology, palaeo-

temperatures and biotic provincialism, magnetostratigraphy, sequence stratigraphy). Only selected examples are given here.

### *The Lower Jurassic of Europe: its subdivision and correlation - Kevin Page*

The Lower Jurassic Sub-system comprises four stages, in chronological order, the Hettangian, Sinemurian, Pliensbachian and Toarcian. Each stage is subdivided into a sequence of 'standard zones' (= chronozones) and subzones - each correlated primarily on the basis of its ammonite fauna. A further increase in stratigraphical resolution is available by the use of intra-subzonal units known collectively as 'horizons'. The close link between ammonites and chronostratigraphy means that faunal provincialism may determine which zonal framework, and therefore which subdivision of the Lower Jurassic, applies in different regions of Europe. Such provincialism is of minor importance in the early Jurassic (Hettangian – Lower Pliensbachian) but increases significantly in the Upper Pliensbachian and into the Toarcian where at least three ammonoid faunal provinces are distinguishable. The standard zonal schemes for each relevant faunal area are discussed here, with greatest emphasis being placed on the Northwest European Province, which is characteristic of much of northern Europe throughout most of the Early Jurassic. Intra-subzonal units have only been described in certain regions for parts of the Lower Jurassic but where recognisable these are introduced.

*Geological Survey of Denmark and Greenland Bulletin* 1, 23-59 (2003)

### *The Middle Jurassic of western and northern Europe: its subdivisions, geochronology and correlations - John Callomon*

The palaeogeographic settings of Denmark and East Greenland during the Middle Jurassic are outlined. They lay in the widespread epicontinental seas that covered much of Europe in the post-Triassic transgression. It was a period of continuing eustatic sea-level rise, with only distant connections to world oceans: to the Pacific, via the narrow Viking Straits between Greenland and Norway and hence the arctic Boreal Sea to the north; and to the subtropical Tethys, via some 1200 km of shelf-seas to the south. The sedimentary history of the region was strongly influenced by two factors: tectonism and climate. Two modes of tectonic movement governed basinal evolution: crustal extension leading to subsidence through rifting, such as in the Viking and Central Grabens of the North Sea; and subcrustal thermal upwelling, leading to domal uplift and the partition of marine basins through emergent physical barriers, as exemplified by the Central North Sea Dome with its associated volcanics. The climatic gradient across the 30° of temperate latitude spanned by the European seas governed biotic diversity and biogeography, finding expression in rock-forming biogenic carbonates that dominate sediments in the south and give way to largely siliciclastic sediments in the north. Geochronology of unrivalled finesse is provided by standard chronostratigraphy based on the biostratigraphy of ammonites. The Middle Jurassic saw the onset of considerable bioprovincial endemisms in these guide-fossils, making it necessary to construct

parallel standard zonations for Boreal, Subboreal or NW European and Submediterranean Provinces, of which the NW European zonation provides the primary international standard. The current versions of these zonations are presented and reviewed.

*Geological Survey of Denmark and Greenland Bulletin* **1**, 61-73 (2003)

*The Upper Jurassic of Europe: its subdivision and correlation- Arnold Zeiss*

In the last 40 years, the stratigraphy of the Upper Jurassic of Europe has received much attention and considerable revision; much of the impetus behind this endeavour has stemmed from the work of the International Subcommittee on Jurassic Stratigraphy. The Upper Jurassic Series consists of three stages, the Oxfordian, Kimmeridgian and Tithonian which are further subdivided into substages, zones and subzones, primarily on the basis of ammonites. Regional variations between the Mediterranean, Submediterranean and Subboreal provinces are discussed and correlation possibilities indicated. The durations of the Oxfordian, Kimmeridgian and Tithonian Stages are reported to have been 5.3, 3.4 and 6.5 Ma, respectively. This review of the present status of Upper Jurassic stratigraphy aids identification of a number of problems of subdivision and definition of Upper Jurassic stages; in particular these include correlation of the base of the Kimmeridgian and the top of the Tithonian between Submediterranean and Subboreal Europe. Although still primarily based on ammonite stratigraphy, subdivision of the Upper Jurassic is increasingly being refined by the incorporation of other fossil groups; these include both megafossils, such as aptychi, belemnites, bivalves, gastropods, brachiopods, echinoderms, corals, sponges and vertebrates, and microfossils such as foraminifers, radiolarians, ciliata, ostracodes, dinoflagellate cysts, calcareous nannofossils, charophyceae, dasycladaceae, spores and pollen. Important future developments will depend on the detailed integration of these disparate biostratigraphic data and their precise combination with the abundant new data from sequence stratigraphy, utilising the high degree of stratigraphic resolution offered by certain groups of fossils. This article also contains some notes on the recent results of magnetostratigraphy and sequence chronostratigraphy.

*Geological Survey of Denmark and Greenland Bulletin* **1**, 75-114 (2003)

*The Jurassic dinoflagellate cyst zonation of Subboreal Northwest Europe- Niels Poulsen and James Riding (With an appendix by Bjørn Buchardt: Oxygen isotope palaeotemperatures from the Jurassic in Northwest Europe)*

The Jurassic dinoflagellate cyst zonation for the British-Danish area is revised and discussed in relation to palaeoenvironmental factors, in particular, eustatic changes and fluctuations in palaeotemperature. The stepwise evolution of dinoflagellate cyst assemblages as defined by inceptions and apparent extinctions was largely controlled by sea-level change, particularly during intervals with significant short-term eustatic fluctuations. During times characterised by less pronounced, or longer term, sea-level change, fluctuations in oceanic palaeotemperatures appear to

have influenced dinoflagellate evolution. Differences in the ranges of certain taxa between Denmark and the United Kingdom may be partly related to differences in palaeotemperature.

*Geological Survey of Denmark and Greenland Bulletin* **1**, 115-144 (2003)

Further information, see: [www.geus.dk](http://www.geus.dk) > Publications > Geological Survey of Denmark and Greenland Bulletin > 1: The Jurassic of Denmark and Greenland

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**A NEW PROJECT ON THE PROBLEMS OF THE TRIASSIC/JURASSIC BOUNDARY IN EASTERN STARA PLANINA MTS. (EASTERN BULGARIA)**

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*ZAGORCHEV* (Geological Institute, Bulgarian Academy of Sciences)

The Upper Triassic sediments in Bulgaria are generally of Peri-Tethyan, shallow shelf character while the lowermost Lower Jurassic sediments are continental or continental/marine. In the eastern Stara Planina Mts. the Upper Triassic and the Lower Jurassic sediments have a basinal Tethyan character and the problem of the Triassic/Jurassic boundary is of great importance. In shelf Peri-Tethyan sequences the boundary has, overall, an unconformable and transgressive character, often with several stages missing (eroded) because of Early Cimmerian orogenesis in latest Triassic times. Conversely, the T/J boundary in the basinal sediments of the eastern Stara Planina Mts. is probably transitional, situated within the silicic turbidites of the Sini Vir Formation.

Since Nachev et al. (1967), most Bulgarian geologists regarded the different Triassic and Lower Jurassic sediments in the eastern Stara Planina Mts as olistolites included in Upper Cretaceous sediments of the Kotel Fm. Tchoumatchenco & Cernjavskaja (1989) and Tchoumatchenco et al. (1992) have proved that the opinion of Cernjavskaja (1965) about a Middle Jurassic age of the Kotel Fm is correct.

That apart, in these black shales with olistolites there exist also other Jurassic sediments of silicic turbidite character – the Sini Vir and Balaban Formations, which lie stratigraphically below the Kotel Fm. The lower boundary of these is unknown, and authors regarded all Triassic sediments as allochthonous (olistolites). In some outcrops of the Triassic olistolites, transgressive contacts between Triassic carbonate platform sediments and Lower Jurassic shallow water sediments can be observed (Fig. 1 – Kayite ; Fig. 2 – contact). Recently, Budurov et al. (1997) described some Triassic sediments and established a lithostratigraphic scheme for them, but



still regarded them as olistolites. Kanchev (1993, 1995) published a map, accompanied by explanatory notes, in which he showed the sediments of the Sini Vir and Balaban Fms. (now proven to be Lower Jurassic) as Upper Triassic, in a tectonic position over the “Lower-Middle Jurassic“ rocks of the Kotel Fm. According to his opinion (Entcheva & Kanchev, 1967), the Sini Vir Fm of Tchoumatchenco & Cernjavaska (1989) and Tchoumatchenco et al (1992) are only Upper Triassic.



Fig. 1. General view of Orta, Ouch and Kodzha Kaya heights – Upper Triassic olistolite in the Middle Jurassic Kotel Formation, near the village of Bilka, Louda Kamchia valley, Burgas District (eastern Bulgaria).

To conclude, there existed up to now the following opinions: (1) All the Triassic and Lower-Middle Jurassic sediments are olistolites in Upper Cretaceous black shales of the Kotel Fm. (Nachev et al. 1967); (2) The Kotel Fm is of Middle Jurassic age and in it are included different olistolites – Triassic and Jurassic - but below it are Lower Jurassic siliciclastic turbidites (Tchoumatchenco & Cernjavaska, 1989-90). However, the basement is unknown; (3) The Upper Triassic sediments are dominantly deep water and lie below the Kotel Fm although the contact is tectonic - there are no Lower Jurassic turbidite sediments and they are only Upper Triassic (Kanchev, 1993, 1995).

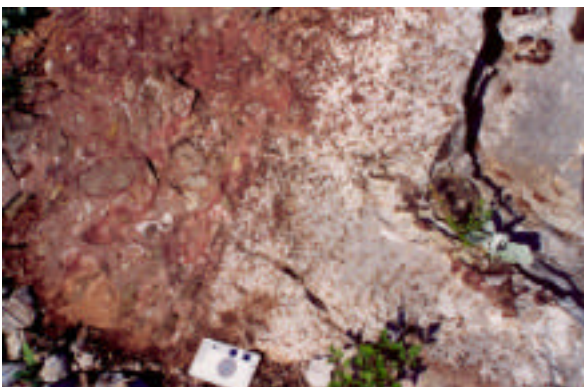


Fig. 2. Transgressive contact of the Lower Jurassic shallow water sediments on the Upper Triassic carbonate platform limestones, near the Bilka Village, Burgas District (eastern Bulgaria).

In 2002 a new artificial exposure was visited in the eastern Stara Planina Mts, in the vicinity of Cheshme Bair, near the Balaban Dere Valley. Upper Triassic

calciturbidites (Fig. 3 – Glogova Fm in Chechne Bair) underlie uppermost Upper Triassic-Lower Jurassic siliciclastic turbidites (Fig. 4 – with Lucy) (Budurov et al., in press). The problem concerns the character of this contact in deep water turbidite sediments and the position of the Triassic/Jurassic boundary. It relates also to the problem of the tectonic situation of the Triassic-Jurassic sediments in eastern Stara Planina Mts. and their connections to west and east (Tchoumatchenco, 2003, fig. 1). Is there a direct connection westwards with the Romanian Cămin-Severin Terrane?



Fig. 3. Glogova Formation (Carnian- (p.p.), Cheshme Bair, Balaban Dere valley, Varna District (eastern Bulgaria).



Fig. 4. Sinivir Formation (Rhaetian-Lower Jurassic), Cheshme Bair, Balaban Dere valley, Varna District (eastern Bulgaria).

To resolve these problems, which are interesting for the Triassic-Jurassic geology of Bulgaria, a team of Triassic and Jurassic stratigraphers and palaeontologists, tectonicians and sedimentologists obtained a grant for a project on the “Stratigraphy of the turbidite sediments – Upper Triassic-Lower Jurassic in Eastern Stara Planina Mountains” from the Bulgarian National Science Foundation for the years 2003-2006. Work on this project is in the beginning.

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**REPORT ON THE SECOND JURASSIC OF MOROCCO MEETING, MARRAKECH, APRIL 21-22, 2004**

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The First National Meeting on the Jurassic of Morocco, held in Rabat in 1999, was organised by the M.A.P.G. (Moroccan Association of Petroleum Geologists) with the support of ONAREP, Geological Survey-M.E.M. Rabat, ENIM-Rabat, Faculty of Sciences and Scientific Institut -Rabat. After this conference, it was decided that the 2<sup>nd</sup> Meeting should

be organised by the University Cadi Ayyad, Marrakech (Faculty of Sciences Semlalia, Faculty of Sciences and Technology).

One of the aims of the 2<sup>nd</sup> Meeting was to enable a review of achievements and synthesise progress on our knowledge of the Jurassic. After six decades, the Jurassic remains one of the most interesting targets for oil exploration in the southern margin of Tethys, including the Arabian oil province. Huge oil fields produce hydrocarbons stored in both transgressive and regressive sequences, comprising carbonates and evaporites of Jurassic age. There are also a number of polymetallic ore deposits, notably in the Haut Atlas of Morocco. Moreover, the Jurassic was a key period in the evolution of Tethys. The main sedimentary, eustatic, tectonic and faunal events in this palaeogeographic and palaeo-geodynamic realm are beautifully recorded in the Jurassic of Morocco.

The themes discussed during the 2<sup>nd</sup> Meeting on the Jurassic of Morocco were:

1. Origin and geodynamic evolution of sedimentary basins during the Jurassic;
2. Stratigraphy, palaeoecology and taphonomy;
3. The magmatic province of the central Atlantic;
4. Natural resources (water, mineral deposits, energy resources and other raw materials);
5. Jurassic oil systems;
6. Geoconservation and protection of palaeontological sites

Participants in the meeting came from countries of the Maghreb (Morocco, Algeria, Tunisia, Libya), Europe (France, Spain, Portugal, Germany, Switzerland, Italy), and Russia. About 60 oral contributions and 10 posters were presented during the conference. The debate was enriched by invited talks and “videoshow” films. A post-conference fieldtrip to the central Haut Atlas was conducted on April 23-25.

A special event was organised to honour national and foreign geologists whose work has contributed to our knowledge of the Jurassic in Morocco. The meeting was also a chance to honour Renaud Du Dresnay and Anne Faure-Muret who passed away in November 2003.

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PS. We regret the lateness of distribution of this year's Newsletter. It was ready and would have been sent in late June but it became clear that some contributions had not been received by me during the period (late March to late April) when my computer was out of action. These had been omitted.

My server informed me that bugs had been detected in outgoing emails. These did not affect my Mac but I did not want to risk infecting all of you. So I closed down until I could get a new Operating System and Antivirus software installed. Even after this was done I discovered that I had lost my addresses and a lot of emails not saved elsewhere (I thought I had saved these to CD but it did not work). Ah well!!! - the joys of having to be on my own without my previous technical support.

Nicol Morton