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SUBCOMMISSION ON  
**JURASSIC**  
STRATIGRAPHY

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Edited by Nicol Morton and Stephen Hesselbo



*Prospective GSSP for base Toarcian, Peniche, Portugal (photo: S. P. Hesselbo)*



ISJS

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## EX-CHAIRMAN'S REPORT

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I am happy to report to you all that this is my last such Report in the ISJS Newsletter. It has been a great honour, and indeed a pleasure, to be Chairman of the Jurassic Subcommittee for these past eight years. It would not have been so without the great help and support of Paul Bown, who corrected my errors, assembled the material into the format, produced and distributed the Newsletters, and of Paul Smith whose advice and assistance have been invaluable. My sincere thanks go to both.

### **Changes of Personnel**

At this time last year I reported (in Newsletter 34 Part 2 p. 8) the election of the new Executive of the Jurassic Subcommittee for the term 2008-2012 – Jozsef Palfy (Chairman), Jingeng Sha (Vice-Chairman) and Stephen Hesselbo (Secretary). Since the International Geological Congress in Oslo this year (I have never known the precise date of the changeover!) they now have responsibility for guiding the Jurassic Subcommittee. I have known personally for several years the three new Executive members and I have full confidence in their abilities. They have all my best wishes and my support.

It is impossible to define their responsibilities! The Executive does not have any power, in the sense of being able to tell anyone what should be done, and very limited financial resources to commission anyone to do something. All they can do is request and encourage individuals to collaborate and undertake tasks that are regarded as a priority for the Subcommittee – so there is a large element of personnel management and relations. The Executive is also answerable to the members of the Jurassic community in one direction and to the International Commission on Stratigraphy (ICS) and the International Union of Geological Sciences (IUGS) in the other – giving an element of geopolitics and diplomacy. For the first group this Newsletter is the primary means of communication; for the second it is the Annual Report, helped by the fact that the Subcommittee Chairman is a full member of the ICS.

The Jurassic Subcommittee and the international Jurassic community in general have the advantages of two changes of personnel at the same time as the advent of its new Executive. The former Jurassic Subcommittee Secretary, Paul Bown, is now Secretary General of ICS, while a Jurassic stratigrapher and palaeontologist and long-standing member of ISJS, Alberto Riccardi, has been elected as President of IUGS. On behalf of all of us I congratulate Paul and Alberto and wish them all success in their new roles.

### **Progress with GSSPs**

The prime responsibility placed on the Jurassic Subcommittee by the IUGS and ICS is the definition by means of GSSPs of the units of the International Standard Chronostratigraphic Scale at the level of Stages and above, and therefore of the International Standard Geological Timescale. A previous requirement for all units to be so defined by the 2008 International Geological Congress in 2008 was quietly dropped by IUGS on the recommendation of a Review Committee, so there is no longer a specific deadline. This has two consequences – one is that decisions do not need to be rushed and possibly premature, the second is that there is no longer the impetus to get on with the job. I can detect both in our current situation.

The importance of having GSSPs for chronostratigraphic units is that it removes any ambiguity in the definition of a boundary and that it gives precision to the boundary, perhaps somewhat spurious in practice when it comes to correlation. It is important that GSSP definitions are respected by the whole community, even those individuals who would have preferred a different definition, if we are to have confidence in the meaning of our standard chronostratigraphic scale and geological timescale. I recall, for example, that British Jurassic stratigraphers in the late 1960s had to accept an Aalenian Stage where previously they had Lower Bajocian. A even more intriguing story, told by Henri Tintant during a lunch break in the Stuttgart Symposium of 1977, was that the decision of French Jurassic stratigraphers to accept a revised definition of the Kimmeridgian, with the consequence that some overlying limestones were now part of the

Kimmeridgian, necessitated a redefinition of the *Appellation Controlé* for the wine Chablis. Who says stratigraphy is not important?!!! These “ancient” examples will, no doubt, have some resonances for today, with the proposed GSSP definitions for the base of the Hettangian Stage/Jurassic System and for the base of the Kimmeridgian Stage.

**Hettangian/base Jurassic:** The various proposals, six in all, for the definition of the Hettangian Stage and the Jurassic System were given in the July 2007 ISJS Newsletter no. 34, Part 1 and in the 2008 ISJS Newsletter 35, Part 1. The saga of the subsequent deliberations, discussions and decisions by votes in the Working Group is also reported in ISJS Newsletter 35, Part 1. The resulting proposals of the GSSP in the Kuhjoch section, Austria and ASSP in the Ferguson Hill section, Nevada, USA, were approved by over the required 60% majority (in fact two thirds) of the Voting Members of the Jurassic Subcommittee in June and August 2008. The subsequent proposal (revised) to ICS in mid August met the problem of the changes of ICS personnel and has not yet been processed. There are, of course, a minority of members of the Jurassic Subcommittee who are not happy with the proposals for various reasons. For me the main problem to be resolved concerns the carbon-isotope stratigraphy and correlations. However, for a proposal to be accepted it is not necessary to have resolved all problems.

**Sinemurian:** The GSSP for the base of the Stage having been ratified by IUGS in 2000, the main question for the future working group concerns division into substages and the boundary definition.

**Pliensbachian:** The working group are exploring the definition of the boundary between the Lower and Upper Pliensbachian, see *ISJS Newsletter* 34/2, pp. 8-13. Use of formal names for the substages (in this case Carixian and Domerian) should be discouraged so as not to multiply the list of names.

**Toarcian:** There is generally accepted agreement, as reported by the late Serge Elmi to the 7<sup>th</sup> International Congress on the Jurassic System in Krakow, Poland in September 2006, that the GSSP for the base

of the Toarcian Stage be placed at the base of bed 15e in the Ponta da Trovao section, Peniche, Portugal. The basis for a proposal will be papers published in the proceedings of the meeting of the Toarcian Working Group in Peniche in July 2005. The formal proposal, based partly on files left by Serge Elmi, is being prepared by Rogerio Rocha, Antonio Goy and colleagues. A ballot within the Working Group will be held before submission to the Jurassic Subcommittee.

**Aalenian/Middle Jurassic:** The GSSP for the base of the Stage and the Series was ratified by IUGS in 2000. Definition of the Standard Zones/Subzones should be the next task.

**Bajocian:** The GSSP for the base of the Stage was ratified by IUGS in 1996. The Working Group should now investigate definition of substages and formal definition of Standard Zones/Subzones.

**Bathonian:** The definition of the base of this stage by the GSSP at the base of limestone bed RB071 in the Ravin du Bès section, Bas Auran, near Digne, Haute-Alpes, France and by the ASSP in the Cabo Mondego section, Portugal was ratified by IUGS in July 2008.

**Callovian:** The section and level to be proposed as GSSP for the base of the Callovian Stage was decided some time ago, but a formal proposal to the Jurassic Subcommittee seems to be still some way off.

**Oxfordian/Upper Jurassic:** There is a mixture of progress and frustration to report about this boundary. The Convenor of the Working Group has made great efforts to achieve detailed proposals to the Working Group for the two leading candidate sections – Redcliff Point (Dorset) and Savournon (Provence) – and has been personally involved in both. As reported last year, most of the data and reports on the Redcliff section have been received but not those on the Savournon section. There seemed to be a failure of communication, for whatever reason. It seems that as of late September the situation may be improving and that some of the data on Savournon has become available. In addition some further work on the section is planned. It had seemed that to meet the original IUGS deadline only Redcliff Point

could be proposed with adequate documentation; now we have returned to the situation of two parallel competing proposals. It is to be hoped that a choice can be based on only scientific grounds as to which is the better section, rather than on national prejudice.

**Kimmeridgian:** Pretty well all the work necessary to achieve a GSSP proposal for the base of the Kimmeridgian has been completed. Some aspects are also voted on and agreed:

- (i) That the base of the Kimmeridgian be defined in the Subboreal sense at the base of the Baylei Zone rather than at the much higher level of the Platynota Zone used in the Submediterranean. This decision by the Working Group was also confirmed by a vote of the Subcommission Voting Members;
- (ii) That the best section in which to locate the GSSP would be the Flodigarry section in Staffin Bay, Isle of Skye, Scotland, confirmed by Working Group vote but not yet submitted to the Subcommission.

Unfortunately there remains deadlock within the Working Group because it is split over the precise stratigraphical level (a difference of just over 1 metre) between those favouring the lower *flodigarriense* ammonite horizon (a small majority) and those favouring the *densicostata* horizon (a large minority) as the basal part of the Baylei Zone. Until an agreement can be reached there can be no GSSP proposal. This is, I find, especially frustrating because, whichever level is selected, the GSSP proposal would prove to be one of the best and most complete of any that I have seen, in any System, during my past eight years as member of ICS. More recently a geographically wide-ranging and detailed analysis of the magnetostratigraphy has been completed and the multi-author paper submitted to EPSL. This demonstrates that there is a magnetostratigraphic event - a change from mainly normal upwards to mainly reversed polarity - that is widely correlatable from the Subboreal into the Boreal and Submediterranean Provinces. This nearly, but not quite, proves the calibration of the event to be extremely close to the base of the *flodigarriense* horizon in the Flodigarry section. Unfortunately, the critical level could not be sampled by either

of the two studies combined in the paper. However, there is evidence of a change to reversed polarity already in the immediately underlying Evoluta Subzone in the Flodigarry section. My personal opinion is that this favours selection of the *flodigarriense* horizon for the base of the Kimmeridgian, but it remains to be seen whether others agree.

**Tithonian:** The situation regarding a GSSP for the base of the Tithonian seems not to have changed much from that reported last year. However, there are glimmers of hope that some projects may soon be brought to completion.

### NEW CHAIRMAN'S REPORT

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Greetings to all Jurassic colleagues! Although you entrusted me with steering the subcommission's activities as a successor of Nicol for the new four-year term, so far I have been hardly able to show that I deserve your confidence. At the time of my nomination I did not anticipate what an exceptionally busy a year 2008 was going to shape up to be for me, with several new responsibilities that I could simply not manage with even efficiency. Thus we are lagging behind schedule in many respects, but fortunately Nicol has not stopped serving you, especially by helping to produce this Newsletter and summarizing the state-of-the-art about GSSPs. Thanks to the competent and enthusiastic support of your new ISJS Secretary Steve, the ISJS has a redesigned website that will serve as an efficient communication channel. Vice Chair Jingeng has been busy with preparations for the next Jurassic Congress to be held in 2010 in China. We are in the process of renewal of our Voting Membership roster, necessary to keep pushing the agenda of GSSP designations. To complete selection and the subcommission-level voting process for the remaining five stage boundaries must be the top priority. We shall show steady progress, trying to avoid the pitfalls of either too rushed or long-overdue decision making. It is our primary mission to complete fixing all the Jurassic GSSPs while making strategic plans for ISJS's agenda after we will have driven in all our Golden Spikes.

## NEWS ITEMS & MEETINGS

### 8<sup>th</sup> INTERNATIONAL CONGRESS ON THE JURASSIC SYSTEM, SHEHONG OF SUINING, SICHUAN, CHINA, AUGUST 2010

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The 8th International Congress on the Jurassic System (8th ICJS) will be held in Shehong of Suining in Sichuan, China in August 2010. Prof. Jingeng Sha is the Chairman of the Chinese Organizing Committee of this Congress. The preparatory work for the congress started in 2007 and continued this year after some interruption caused by the earthquake. The membership of the Chinese Organizing Committee has been established, and the Scientific Committees will be finally decided soon. The Congress will be co-organized by Nanjing Institute of Geology and Palaeontology, CAS, Department of Land and Resources of Sichuan Province, Municipal Governments of Suining City and Shehong County of Sichuan Province. The Congress will be sponsored by the Chinese Academy of Sciences, The Ministry of Land and Resources of PRC, and Sichuan Provincial People's Government.

The theme of the Congress will be "Marine and Non-marine Jurassic System", and a variety of scientific sessions will include:

- 1) Marine and non-marine Jurassic boundaries and stratotypes;
- 2) Biostratigraphy, sequence stratigraphy, isotopic stratigraphy, magnetostratigraphy, cycle stratigraphy of the Jurassic;
- 3) Biodiversity and evolution of Jurassic life;
- 4) Depositional facies, palaeogeography and environmental change and ecosystem reconstruction;
- 5) Jurassic paleoclimate and paleo-atmospheric CO<sub>2</sub> content;
- 6) Major bio- and geological events of the Jurassic and their causes and mechanisms;
- 7) Mineral and energy resources (oil, gas

and coals, etc) of Jurassic deposits;

8) Jurassic Geoparks and museums: their roles in geological relic protection and public education, etc.

We invite Jurassic colleagues who are interested in acting as session conveners to submit further proposals for organizing sessions.

Preparation of field excursions has also progressed during these two years. Chinese colleagues undertook fieldwork in 2007 and 2008 to prepare the excursion routes; Thai and Vietnamese colleagues have agreed and discussed preparation of the excursion route in these two countries. The field excursions proposed include:

- 1) Non-marine Triassic and Jurassic Systems in the Sichuan Basin;
- 2) Marine and non-marine Jurassic and Cretaceous deposits in East Heilongjiang Province, NE China;
- 3) Non-marine Triassic and Jurassic sequences and T/J boundary in Xinjiang, NW China;
- 4) Marine Jurassic and Triassic-Cretaceous in southern Tibet;
- 5) Marine and non-marine Jurassic in Vietnam and Thailand.

In addition, a special field excursion will be organized to visit the quake relics of the Wenchuan strong Earthquake 8.0 magnitude of May 12, 2008 in Sichuan.

The Chinese Organizing Committee has held two business meetings in Nanjing and Shehong of Suining this year, to discuss issues relating to the preparation for the Congress. The **First Circular** for the Congress will be officially sent out in January 2009, and the Congress website will be opened soon in early 2009.

**REPORT ON 5<sup>TH</sup> INTERNATIONAL  
SYMPOSIUM, IGCP 506  
HAMMAMET, TUNISIA, 28-31 MARCH  
2008**

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Following the previous workshops and symposia of IGCP506 in Nanjing (Nov. 2005), Beijing (June 2006), Krakow (Sept. 2006) and Bristol (July 2007), the 5th Symposium was held in Hammamet, Tunisia in March 2008. The symposium was organised at relatively short notice (8 months!) by Mabrouk BOUGHDIRI (Faculty of Sciences of Bizerte) and Mohamed SOUSSI (Faculty of Sciences of Tunis) (Fig. 1) and their colleagues, under the auspices of the Minister of Higher Education, Scientific Research and Technology. It was held in the Conference Centre of the Diar Lemdina Hotel in the recently built “reconstruction” Medina Centre of Southern Hammamet – a very suitable and interesting location!



*Fig. 1. Mohamed Soussi (left) and Mabrouk Boughdiri (right) entertain the group during the gala dinner (ending an excellent display of traditional dancing!)*

The Symposium was highly successful, attended by 121 participants from 19 countries. Two days of scientific communications were held on 28th and 29th March, followed by two parallel field trips on 30th and 31st March, which joined up for a final day of geotourism on 1st April.

**Conference Sessions**

After the formal opening ceremony, tributes were paid to colleagues who had recently died – Serge Elmi, René Mouterde, Milós Rakús and Václav Housa.

Each half-day session began with invited plenary lectures:

M. SOUSSI: Jurassic series of Tunisia: the state of the art

F. OLORIZ: Ecostratigraphy and Invertebrate assemblages. Examples from the Upper Jurassic of the Iberian Sub-plate

E.H. CHELLAI: Moroccan Jurassic System: an overview

S. BOUAZIZ: The Tethyan rifting in Southern Tunisia: geodynamic pattern during the Jurassic

N. MORTON: Defining Jurassic Stages – what do we require for a useful stratotype?

These were followed by two parallel sessions of oral presentations organised in the themes:

1. Integrated Stratigraphy; convenors: N. MORTON & M. SOUSSI (Frid. am)  
G. PIENKOWSKY & D. TURKI (Frid. pm)  
F. OLORIZ & A. BACHNOU (Sat. pm)  
Y. WANG & D. SADKI (Sat. pm)

2. Sedimentology and Palaeoenvironments  
convenors:  
M.H. BEN ISMAIL & A. AIT ADDI (Frid. pm)  
M.H. BEN ISMAIL & N. MORTON (Frid. pm)

3. Biodiversity Changes and Palaeoecology:  
Y. WANG & M. BOUGHDIRI (Frid. am)  
J.G. SHA & B.L. MARQUES (Frid. pm)

4. Isotope Geology and Magnetostratigraphy  
G. PIENKOWSKY & M. BOUGHDIRI (Sat. am)  
J.G. SHA & M. BEN YOUSSEF (Sat. am)

5. Tectonics and Geodynamics  
E.H. CHELLAI & M.M. TURKI (Sat. am)

6. Mineral Resources as Economic Potential  
M. BEDIR & F. OLORIZ (Sat. am)

In addition to the oral presentations, poster presentations were available for study and discussion on each day.

**Abstracts Volume**

The Abstracts Volume, with 114 pages, includes the following sections:

A homage to famous Jurassic Stratigraphers:  
Serge Elmi, Milos Rakús, Václav Housa and  
René Mouterde;

Integrated Stratigraphy – 16 abstracts

Sedimentology and Palaeoenvironments – 12  
abstracts

Biodiversity Changes and Palaeoecology –  
11 abstracts

Isotope Geology and Magnetostratigraphy –  
6 abstracts

Tectonics and Geodynamics – 5 abstracts

Mineral resources as Economic Potential – 5  
abstracts.

It is interesting to note that 159 contributing  
authors are listed for the 65 presentations  
submitted, although, of course, not all were  
present at the symposium!

### Field trips

Two parallel field trips were arranged for the  
two days following the conference sessions,  
30th and 31st March, though participants in  
the first field trip left Hammamet on the  
evening of the 29th for the long drive south  
to Tatouine. For each field trip an excellent  
and well-illustrated field guide was  
produced. Each begins with Part 1 an  
Introduction to the Geology of Tunisia –  
regional tectonic setting, summary of the  
stratigraphy of Tunisia and overview of the  
Jurassic of Tunisia. The second part gives  
more detail of the stratigraphy of the area  
being visited and is followed by descriptions  
of the localities to be visited.



*Fig. 2. Participants of the Southern Tunisia  
field trip outside the Tatouine Museum of the  
Earth.*

Field trip 1 Southern Tunisia. This excursion,  
led by Khaled EL ASMI and Mohamed  
SOUSSI and centred in Tatouine,

demonstrated the Jurassic and Lower  
Cretaceous of the Saharan Platform of  
Tunisia, focussing on the sedimentary record  
and sea-level changes. The sedimentary  
environments varied from open marine to  
marginal marine and the facies are dominated  
by siliciclastics and evaporites intercalated  
with fossiliferous shales and carbonates.  
These are superbly exposed in the semi-  
desert landscape. Although fossils are not  
often everywhere abundant there are some  
interesting remains – and large dinosaurs  
overlooking some outcrops! In addition visits  
were arranged to the Tatouine Museum of the  
Earth and to several interesting  
archaeological and cultural sites. For  
aficianados of the Star Wars films this field  
trip was also a pilgrimage – to the Planet  
Tatouine and especially the town Mos Espa  
of the film *The Phantom Menace* at Ksar  
Hedada.

Field trip 2 Central and Northern Tunisia.  
This excursion was led by Mabrouk  
BOUGHDIRI, Sofiane HADDA and Mohsen  
RABHI and centred in Hammamet and  
Sbeitla, concentrated on the Tunisian Atlas  
Belt. On the first day Central Tunisia was  
visited to examine the marine Jurassic and  
Lower Cretaceous, mainly carbonates, of the  
Pelagian Zone. On the second day in  
Northern Tunisia the outer shelf, slope-to-  
basin and basinal carbonates and radiolarites  
of the Atlasic Zone were demonstrated.



*Fig. 3. Upper Jurassic to Lower Cretaceous,  
with M'Rabtine Formation at Col of Bir  
Miteur, southern Tunisia, with apparently  
friendly dinosaur looking on.*

## REPORTS OF WORKING GROUPS

### PLIENSBACHIAN WORKING GROUP

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In the last issue of the Newsletter we gave detailed information about potential good outcrops for a GSSP of the Lower - Upper Pliensbachian Substage boundary. For the moment, it seems that few persons are concerning with this period. So there is little to add for these Substages.

A short sojourn in the Causses Basin (SW France) shows that both potential outcrops for a GSSP (Rivière-sur-Tarn and Le Samonta) are in quite bad condition. Fauré (2006) presents a new section in the Corbières (Aude, France) and Schubert (2004, 2007) provides new data in the Northern Germany (Herford area) for this period.

#### Some recent publications relevant to the Pliensbachian

BOURILLOT R., NEIGE P., PIERRE. A. & DURLET C. 2008. Early-Middle Jurassic lycoceratid ammonites with constrictions from Morocco: palaeobiogeographical and evolutionary implications. *Palaeontology*, **51** (3): 597-609.

DOMMERGUES J.-L. & MEISTER C. 2008. Les faunes d'ammonites du Pliensbachien inférieur des séries dauphinoises de la Durance (Jurassique inférieur, Barrage de Serre-Ponçon, Hautes-Alpes, France). *Geobios*, **41**: 205-225.

FAURE P. 2006. Le Domérien (Pliensbachien supérieur) des Corbières (Aude, France) Biostratigraphie, évolution sédimentaire, paléogéographie. *Bulletin de la Société d'Etudes scientifiques de l'Aude*, **CIII**: 29-44.

FAURE P. & ALMERAS Y. 2006. Le Sinémurien terminal (zone à *Raricostatum*) des Pyrénées et des chaînons du Bas-Languedoc (France): Biostratigraphie, évolution sédimentaire et paléogéographie. *Bulletin Société Histoire Naturelle Toulouse*, **142**: 5-25.

FAURE P., ALMERAS Y., SEKATNI N. & ZARGOUNI F. 2007. Le Pliensbachien de Jebel Zaghuan (Tunisie). Nouvelle données fauniques. Implications biostratigraphiques et

paléobiogéographiques. *Geodiversitas*, **29** (4): 473-506.

LLANOS M.P.I., RICCARDI A.C. & SINGER S.E. 2006. Palaeomagnetic study of Lower Jurassic marine strata from the Neuquen Basin, Argentina: A new Jurassic apparent polar wander path for South America. *Earth and Planetary Science Letters*, **252**: 379-397.

MACCHIONI F., SMITH P.L. & TIPPER H.W. 2006. Late Early Sinemurian (Early Jurassic) Ammonites from the Taseko Lakes map area, British Columbia. *Palaeontology*, **49** (3): 557-583.

PASSERI L., CIARAPICA G., LEONARDIS F., REGGIANI L. & VENTURI F. 2008. The Jurassic succession in the western part of the Gran Sasso Range (Central Apennines, Abruzzo, Italy). *Bollettino della Società Geologica italiana (Italian journal of Geosciences)*, **127** (1): 141-149.

RICCARDI A.C. 2005. First teuthid cephalopod from the Lower Jurassic of South America (Neuquen Basin, Argentina). *Geologica Acta*, **3** (2): 179-184.

RUBAN D.A. 2007. Jurassic transgressions and regressions in the Caucasus (northern Neotethys Ocean) and their influences on the marine biodiversity. *Palaeogeography, Palaeoclimatology, Palaeoecology*, **251**: 422-436.

RULLEAU L., GUIFFRAY A. & DOMMERGUES J.-L. 2007. *Biostratigraphie et paléontologie de la région lyonnaise, Tome II: du socle au Lias moyen*. Rulleau L. et section Géo-Paléo du Comité d'établissement des carrières Lafarge, Lozanne (éd.) : 229 p.

SCHUBERT S. 2004. Das Pliensbachium im Grenzbereich Unteres/Oberes Pliensbachium (Carixium/Domerium) von Pödinghausen in der Herforder Liasmulde. *Bericht Naturwissenschaft Verein für Bielefeld und Umgegend*, **44**: 7-39.

SCHUBERT S. 2007. Fossilienfunde im Unter-Pliensbachium (Carixium) am neuen Autobahnzubringer bei Herford. *Bericht Naturwissenschaft Verein für Bielefeld und Umgegend*, **47**: 17-93.

SMITH P. L. 2006. Paleobiogeography and Early Jurassic molluscs in the context of terrane displacement in western Canada. *Geological Association of Canada, Special Paper*, **46**: 81-94.

TOMAS R. & PALFY J. 2007. Revision of Early Jurassic ammonoid types from the Persani Mts (East Carpathians, Romania). *Neues Jahrbuch für Geologie und Paläontologie Abhandlung*, **243 (2)**: 231-254.

VALENCIO S.A., CAGNONI M.C., RAMOS A.M., RICCARDI A.C. & PANARELLO H.O. 2005. Chemostratigraphy of the Pliensbachian, Puesto Arayo Formation (Neuquen Basin, Argentina). *Geologica Acta*, **3 (2)**: 147-154.

VENTURI F., BILOTTA M. & RICCI C. 2006. Comparison between western Tethys and eastern Pacific ammonites: further evidence for a possible late Sinemurian-early Pliensbachian trans-Pangaeian marine connection. *Geological Magazine.*, **143 (5)**: 699-711.

VENTURI F., NANNARONE C. & BILOTTA M. 2007. Ammonites from the Early Pliensbachian of the Furlo Pass (Marche, Italy): biostratigraphic and paleobiogeographic implications. *Bollettino della Società Paleontologica Italiana*, **46 (1)**: 1-31.

YIN J. 2007. A review on Jurassic sea-level changes in Himalayan Tibet. *Beringeria*, **37**: 253-266.

## BATHONIAN WORKING GROUP

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The Global Boundary Stratotype Section and Point (GSSP) for the base of the Bathonian Stage has been formally proposed and ratified at the base of the Zigzag Zone in the Ravin du Bès Section, Bas-Auran area, around 25 km at the South-Southeast of Digne-les-Bains, in the “Alpes de Haute Provence” Department (France). The Cabo Mondego Section (Portugal), providing complementary data on the ammonite succession in the Sub-Mediterranean Parvum Subzone and its chronocorrelation with the Northwest European Convergens Subzone, is suggested as the Bathonian auxiliary section and point (ASSP) within this GSSP proposal.

Several specialists and members of the Bathonian Working Group developed a dossier proposing the formal selection of the Bathonian GSSP at the base of the Zigzag Zone (base of limestone bed RB071) in the Ravin du Bès Section (Fernández-López *et al.* 2007b). The formal proposal to all members of the Bathonian Working Group was submitted for voting during November-December 2007. The members of the Bathonian Working Group are: Alméras Y. (France), Bardhan S. (India), Bodergat A.M. (France), Callomon J.H. (UK), Cresta S. (Italy), Dietl G. (Germany), Dietze V. (Germany), Enay R. (France), Fernández-López S.R. (Spain), Galász A. (Hungary), Hall R.L. (Canada), Henriques M.H. (Portugal), Hillebrandt A. von (Germany), Lanza R. (Italy), Mangold C. (France), Matyja B. (Poland), Meléndez G. (Spain), Mitta, V. (Russia), Mönnig, E. (Germany), Morton N. (France), Page K. (UK), Pandey D.K. (India), Pavia G. (Italy), Poulsen N. (Denmark), Poulton T.P. (Canada), Riccardi A.C. (Argentina), Rogov M.A. (Russia), Sandoval J. (Spain), Schlögl J. (Slovak Republic), Schweigert G. (Germany), Seyed-Emami K. (Iran), Wierzbowski A. (Poland), Yin J.-R. (China). The results of the vote were as follows: Total BtWG members = 33, YES votes = 31 (93.94%), NO votes = 1 (3.03%), ABSTAIN = 1 (3.03%), NO RESPONSE = 0.

In order to achieve the formal ballot on the proposal of the Bathonian GSSP within the

Voting Members of the International Subcommittee on Jurassic Stratigraphy during February-March 2008, an upgraded version of the dossier incorporating comments and responses of the BtWG ballot 2007 was presented (Fernández-López *et al.* 2008). The results of the Subcommittee votes were as follows: Of the 22 members, 21 (95.5%) returned a vote; of the 21 votes received YES 20 (95.2%), NO 1 (4.8%).

The approved proposal, together with the dossier and a preface by the ISJS Chairman (N. Morton), were sent to the Secretary of the International Commission on Stratigraphy (J. Ogg), who forwarded it together with a voting form to all the members of the Commission, during May-June 2008. After approval by the Commission on Stratigraphy, the ICS Secretary has submitted the proposal to the Executive Committee of IUGS to ratify the Bathonian GSSP. The proposal has been ratified by the IUGS in July 2008.

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## CALLOVIAN WORKING-GROUP

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It has been a quiet year in the Callovian. We have meanwhile seen the appearance of three huge collaborative proposals in support of the designation of basal boundary GSSPs, for the Bathonian, the Kimmeridgian and, ultimately, for the Hettangian and thereby for the Jurassic as a whole. These proposals have not emerged without intensive discussion over ends and means, both in previous pages of our *Newsletter* and in correspondence, at times quite vigorous, between members of the Working-Groups. I am afraid that on the one hand the much-delayed formal proposal for the Callovian basal boundary GSSP will not be on the same comprehensive scale, mainly because the resources in time and manpower simply have not been available. Previous appeals for new members to join the Callovian W-G have met with little success. On the other hand, the reason could be that the main problem that GSSPs are supposed to solve, the typological definition of the time-plane marking the basal boundary of the Callovian Stage, was essentially solved 17 years ago. And no-one has complained or contested the choice since. The choice of locality for the primary standard GSSP, at Albstadt-Pfeffingen, was considered and then ratified *nem. com.* by a Working Group of 18 members at the time.

The matter came up again for debate at the Krakow Symposium in 2006 and the question of possible alternative sections to be considered for the GSSP was raised. One proposal has since been put forward, based on the dramatic new discoveries in the Volga Basin on the Russian Platform that have been made in the course of the great Russian Jurassic renaissance we have seen during the last fifteen years or so. Those at the settlement of Prosek in the region of Nizhny Novgorod, on the Middle Volga, have now been described in a fine new paper by our colleagues Dmitry KISELEV and Michail ROGOV (2007, reference below). The ammonite biostratigraphy is based primarily on two genera, *Cadoceras* and *Keplerites*, with widely intermittent incursions of some *Macrocephalites* but no perisphinctids. The closest resemblance is to the succession in

East Greenland rather than that in central and north-western Europe, with similar problems of correlation. Quite properly, the first move has been a hierarchically upwards classification of the ammonite succession into a series of faunal horizons, of which eight have been distinguished. The lowest two are assigned to a single Infimum Zone in the Upper Bathonian, the following six to two Zones of the Lower Callovian, the Elatmae and Subpatruum Zones. But whereas the lowest two can be roughly correlated with the Calyx Zone of East Greenland, the higher, 'Callovian' ones, match at all closely neither those of East Greenland nor those of Europe. Their faunas seem to represent a Russian provinciality. And it remains uncertain where the base of the Callovian as defined in Swabia lies, at least at the precision of biohorizontal chronology. The diagnostic guide-species, *Keplerites kepleri*, has not been unambiguously identified at Prozek, although its presence at Alatyry on the Sura, 200 km to the south-east, seems assured. Much depends here also on the specific identifications of the ammonites. To be used as guide-fossils at the level of time-resolution aimed at in the differentiation and correlations of faunal horizons, comparisons have to be of assemblages - biospecies - rather than of single or small numbers of individuals - morphospecies, possibly having extended ranges. Unfortunately, the leading forms being used here, the Cadoceratinae, are in this sense not very good guide-fossils. It seems most appropriate, therefore, to treat the succession at Prozek for the time being as a candidate for a Russian secondary standard chronozone.

The ammonite biohorizontal successions now recognized around the Bathonian-Callovian transition in the classical areas of Swabia and England have recently also undergone a review, prompted by a summary of the results of detailed studies in recent years, by Volker DIETZE and colleagues, of Middle Jurassic exposures around the Ipf, a prominent hill on the western edge of the Ries impact crater at the Swabo-Bavarian border (reference below). The total number of biohorizons in the English Bathonian now stands at 20. Those in the Lower Callovian number 22, lying in a zonation of three standard Zones subdivided into eight

Subzones. Even so, there are still discernible gaps waiting to be filled. The temporal resolving-power of ammonites in stratigraphical successions continues to be cause for amazement - at least, to me.

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## KIMMERIDGIAN WORKING GROUP

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### Introduction

Detailed studies of the Flodigarry section, Staffin Bay, Isle of Skye, have resulted in the publication of much of the information on the section necessary for its definition as the Global Stratotype Section and Point (GSSP) for the base of the Kimmeridgian Stage (Matyja *et al.* 2006; Wierzbowski *et al.* 2006: full text accessible on web-site: [www.voluminajurassica.org](http://www.voluminajurassica.org)). Thus only new biostratigraphical observations additional to those published already are presented below. The choice of a marker horizon for the Oxfordian/Kimmeridgian boundary should include its correlation potential, and this is considered below in the light of new biostratigraphical data obtained mostly in 2007, but also with some reference to older relevant material not discussed so far. A full review of the carbon and oxygen isotope records in relation to isotope stratigraphy, as well as the new results related to the magnetostratigraphy of the Flodigarry section will be soon published and will be presented elsewhere (E.Nunn and G.Price; P. Przybylski, J. Ogg *et al.*). In addition, it is fortunate that radiometric dating of the Oxfordian/Kimmeridgian boundary in the Staffin Bay section has recently become available (Selby 2007).

### State of knowledge and formal regulations

(A.Wierzbowski)

The Flodigarry section at Staffin Bay in northern Skye, Scotland, shows an expanded stratigraphical succession rich in ammonites of Subboreal and Boreal affinities, and enables detailed chronostratigraphic correlation between the Subboreal and Boreal schemes of ammonite zones, subzones and horizons. The Flodigarry section fulfils the criteria for definition as the Global Stratotype Section and Point (GSSP) for the base of the Kimmeridgian Stage (Matyja *et al.* 2006; Wierzbowski *et al.* 2006).

In April 2007, the Flodigarry section was accepted by the Kimmeridgian Working Group as the Global Stratotype Section and Point for the Kimmeridgian Stage. Independently both the Kimmeridgian Working Group and the International

Subcommission on Jurassic Stratigraphy accepted the Subboreal base of the Kimmeridgian Stage (the base of the Baylei Zone) as the primary standard of the Stage - *i.e.* the level at which the base of the Kimmeridgian should be defined at the Global Stratotype Section and Point. The only problem that was not unequivocally resolved during the last vote in April 2007 is that concerning the selection of the faunal horizon defining the base of the Baylei Zone. Of the two faunal horizons proposed: the *flodigarriensis* horizon, and the *densicostata* horizon, the former received nearly 52% of votes, whereas the latter 37% of votes. The main reason of this inconclusive vote (below 60%) was related to problems of correlation potential of particular horizons including their biostratigraphical, chemostratigraphical, magnetostratigraphical and other characteristics.

Both these horizons can be distinguished in the Staffin Bay section, in the lower part of the *Densicostata* Subzone (lower part of the Baylei Zone), with the *flodigarriensis* horizon lying directly below the *densicostata* horizon. The difference between the two levels in the Flodigarry section is about 2 metres.

The *flodigarriensis* horizon was established for the first time in the Flodigarry section (Matyja *et al.* 2006; Wierzbowski *et al.* 2006) as the oldest *Pictonia* horizon known in NW Europe. The base of the horizon is defined by the first appearance of the newly established species *Pictonia flodigarriensis* Matyja, Wierzbowski & Wright. This oldest representative of the genus *Pictonia* appears together with the first microconch counterparts of *Pictonia* – *Prorasenia*. The base of the *flodigarriensis* horizon coincides in the Flodigarry section with the base of an unnamed Boreal horizon characterized by the first appearance of the diminutive Boreal *Amoeboceras* of the subgenus *Plasmatites* (the so-called *A. bauhini* group). The group is represented by the species *A. praebauhini* (Salfeld), which however shows a lateral transition to the *A. bauhini* morphotype. In the same horizon there occur also typical large *Amoeboceras schulginae* Mesezhnikov and the last *A. rosenkrantzi* Spath. This Boreal horizon marks the base of the Boreal Bauhini Zone (Matyja *et al.* 2006). Thus, the

base of the Subboreal *flodigarriensis* horizon if treated as the base of the Subboreal Baylei Zone corresponds to the base of the Boreal horizon with first *Plasmatites* which indicates the base of the Boreal Bauhini Zone. Such a definition of the Oxfordian/Kimmeridgian boundary provides a good correlation of the Subboreal and Boreal zonations at the zonal level.

The *densicostata* horizon is defined by the first appearance of the Subboreal species *Pictonia densicostata* Buckman (M, no discernable change in microconch *Prorاسenia* when compared with the underlying *flodigarriensis* horizon), and the Boreal species *Amoeboceras (Plasmatites) bauhini* (Oppel), as shown in the Staffin Bay section (Matyja *et al.* 2006). These ammonites are not the earliest forms of the two lineages, but represent somewhat more advanced representatives of the *Pictonia-Prorاسenia* macro-microconch lineage, and the *Plasmatites* lineage, respectively. The base of the *densicostata* horizon has historical importance because it has been recognized as defining the base of the Baylei Zone according to original definition of Salfeld (1913) in the Dorset Coast (southern England) [in fact Salfeld defined the lowest zone of the Kimmeridgian as “that characterized by *Pictonia baylei* and other species of *Pictonia*”; he gave no clearly defined type section: “above the Sandsfoot Grit we may place the basal line of the Kimmeridgian, with not a very sharp division”, and placed it within strata we now regard as Oxfordian. Arkell (1933) was the first to note that the first *Pictonia* occur in the Inconstans Bed, but it is only recently through the work of Callomon and others that the Inconstans Bed fauna has been regarded as marking the base of the Kimmeridgian]. It should be remembered, however, that a marked hiatus occurs in the Dorset sections at the Oxfordian/Kimmeridgian boundary covering at least the *flodigarriensis* horizon.

The second vote concerning selection of the faunal horizon defining the base of the Baylei Zone, *i.e.* the base of the Kimmeridgian Stage, gave similar results to the first vote on that matter in April 2006, and it has not been unequivocally resolved. The proposed horizon (the *flodigarriensis* horizon) once more received a majority of votes, *i.e.* 14

votes “yes” (53.85%), but less than the preferred minimum (over 60%); against (in fact mostly persons who voted for the *densicostata* horizon) were 12 votes (46.15%). There were no abstentions. Of the total membership of the Kimmeridgian Working Group, 26 (67%) took part the vote, thus the vote was valid.

To summarize the current situation: The Kimmeridgian Working Group and the International Subcommittee on Jurassic Stratigraphy have accepted the Subboreal base of the Kimmeridgian Stage (the base of the Baylei Zone) as the primary standard of the Stage – *i.e.* the level at which the base of the Kimmeridgian will be defined at the Global Stratotype Section and Point (both votes in November/December 2006). Subsequently, the Kimmeridgian Working Group (vote in April 2007) accepted the Flodigarry section at Staffin Bay in northern Skye, Scotland, as location of the Global Stratotype Section and Point for the Kimmeridgian Stage. These are our achievements, and in these points we are on firm ground.

I do not see any chance in near future, however, to obtain a compromise in selection of the faunal horizon defining the base of the Baylei Zone. This is related with the main controversy – which of the two faunal horizons under question – the *flodigarriensis* horizon or the *densicostata* horizon has the better correlation potential? The last two votes in that matter (April 2007, and April 2008) have shown that the problem may not be solved in the near future by another vote, even when supported by sending of successive comments by e-mail. In fact few (if any) of the arguments presented in support of the *flodigarriense* horizon have convinced opponents.

#### **New biostratigraphical data and their correlation potential**

(A.Wierzbowski, E.Głowniak, D.Kiselev, B.A.Matyja, M.Rogov, J.K.Wright)

The correlation potential of particular horizons within the Boreal, Subboreal, and Submediterranean successions studied is discussed below, with reference to selected sections.

**1. Boreal successions – cores from Barents Sea and Norwegian Sea; Nordvik section of northern Siberia.** Studies have been carried out on ammonite faunas from the Oxfordian/Kimmeridgian boundary interval discovered in numerous cores from the Barents Sea and Norwegian Sea areas (Wierzbowski & Smelror 1993; Wierzbowski et al. 2002). The Rosenkrantzi and Bauhini Zones of the Boreal succession can be recognized here on the basis of the occurrence of ammonites of the genus *Amoeboceras*. Just as in the Flodigarry section (cf. Matyja et al. 2006), the first *Amoeboceras*, *A. (Plasmatites) praebauhini* (Salfeld), occurs here together with last representatives of *A. rosenkrantzi* Spath indicating the lowest faunal horizon of the Bauhini Zone. Within this faunal horizon ammonites very close to *A. bauhini* appear in the cores – these were described as “*A. cf. praebauhini* (Salfeld) - coarsely ribbed variant similar to *A. bauhini*” (see Wierzbowski & Smelror 1993: fig.4, pl.1, fig. 3). This indicates that even in Boreal sections situated far from the Flodigarry section of Skye (up to 2300 km to north-east) recognition of the first appearance of the subgenus *Plasmatites* is much easier than recognition of the acme of the “true” *A. bauhini*.

Recognition of the Bauhini Zone is possible also in northern Siberia, where the Nordvik Peninsula section on the Laptiev Sea, yielded numerous ammonites of the genus *Amoeboceras*. The boundary between Oxfordian and Kimmeridgian is marked by appearance of ammonites of the subgenus *Plasmatites*, such as *A. (P.) lineatum* (Quenstedt) and *A. (P.) cf. praebauhini* (Salfeld) indicating the Bauhini Zone of the lowermost Kimmeridgian, and occurring above *Amoeboceras rosenkrantzi* Spath indicative of the Rosenkrantzi Zone of the uppermost Oxfordian (Rogov & Wierzbowski 2008, in press).

Because the appearance of *Plasmatites* corresponds to the base of the Bauhini Zone and is equivalent of the base of the *flodigarriensis* horizon (proposed as the base of the Subboreal Baylei Zone) – this definition of the Oxfordian/Kimmeridgian boundary is the most practical and useful in Boreal successions.

**2. Boreal/Subboreal successions – the Russian Platform.** The section at Mikhalenino on the Unzha River of the Kostroma District, about 500 km north-east of Moscow has recently yielded numerous ammonites from the Middle and Upper Oxfordian and lowermost Kimmeridgian, collected bed by bed (Glowniak, Kiselev, Rogov, Wierzbowski, Wright 2008, *in prep.*). This section is situated about 3000 km to the east of the Flodigarry section in Skye. The ammonites belong mostly to the Boreal family Cardioceratidae, but also to the Subboreal family Aulacostephanidae (Submediterranean ammonites were also collected in some levels, but not at the Oxfordian/Kimmeridgian boundary).

Nearly all the standard Boreal zones and subzones have been recognized in this section. The ammonite fauna of the Rosenkrantzi Zone of the uppermost Boreal Oxfordian consists of *Amoeboceras rosenkrantzi* Spath, *A. cf. marstonense* Spath and *A. tuberculatoalternans* (Nikitin). The top of the Zone, and the base of overlying Bauhini Zone, is marked by the first appearance of small-sized representatives of the subgenus *Plasmatites* – such as *A. (P.) cf. lineatum* (Quenstedt) and *A. (P.) aff. bauhini* (Oppel) which co-occur with *A. shulginae* Mesezhnikov, and the last *A. cf. rosenkrantzi* Spath. This is the faunal assemblage typical of the lowest faunal horizon of the Boreal Bauhini Zone and corresponds well to the base of the Kimmeridgian Stage as recognized in the Flodigarry section.

Like the Flodigarry section, the Mikhalenino section contains in the uppermost part of the Subboreal Upper Oxfordian, the Evoluta Subzone of the Pseudocordata Zone, a similar assemblage of ammonites: late representatives of the genus *Ringsteadia*, such as *R. frequens* Salfeld (M), and corresponding microconchs represented by forms transitional between *Microbiplices* and *Prorasenia* (Glowniak et al. 2008; cf. Matyja et al. 2006). Directly above these in the Mikhalenino section, there occur the first representatives of the genus *Pictonia* (M) and its microconch counterpart – *Prorasenia*. The occurrence of these forms indicates already the lowermost part of the Baylei Zone of the Lower Kimmeridgian. The lower boundary

of the Subboreal Baylei Zone lies exactly at the same horizon as the base of the Boreal Bauhini Zone. This indicates that the base of the Kimmeridgian in the Mikhalenino section correlates very well with the base of the Kimmeridgian in the Flodigarry section as placed at the base of the *flodigarriensis* horizon.

It is important to note, however, that the Subboreal ammonites occurring in the Baylei Zone in the Mikhalenino section represent NE European forms, somewhat different from those occurring in coeval deposits in the NW European sections (including that at Flodigarry). The early ammonites of the genus *Pictonia* found here generally show, for example, stronger ribbing of the inner whorls, and none of the forms recognized in the Mikhalenino section corresponds exactly to such NW European early *Pictonia* species as *Pictonia flodigarriensis* Matyja, Wierzbowski, Wright and *Pictonia densicostata* Buckman. There occur also in the Mikhalenino section other representatives of Subboreal aulacostephanids such as *Vineta* and *Pomerania* that are completely unknown in the NW European sections. The precise recognition of the total ranges of *Pictonia flodigarriensis* and *P. densicostata* horizons may be thus difficult in the Mikhalenino section, but the base of the Baylei Zone as defined in the Flodigarry section at the base of the *flodigarriensis* horizon and corresponding to the base of the Boreal Bauhini Zone can be recognized here easily. This boundary is marked by the appearance of new taxa – both of *Cardiocerata* (*Plasmatites*) and *Aulacostephanidae* (*Prorاسenia*), and represents, thus, a widely recognizable faunal change. This indicates once more that the definition of the base of the Kimmeridgian in the Flodigarry section at the base of the *flodigarriensis* horizon is definitely more practical and useful than its definition at the base of the *densicostata* horizon.

**3. Submediterranean successions – Wielun Upland (Central Poland).** Whichever of the two faunal horizons with *Pictonia* is selected to mark the base of the Baylei Zone, some problems of detailed correlation of the Boreal and Subboreal ammonite successions with Submediterranean and Mediterranean ammonite successions remain to be resolved

in future. This is not surprising because in advanced studies on the selection of the GSSPs for some other Jurassic stages, the recognition of the base of the stage in areas (sometimes quite large) which lie outside that characterized by the ammonite faunas which define its GSSP is at present impossible (e.g. the base of the Bathonian Stage in Boreal areas, or the base of Oxfordian Stage in Mediterranean areas).

It should be possible to correlate the base of the Kimmeridgian Stage in Submediterranean areas using the records of Subboreal and Boreal ammonites found in the Submediterranean successions in Poland and Southern Germany, and possibly also in other countries. So far according to the available information, if the base of the Baylei Zone is placed at the base of the *flodigarriensis* horizon, some lower part of the Bimammatum Subzone of the Submediterranean succession correlates with the lowermost part of the Boreal Bauhini, and of the Subboreal Baylei Zones, i.e. with the lowermost Boreal-Subboreal Kimmeridgian (Matyja *et al.* 2006). Such a correlation results from occurrence of Boreal *Plasmatites*, and Subboreal *Prorاسenia* in the Bimammatum Subzone. Recent studies in the Wielun Upland (Central Poland) have revealed a fairly thick and complete succession of Bimammatum Subzone deposits (Wierzbowski, Glowniak, Pietras *in preparation*). These deposits, about 10 m in thickness, have yielded abundant ammonites (about 500 specimens). Besides the presence of numerous Submediterranean ammonites, especially *Oppeliidae* such as *Taramelliceras costatum* (Quenstedt), *T. pichleri* (Oppel) and others, and rarely even *Epipeltoceras bimammatum* (Quenstedt) and *Aspidoceras binodum* (Oppel), the section has also yielded Boreal ammonites [*Amoeboceras (Plasmatites) cf. lineatum* (Quenstedt)] and Subboreal ammonites [*Prorاسenia* and *Vineta*, also some similar to *Pictonia*]. These Subboreal and Boreal ammonites make possible correlation of the Bimammatum Subzone of Submediterranean successions with the lower part of the Baylei and Bauhini Zones.

If the base of the Baylei Zone is placed at the base of the *densicostata* horizon, the situation is undoubtedly less clear. Some lower part of

the Hauffianum Subzone and/or upper part of the Bimammatum Subzone correlates with the lowermost part of the Baylei Zone (cf. Schweigert, Callomon 1997; Matyja, Wierzbowski 1997; Schweigert 2000 – see also Wierzbowski 2007). Surely, recognition of the *densicostata* horizon in the Submediterranean sections depends on the finding of a full succession of *Pictonia* and *Amoeboceras* (*Plasmatites*) species there, something which is very unlikely.

These difficulties of correlation are partly related to the scarcity of Boreal/Subboreal ammonites, and also to the generally poor knowledge of Submediterranean ammonite faunas and their distribution in the upper part of the Hypselum Subzone (the *berrense* horizon), the Bimammatum Subzone and lowermost part of the Hauffianum Subzone. Thus, further studies on the ammonites in the Submediterranean and Mediterranean successions in this stratigraphical interval should be undertaken as soon as possible.

#### **Suggested future activities of the Kimmeridgian Working Group**

(A. Wierzbowski)

Eventually the best solution could be a meeting of the Kimmeridgian Working Group devoted only to selection of the faunal horizon to indicate the base of the Kimmeridgian Stage. During discussions should be presented materials – both detailed logs with stratigraphical data, and the fossils or their illustrations. We need new sections documented in detail and offering clear arguments for correlation between the Boreal/Subboreal and the Submediterranean Successions. We need also detailed documentation of the stratigraphy of the crucial interval of the Submediterranean/Mediterranean successions – the Bimammatum Zone with the Hypselum Subzone, the Bimammatum Subzone and the Hauffianum Subzone. The main problem that remains to be solved, is simply establishing which of the two Subboreal faunal horizons proposed for the base of the Kimmeridgian is better recognisable in Submediterranean successions. That Subboreal faunal horizon should receive priority for defining the base of the Kimmeridgian Stage.

These are my suggestions on future activities to the members of the Kimmeridgian

Working Group as well as its future convenor (the new Executive and the new Bureau of the Jurassic Subcommittee can change the convenors of the Working Groups. The membership of the Working Group should also be revised by inviting persons involved in studies on the stratigraphy of the Kimmeridgian.

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## POSTSCRIPT

(N. Morton)

Some time after this Report by Andrzej Wierzbowski was submitted, I received from Jim Ogg a summary with key figures of a paper that has been submitted to Earth and Planetary Science Letters:

### ***Magnetostratigraphic correlation of the Oxfordian - Kimmeridgian boundary among ammonite zonations of the Boreal, Sub-Boreal and Sub-Mediterranean provinces***

By Piotr A. Przybylski<sup>1</sup>, James G. Ogg<sup>1</sup>, Andrzej Wierzbowski<sup>2</sup>, Angela L. Coe<sup>3</sup>, Mark W. Hounslow<sup>4</sup>, John K. Wright<sup>5</sup>, François Atrops<sup>6</sup>, and Erik Settles<sup>7</sup>

I have not discussed this with others but I take the liberty of expressing my own conclusions. The significant conclusion of this study that is of direct relevance to the discussions above is that the Subboreal base of the Kimmeridgian Stage is very close to a major shift from normal upwards to reversed

polarity and that this change of polarity can also be correlated to other ammonite provinces, notably Boreal and Submediterranean.

In the Staffin section a change from normal polarity to indeterminate polarity is situated just below the top of the Evoluta Subzone (uppermost Oxfordian). Unfortunately the level of the *flodigarriense* horizon was not sampled (not known at the time of the sampling!) but higher levels in the basal Kimmeridgian have reversed polarity. However, in terms of the detailed ammonite biostratigraphy available in the Staffin section the magnetozone boundary lies closest to the base of the *flodigarriense* horizon (Subboreal Baylei Zone) and the Boreal Bauhini Zone (more specifically *praebauhini*).

A similar-style polarity interval obtained from Sub-Mediterranean outcrops from Poland and Germany and marine magnetic-anomaly records, suggests that this level approximately corresponds to the lower to middle part of the *Epipeltoceras bimammatum* Subzone and can be correlated with the beginning of marine magnetic Chron 26r.

It seems to me that this latest magnetostratigraphic evidence tends to support the *flodigarriense* horizon as being the more widely useful level for defining the base of the Kimmeridgian.

## TITHONIAN WORKING GROUP

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### Activities of the Working Group

The somehow disappointing state of the art concerning Tithonian stratigraphy outlined in the last Newsletter gave us no chance to present a proposal for an adequate GSSP this year. But research activities continue worldwide.

New research activities in late Kimmeridgian and Tithonian (including Volgian) strata have been undertaken by M. Rogov (Moscow University), searching for further data resolving the old problem of correlation between the Lower Volgian and the Tithonian standard.

In SW Germany, A. Zeiss (Erlangen) continued his examination of the ammonite faunas of the fossil site Schamhaupten (famous for the recently described small theropod dinosaur *Juravenator starki*).

In France, F. Atrops (Lyon-Villeurbanne) retired in March 2008, but he intends to finish his studies of the most important sections of Crussol and Canjuers crossing the Kimmeridgian/Tithonian boundary and their valuable ammonite fauna.

In Argentina, H. Parent (Rosario) continued his studies of various ammonite faunas in the Neuquén-Mendoza Basin. New material was collected during a fieldtrip in spring 2008, together with A. Scherzinger.

In southern Spain, F. Olóriz (Granada) has made progress with a research program focused on the revision of genus *Hybonoticeras* and detailed biostratigraphy of the Kimmeridgian/Tithonian boundary (PhD. thesis in course).

In Mexico, A.B. Villaseñor (Mexico, D.F.) & F. Olóriz (Granada) continued with revision of Tithonian deposits and their ammonite fauna. At present they are involved in a field survey in E-SE of Mexico. The new genus *Housaites* (Geobios, in press) has been proposed to clarify the interpretation of

endemic ammonites in the so-called Caribbean Province.

**New Literature** References of new papers concerning the Kim/Tith boundary, Tithonian stratigraphy or containing information on these topics are listed below. These papers correspond only to those which have been communicated to the Convenor or to the Secretary.

COBIELLA J. & OLÓRIZ F. 2008 (in press): Oxfordian – Berriasian stratigraphy of the North American paleomargin in western Cuba: Constraints for the geological history of the Proto-Caribbean and the early Gulf of Mexico.

PARENT H., SCHERZINGER A., SCHWEIGERT G. & CAPELLO O.D. 2007: Ammonites from the middle Tithonian Internispinosum Zone of Barda Negra, southern Neuquén-Mendoza Basin, Argentina. – *Boletín del Instituto de Fisiografía y Geología*, **77 (1-2)**: 11-24; Rosario.

SCHWEIGERT G. 2007: Ammonite biostratigraphy as a tool for dating Upper Jurassic lithographic limestones from South Germany – first results and open questions. *Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen* **245**: 117-125; Stuttgart.

ZEISS A. & LEANZA H. A. 2008: Interesting new ammonites from the Upper Jurassic of Argentina and their correlation potential: new possibilities for global correlation at the base of the *Upper Tithonian by ammonites, calpionellids and other fossil groups*. – *Newsletters on Stratigraphy* **42 (3)**: 223-247; Berlin & Stuttgart.

VILLASEÑOR A.B. & OLÓRIZ F. 2008: Caribbean Lower Tithonian ammonites from central-east Mexico. *Geobios* [in press].

## **GEOCONSERVATION WORKING GROUP**

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### **5th International ProGEO Symposium on Conservation of the Geological Heritage and ProGEO Working Group 1 Annual Meeting (1st - 5th October 2008, Rab Island, Croatia)**

[Editor's note – this text was submitted before the conference took place. The actual programme may have differed slightly from that indicated.]

This year's geoconservation highlight was the 5<sup>th</sup> ProGEO symposium, held on Rab Island, Croatia, at the beginning of October. ProGEO – the European Association for the Conservation of the Geological Heritage – invited all professionals and students whose work or research is dedicated or related to Nature conservation, geoparks, geotourism, life-learning programs, education, management, sustainable development, land-use planning and decision-making to participate. The main objectives of the meeting were:

- To celebrate the International Year of Planet Earth by Symposium outreach activities;
- To discuss threats and site loss, and constraints imposed by town and country (spatial) planning;
- To promote activities of ProGEO working groups on European geosites;
- To encourage national geoparks projects in the framework of sustainable development;
- To discuss legal frameworks of national geoparks and their practical management;
- To enhance geotourism and its potentials for regional developments;
- To improve quality of communication between geoconservationists and the public.

A number of workshops were included, with the following themes:

Workshop 1 - European geoheritage frameworks and geosites;

Workshop 2 - National geoparks for sustainable development: evaluation, legislation and management;

Workshop 3 - Geoheritage to public: outreach activities - who, where, what, how?;

Workshop 4 - Geoheritage and protection in practice: recognition, conservation, threats and practical management - good examples and possibilities;

Workshop 5 - Geotourism: new potentials for regional development.

Results included:

- Scientific and practical input for geoconservation in Croatia and other developing countries;
- Implementation of the most effective outreach methods and approaches for successful communication with public, decision- and policy-makers;
- Options for a compromise between geoconservation and spacial planning;
- Improvement of geoconservation by new synergies in the use of interpretation within the promotion of the geoheritage values;
- Capacity building for teaching geoscience in life-long learning programs;
- Lessons learned in capacity building for geopark management;
- 'National geoparks' in the legal frameworks, as an integrated approach to sustainable development based on scientific and applied research.

A number of pre- and post-symposium excursions were also organized. Of particular interest to any Jurassic worker was Field Trip 1A, starting in Pula and ending on Rab. Topics included: dinosaur tracks of Upper Tithonian (Late Jurassic) age which are the oldest evidence of dinosaurs on the Adriatic-Dinaric carbonate platform (Kirmenjak locality, more than 1000 exposed footprints);

dinosaur tracks of Late Albian (Middle Cretaceous) age (Solaris camp site) and 'fascinating structures' in Berriasian (Lowermost Cretaceous) dolomites created by a variety of diagenetic processes (Fantazija quarry protected geological monument).

### A VERY LONG SNAKE...

Long running television series in which domestic dramas are played out in excruciating detail are known in the Anglo-Saxon world as '*soap operas*' or just '*soaps*' – the idea being that they are watched whilst carrying out domestic chores... In the Hispanic world, however, these series are known as '*culebrones*', or giant snakes – stories with no visible ending – and so it seems that the Dorset and East Devon World Heritage site saga has become one of these, as played out in the pages of the ISJS's own newsletter...

It is some years now since Julio Pavia, then Chair of the ISJS, invited the formation of a Geoconservation Working Group within the Subcommittee. Issues concerning loss and damage to key stratigraphical and palaeontological sites and, conversely, the consequences of the implementation of highly restrictive new conservation systems were key issues of concern. Since then the Working Group has convened two ISJS conference sessions - in Palermo and in Krakow - and proposed a scientific framework for deciding what types of fossils and sites really do require protection and which can be managed more freely and with general education and public participation in mind. Under the auspices of the group discussion papers have also been presented at international conferences on geological heritage, including the 1995 ProGEO (European Association for the Protection of the Geological Heritage) in Braga, Portugal.

The Group remains as a forum within which scientifically informed discussion can take place on those important matters which affect all us who still try and go to the field from time to time to collect the samples necessary for our continuing research. It is of great concern, therefore, that in recent issues of the ISJS newsletter, the publication of articles critical of aspects of the work carried out within the Geoconservation WG has been permitted with no liaison with the WG whatsoever. Clearly it is important that all informed views are presented and that nothing relevant to the Group is suppressed – that would be censorship - but meaningful discussion cannot take place if established forums are bypassed, as has been happening. An additional consequence has been that some of the published articles have been misleading or inaccurate and I find myself yet again compiling a response...

Not surprisingly for some of us working in the UK, all such articles have been generated in connection with the high-profile Dorset and East Devon 'Jurassic Coast' World Heritage site where palaeontological heritage has a high commercial value, both in terms of a tourist attraction and a source of saleable fossils ('*the only World Heritage Site that you can hit with a hammer*' according to a local tourism chief Malcolm Bell (*Western Morning News*; April 2005). Notably *none* of these articles has come from scientists active on the Jurassic in the area and all have been produced by either commercial fossil collectors or representatives of the local and national governmental organisations which are directly responsible for the scientifically inadequate site management systems in place in the area.

The latest installment in this story is the article by the commercial fossil collector David Sole in the last ISJS Newsletter entitled '*A hostile analysis of the West Dorset (UK) fossil collecting code – was*

*it justified?*' (Sole 2007). As discussed elsewhere, this code is written primarily from a fossil collector's rather than a palaeontological perspective and therefore, not surprisingly, offers no definitive guarantees as to the future any specimens collected from the World Heritage site, all of which are given away to the finder, to sell should they choose. The only condition incorporated into this process is that UK institutions should first be offered such items to purchase, no doubt at a full international market place price which most cannot afford – certainly a strange way to manage the national and global heritage... (see discussion in Page 2005, 2006, etc.). The lack of scientific insight or background to the Code becomes obvious in view of its creators, representatives of a range of local governmental organisations (Dorset County Council, Charmouth Parish Council, West Dorset Heritage Coast Project), cultural heritage or ecologically-focused conservation bodies and trusts (National Trust, English Nature, Charmouth Heritage Coast Centre) and 'Local fossil collectors' (a primarily commercial group). Some input from Dorset and Somerset Museum Services is noted but NO scientific organisation was included according to Natural England documents.

As the core of Mr Sole's letter is a critique of the results of an analysis I carried several years ago in an attempt to demonstrate the scale of loss of palaeontological heritage due to the inadequacies of the fossil collecting code presently in place, some response here is, unfortunately, unavoidable. The original analysis was circulated by e-mail in 2002 to Dorset County Council (the local governmental body for the area), and English Nature (now reformed as Natural England – the state nature-conservation body for England), in order to stimulate some constructive discussion on the effectiveness of the Code. However, it was only with the *publication* of the

proceedings of a conservation and geological heritage symposium at Hettange, which included a paper on the subject (Page 2005 - sent to English Nature as a courtesy), that both organisations and their associates in the fossil-collecting world began to react and attempt to throw doubt on the study (see Page 2006, etc). The latest stage is this long saga is Mr Sole's most recent ISJS Newsletter paper.

So what was the analysis that generated such 'controversy'? Details are provided in a previous ISJS Newsletter (Page 2006), but are no more than a simple attempt to make sense of two wildly different data sets. The first, gathered during construction of the Charmouth road bypass (adjacent to the coast) was, for the most part, systematically collected, documented and then distributed to a number of regional and national museums. The large collection size – 2420 documented samples – provided an appropriate basis for a simple palaeoecological-style analysis which indicated that reptiles make up around 0.12% of the total fauna of the sampled interval – essentially the 'Black Ven Marls' unit of the Charmouth Mudstone Formation (Turneri Chronozone, Birchi Subchronozone to Raricostatum Chronozone, Raricostatoides Subchronozone: Page in press). Due to the way in which the Dorset fossil collecting code was developed, only reptile fossils are well documented, so the percentage of reptiles to non-reptiles in the Charmouth bypass sample was taken as a standard for comparison. However, because only 36 fossils from the Charmouth Mudstone Formation had been recorded from coastal sections through the *West Dorset Fossil Code* over its first *three* years of implementation, the inclusion of material from different levels was unavoidable in order to generate some sort of comparative result (by doing this, the

West Dorset Fossil Code results actually look better!).

The conclusions of the analysis were that records of over 1300 fossils of scientific interest should have been expected from the West Dorset coast over that period (according to the assessment principles for scientific importance established by the Geoconservation WG; Page 2004), when in reality only 36 had been reported. Crucially this demonstrates that the scheme is fundamentally flawed in that it does not encourage the recording of an appropriate range of fossil types, as well as not recording enough of those it supposed to document fully. Obviously, some material is not recorded from the coast: it might be lost to the sea or taken away by tourists, and even the odd researcher, but that these groups might not be recording their finds should also be in issue in itself that needs to be addressed. But having said all of this, according to the original West Dorset Fossil Code data, nearly 40% of the fauna of the Lower Jurassic rocks of the Dorset coast are reptiles – i.e. for every ammonite one might want to collect, one would need to discard around 3.5 reptiles! Something is not right, whatever way one chooses to look at the West Dorset Fossil Code data...

Taking Mr Sole's points in turn:

1 & 3. Yes, the range of strata on the coast is greater than on the bypass – but see comments above (i.e. only 36 specimens initially recorded by the West Dorset Fossil Code).

2, 3 & 4. The type of exposure *was* different between the bypass and the coast – but my analysis of the total number of specimens recorded on the Charmouth bypass means that questions of volume and erosion rates are irrelevant. Most of the bypass works were searched on a daily basis, and many fossils were recorded from shales.

Collecting could take place during excavation, from exposures created, and from spoil material – recovery was therefore very good and if there had been reptiles in the shales on the bypass site, it is very likely that they would have been documented, at least in a fragmented state.

5. Management possibilities on the coast and on the bypass are different, and, as noted above, some unrecorded loss from the latter is avoidable. The scale of the latter is important, however: 36 to 1300 specimens is a vast difference and is exaggerated by the inappropriate categories in the existing Code which mean that many important fossil types are not recorded, despite being recovered by those who *do* report other finds.

6. Scientific importance can only be assessed by scientists, who have had almost no part in drawing up the Code or overseeing its implementation. The rocks seen on the bypass are also exposed on the adjacent coast so scientifically their study cannot be separated (as Mr Sole suggests). Yes, many fossils have been collected from the latter area over the years, but it is an unfortunate fact that very little of the West Dorset Lower Jurassic fauna has been adequately described or monographed, and this is unlikely to be achieved in the near future unless more effort is made by the World Heritage management group (including Dorset County Council and Natural England) to promote and finance genuine scientific research rather than just commercially driven fossil collecting (with its related large scale removal of potential research materials or the high prices it demands for their subsequent recovery to a museum or university for study).

One has to remember that this area of coast is protected by UK heritage laws and has been listed by UNESCO for its global importance to all societies on the

planet. Is invoking market forces really the best way to safeguard this internationally important heritage? – it seems that in the UK we are lagging behind most of the rest of planet Earth in this respect. India would never allow pieces of the Taj Majal to be traded – even to finance its upkeep, and in the USA, at the heart of globalization, the Grand Canyon is still sacred.

So why is all of this local politics relevant to the ISJS? Beyond the inclusion of un-reviewed statements by local groups in a scientific newsletter – the relevance of which at times has to be questioned – and the consequent necessity to restate the scientific case, there is also an element of an important ‘case history’ to be demonstrated. Much of the discussion will be irrelevant or even tedious for many colleagues, but for those with a crossover to geoconservation research fields, they can be very interesting – hence the presentation of another installment of this seemingly endless ‘*culebron*’. In particular, as these issues are relevant to a UNESCO listed World Heritage site and supported by the governmental conservation agency Natural England, the scenario in Dorset has been presented internationally, and will no doubt continue to be so, as an example of ‘good-practice’ for the management of palaeontological heritage.

If the scientific community in other countries does not mobilize itself it may well find that this very English market-led system will be exported elsewhere and it will find itself not only trying to raise money for field work, but also to ‘buy-back’ research material from the commercial enterprises which may have set themselves up on key sites, irrespective of any conservation designations that may be in place. It is perhaps not too extreme to speculate that key sites such as GSSPs – the selection of which many of us have been involved with – will be rendered virtually useless

for future scientific study if they too become a target for exploitation. After all, what more important sites can there be as a source of ‘Jurassic’-branded tourist souvenirs than those which define the units into which the System is formally subdivided?

Natural England is now applying the Dorset Fossil Collecting Code to one of its most important National Nature Reserves, between Axmouth and Lyme Regis in the eastern part of the adjacent county of Devon. This is also part of the World Heritage site and the only place in the area where the Triassic-Jurassic boundary can be seen. This raises many questions about the future of geoconservation sites throughout England, and whether commercial exploitation will be promoted elsewhere as a conservation method by an organisation with a budget which is completely inadequate to carry out the site management works necessary itself. A letter raising concern about these and related issues was sent to Natural England on behalf of the County of Devon’s geoconservation forum, the Devon Regionally Important Geological Sites (RIGS) Group, in February 2008: over 4 months later Natural England seemed unable to answer the concerns raised.

The Charmouth Bypass data will be published in full elsewhere, however, because they still have the potential to bring further insights into aspects of fossil collecting policy, not only in Dorset but elsewhere. As more specimens are recorded by the West Dorset Fossil Code scheme in Dorset, the more bizarre its representation of the palaeontological resource becomes: one could be forgiven into believing that the ‘Black Ven Marls’ are an estuarine or even non-marine deposit due to the number of insects now recorded (apparently mainly fragments salvaged from rock chips discarded as larger fossils are prepared for sale in the

many fossil-cleaning workshops in the Lyme Regis – Charmouth area of Dorset).

### A way forward...

Clearly there is still a need to promote a more appropriate approach to the conservation of fossils, not only in Dorset but elsewhere, and one that reflects their scientific, and hence cultural, value without hindering the *bone fide* scientific activity that bestows on them such values. The English example – amongst other national examples – indicates that one has to move beyond national politics, ‘traditions’, and prejudices, and establish such principles in an international context. With this in mind the following discussion paper was presented at the 2008 ProGEO conference on Rab Island (Croatia):

Kevin N. Page (1), Bill Wimbleton (2) and Guillermo Meléndez (3). *Conserving palaeontological heritage and palaeontological science in Europe: a proposed framework for the international collaboration and exchange.*

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It is hoped that this paper will stimulate a more focused discussion on this increasingly important subject, leading to some coordinated international action. A consensus is crucial, but we also need to guard against undue influence from political or commercial interests opposed to any form of ‘external’ controls on their activities. As with previous proposals by the WG, it is crucial that we ensure that

any conservation decisions that are made on any site are based on sound scientific principles and needs. Any colleague who would like to become involved with developing these proposals should contact the Convenor of the Geoconservation Working Group at their earliest convenience!

I would also like to take the opportunity, once more, to invite Dorset County Council and Natural England to sit down with *bona fide* palaeontologists active in the area of the ‘Jurassic Coast’ World Heritage site, and discuss how their policies and practice could be better informed by establishing a genuine dialogue with a *relevant* scientific community. As I have stated previously: ‘*Conservation practice and philosophy will only develop and improve if there is meaningful and open debate on matters of concern*’ (Page 2007). By using this quote at the end of his short statement in the last ISJS newsletter (34/2, p.33), I hope that Jonathan Larwood of Natural England is at last showing a genuine willingness to engage.

### Scotland the Brave!

In complete contrast to England, the equivalent governmental conservation body to Natural England, Scottish Natural Heritage, carried out a thorough and open process of consultation that included the scientific community before publishing its excellent *Scottish Fossil Code* (SNH 2008). The structure of the Code was reviewed at the consultation stage in ISJS Newsletter (Page 2007) and is available on the SNH website ([www.snh.org.uk](http://www.snh.org.uk)) or from: [pubs@snh.gov.uk](mailto:pubs@snh.gov.uk) .

The document offers an intelligent approach to the problems of managing palaeontological heritage for science, education, and even recreation. It is clear that SNH now leads the UK in its philosophy and practice in this field and

governmental authorities south of the border with England should take note.

any organisation with which they may be associated unless otherwise stated.

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*Disclaimer:* The views expressed in this Report are those of its contributors and should not be taken to represent those of

## LIAISON WORKING GROUP

Robert CHANDLER, Convenor

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There are two items of report for the Newsletter this year. The first concerns the death of Colin Parsons, for whom a tribute is included later in this Newsletter. The second is a report on a visit to England by Louis Rulleau and his colleagues from the Lyon area, France.

### Farewell to a colleague

Robert CHANDLER

In 2002 I noticed two names proposed for election to the Geologists' Association; C. F. Parsons and J. Whicher both of whom were interested in the Jurassic and had been involved with the excavations for the rubbish tip at Osborne Wood near Sherborne, a locality where *Stephanoceras* were so common that John Callomon referred to the level from which they came as the Pirelli Bed. I ran a field trip over the weekend of October 4<sup>th</sup> -5<sup>th</sup> 2003 and thought it could be treated as a reunion. I invited both along and to my delight they accepted.



*Colin's first geology trip to Dorset in 20 years.*



*A return visit to Dorset 2005 for David Sole, Hugh Prudden, Colin Parsons, John Huxtable, Robert Chandler, John Whicher*

There was of course much discussion of ammonites and I recalled another colleague, John Huxtable had expressed an interest in meeting Colin, so I asked him along also. This was a very profitable weekend and the start of a productive friendship between Colin and John Huxtable. At the end of the weekend Colin told me that despite being very depressed, at times this weekend had made him very happy and had inspired him to look again at his material. There followed a series of research digs involving John Huxtable and Alan Bentley. It did not take long before Colin was back in full force, advising, collecting and suggesting new names. He was somewhat disappointed that in his 20 year absence Sixto-Fernandez Lopez had erected *Albaracinites*. Colin had always planned to name it himself. It did not take long before Colin was familiarising himself with the modern literature. During this time of reintroduction John Huxtable figured very highly in Colin's estimation for the support and help he gave so willingly. Of particular interest was the information obtained at Redhole Lane, near Sherborne. Volker Dietze and I had collaborated on an account of *Mollistephanus* and John Huxtable and Colin had made a very thorough search of the Sauzei Zone there. Independently we had both concluded that it was possible to trace the ancestors of *Teloceras* back to *Kumatostephanus* in the Sauzei Zone at both Redhole Lane and Sandford Lane. Colin had lost interest in publication in journals so had made his work available to the public through the British library website. He then began to produce

papers on his web site including the finds made at Redhole Lane.

**Visit to England by the *Section Géo-Paléo Lafarge***

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[translated NM]

From the 1st to the 4th May 2008, 36 members of *section Géo-Paléo du Comité d'Entreprise Lafarge ciments du Val d'Azergues*, near Lyon, had a most enjoyable journey to Dorset. The first and the last days were taken up by the voyage, a little long, it must be said ! At least the crossing enabled most of us to get to know Eurotunnel, a great achievement that put an end to the insular status of England. During the second and third days, we benefited from excellent weather and the warm and friendly welcome by two members of the DGAG (Dorset Geologists' Association Group), Robert Christian and Robert Chandler, who have detailed knowledge of the geology of the area and guided our excursions.

So on the 2<sup>nd</sup> May, leaving our hotel in Yeovil, we explored, under the direction of Robert Christian, the magnificent coast of Dorset between Charmouth and Lyme Regis. These two localities are high points of world geology, because of their outstanding outcrops, in cliffs, of Sinemurian and Pliensbachian strata. Thus we learned that these stages are developed in facies that are not at all like those of their French equivalents. In Dorset they are extremely fossiliferous and even if we were not able to find many ammonites on the shore, we were able to appreciate it from our visits to the Charmouth Heritage Coast Centre, the Lyme Regis Museum ..... and the fossil shops ! We were also favourably impressed by the fact that the public authorities of the area use this richness of fossils to encourage tourism, something that is rarely seen in France.

We then, appropriately, finished the day at Bradford Abbas, where we met up with Robert Chandler, with a pilgrimage to the grave of James Buckman there, followed by an excellent dinner in the local inn, the Rose and Crown.

On the 3rd of May Robert Chandler took us to Burton Bradstock to show us another geological formation – the Inferior Oolite that crops out at the top of the cliffs from where blocks fallen onto the beach are very fossiliferous and enable collection of ammonites. This level was studied in minute detail by S.S. Buckman, the son of James Buckman. It is more familiar to us, because in the large Lafarge quarries of Beaujolais at Belmont, our usual « hunting ground », we also collect fossils (mainly ammonites) of the Aalenian and Bajocian Stages. Only, at Belmont these stages are together more than 60 m thick, while in the Inferior Oolite of Dorset they are condensed into a few metres. This type of deposit reminds us of another celebrated French locality, that of Saint-Quentin-Fallavier-La Verpillière, where the Toarcian and Aalenian deposits are also extremely condensed and lenticular with the same phenomena of emergence and remanié fossils as in Dorset. Always in Dorset we could find ammonites, some of which are familiar to us (*Leioceras*, *Tmetoceras*) and others more rare for us (*Breydia*, *Hyperlioceras*). Collecting was even more fruitful at Mapperton where Bob took us in the afternoon.

It was then time for good-byes and, reaching our hotel near Stonehenge, we visited of course this famous monument .... unfortunately after the gates were closed ! The day then ended with a visit to the beautiful city of Salisbury, with its cathedral and its pubs !

All the participants in this voyage retain happy memories of this meeting and several will, I think, return to Dorset. We repeat our thanks to our volunteer guides who enabled us to discover in such an excellent way the geological and palaeontological richnesses of a privileged area and we cordially invite them to visit us in the Lyon area.

## CORRESPONDENCE

### SESSION ON THE JURASSIC SYSTEM AT THE 2007 ANNUAL MEETING OF THE GEOLOGICAL SOCIETY OF JAPAN

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A topical session, 'The Jurassic System', was organized during the 114th annual meeting of the Geological Society of Japan (Sept. 9-11, 2007) in Hokkaido University. The following six talks and three posters 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. 20-22, 2008) in Akita University.

#### Oral presentations:

NAKADA K. & MATSUOKA A. 2007. Ammonite biostratigraphy of the Nishinakayama Formation in the Lower Jurassic Toyora Group, southwest Japan.

KOKUBO, S. & MATSUOKA, A. 2007. Stratigraphy and geologic structure of accretionary complexes of the Northern Chichibu Belt in the Kazahaya-toge area, Kanto Mountains, central Japan.

NIKAIDO, T. & MATSUOKA, A. 2007. Lithostratigraphy and radiolarian biostratigraphy of Triassic bedded chert along the Sakahogi section, in the Mino Terrane, central Japan.

MATSUOKA, A. 2007. How to know the equator passing on the Phanerozoic oceanic plates.

KAKIZAKI, Y., ISHIKAWA, M., TANIMIZU, M., NAGAISHI, K., KAWAGOE, N. & KANO, A. 2007. The palaeoceanographic change inferred from the  $\delta^{13}\text{C}$  curves of "Torinosu-type" limestone.

ISHIDA, N. 2007. Lower Jurassic strata of the Kurosegawa Terrane in western Kyusyu.

HORI, R., AKIKUNI, K. & IKEHARA, M. 2007. Upper Triassic  $\delta^{13}\text{C}_{\text{org}}$  stratigraphy of deep-sea sedimentary rocks in SW Japan.

#### Poster presentations:

TERABE, K., SATO, K. & MATSUOKA, A.

2007. Restudy of the stratigraphy Sanchu Cretaceous, Kanto Mountain.

SANO, S. & MORINO, Y. 2007. Recent progress in studies of rudist bivalves from the Torinosu-type limestones in Southwest Japan.

**ANNUAL MEETING OF THE GERMAN  
SUBCOMMISSION ON JURASSIC  
STRATIGRAPHY BAMBERG  
(BAVARIA) 22-24 MAY 2008**

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Over 40 geologists attended the meeting of the German Jurassic Subcommission in Bamberg (Bavaria). The excursions in the Northern Franconian Alb (Bayern) were guided by G. Bloos (Stuttgart), C. Schulbert (Erlangen), A. Waltschew (Nuremberg) and M. Mäuser (Bamberg). We visited recent exposures especially in the Lower Jurassic, including Hettangian in marine and fluviatile facies, and ammonite-rich mudstones of the upper Toarcian (Mistelgau clay pit). A special feature was the quarry near Wattendorf with platy, fossiliferous limestones of the upper Kimmeridgian where crabs and fish in particular were excavated by the Natural History Museum Bamberg.

At the annual meeting of the German Jurassic workers E. Mönning reported on the situation of the Subcommission and the activities of last year. At present we have 56 members with 22 retirees, 17 permanent employees, 9 jobseekers and 8 amateurs. In the elections 15 voting members elected for 2008-2011 with Eckhard Mönning (Coburg) as Chairman and Günter Schweigert (Stuttgart) as Secretary. This year our member Volker Dietze will be awarded the Zittel Medal of the Paläontologische Gesellschaft for his outstanding scientific achievements.

At German universities there is hardly any current research on the Jurassic, so there will be no scientific workers in the next generation. At the geological surveys, there are only a few palaeontologists, and consequently less biostratigraphy. Most of the so-called "knowledge carriers" are retired but continue their valuable work. Those who are still in work are charged with many other tasks. The same applies to the museums. Especially in smaller and medium-sized museums, research is possible only to a very limited extent. However, these colleagues are at the interface between science and the public; that is to say, they bring our knowledge of stratigraphy in terms of environmental education to the outside world. This is essential, because Historical

Geology contributes significantly to our world picture. If you are involved in this task of geo-didacticism, the quantity and the quality of your scientific work must suffer. Unfortunately, it can be observed that the gap between 'scientists' and 'geo-didacts' becomes bigger, even though both are dependent on one another. Here, more tolerance is necessary because in future the so-called 'amateurs' will become increasingly important. Within the German Jurassic group they are an important and valuable part and provide good scientific work.

The monograph on the Middle Jurassic of Northern Germany by Brand & Mönning is finally in print after years of work (Schriftenreihe of the DGG). A monograph on the Jurassic System in Germany is under way. As a first step in 2008 a detailed chronostratigraphic chart will be produced.

Web: <http://jurasubkom.pal.uni-erlangen.de/>



*Joachim Blau and Arnold Zeiss explore the boundary between the Lower and Upper Sinemurian (Arietensandstein Fm – Obtusumton Fm) near Coburg. Foto by Gernot Arp*

**TRANS-BORDER (S.E. SERBIA/S.W. BULGARIA) CORRELATION OF JURASSIC SEDIMENTS – A NEW BILATERAL PROJECT**

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**Abstract**

The Infra-Getic, Getic and the Supra-Getic are palaeogeographic units in east Serbia and south-west Bulgaria, southward prolongations of the same units from the Romanian south Carpathians. A correlation of their formal Jurassic lithostratigraphic units in south-west Bulgaria and east Serbia is presented.

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**Key Words:** Jurassic, Infra-Getic, Getic, Supra-Getic, lithostratigraphic correlations, east Serbia, south-west Bulgaria.

**Introduction**

In all Bulgarian and the Serbian geological maps (e.g. the geological maps of Serbia and Bulgaria on the scale 1:100 000, recently published in the two countries), the geological units extend only up to the state border. From one side of the border to the other the geological maps are completely different and it is very difficult to correlate the geological units. This is why a mixed Serbian-Bulgarian team of geologists started research across the state border with the aim of making an effort at unification of the

views of the geologists concerning the geology of the Jurassic on both sides.

For the Jurassic, extending from the Romanian Carpathians into south-eastern Serbia and south-western Bulgaria, the following main paleogeographic units can be recognised (the first name is used in Bulgaria and the second in Serbia) (Fig. 1):

Thracian Massif corresponding to the Serbo-Macedonian Massif;  
Luznica-Koniavo Unit corresponding to the Supra-Getic Unit;  
Dragoman Paleo-Horst, prolongation of the Getic Unit;  
Izdremets Paleo-Graben, prolongation of the Infra (Sub)-Getic Unit.

These units are strictly paleogeographic, but controlled by the Jurassic tectonics of this part of the Balkan Peninsula. They have a bipartite structure, built of two sequences of beds – a lower sequence (Lower Jurassic to ?Lower Callovian) and an upper sequence (?Middle Callovian-Tithonian-Berriasian).

The characteristics of the Jurassic in these units are:

- (i) *The Thracian Massif Unit* is without Jurassic sediments and always served as source area;
- (ii) *the Luznica-Koniavo Unit* is partially Early Jurassic in Gresten facies and deep water Middle Callovian – Kimmeridgian (p.p.) sediments of type “ammonitico rosso”, and Upper Kimmeridgian-Tithonian-Berriasian siliciclastic flysch;
- (iii) the boundary between the *Dragoman Paleo-Horst - Getic* and the *Izdremets Paleo-Graben - Infra (Sub) Getic* is in different places during the Early–Middle Jurassic and the Late Jurassic, placed between occurrence of carbonate platform (Stramberg facies) and of the “ammonitico rosso” facies during the Late Jurassic.
- (iv) *The Dragoman Paleo-Horst/Getic Unit* is subdivided into two subunits – *Western Getic Sub-Unit* without Lower Jurassic sediments, and *Eastern Getic Sub-Unit* with continental and marine Lower Jurassic sediments, and followed in both subunits by carbonate platform limestones (Stramberg type).
- (v) *The Infra (Sub)-Getic Unit* has relatively deep water Liassic and Dogger

sediments (the Dogger of “black shales with *Bositra alpina*” type) and Middle Callovian – Tithonian – of “*ammonitico rosso*” type.

Unfortunately, different methods of naming the formal lithostratigraphic units are used in Bulgaria and Serbia, making correlation more difficult.

### **Correlation of Jurassic formal lithostratigraphic units**

#### ***Infra (Sub-) Getic-Izdremets paleo-graben:***

We attempt here to correlate existing published Jurassic formal lithostratigraphic units in the Infra-Getic palaeotectonic and palaeogeographic unit, known as the *Staroplaninska-Porecka unit* in Serbian literature (Andjelkovic et al. 1996) and as *Izdremets Jurassic palaeograben* in Bulgarian literature (Sapunov & Tchoumatchenco 1986).

#### **LOWER JURASSIC**

In the vicinity of Velika Lukanja (Serbia) and Stanyantsi (Bulgaria), Early Jurassic sedimentation started with continental deposits, in Serbia called the *Lukanja clastics* and *Lukanja coal beds* (Andjelkovic et al. 1996, p. 84-86) and in Bulgaria the *Tuden Formation* (Sapunov et al., 1990). They are overlain by marine sandstones.

*Lukanja clastics* (Serbia) - conglomerates with quartz pebbles and sandstones, 2-120 m thick (Andjelkovic 1958, p. 13-14), discordant on different Triassic rocks.

*Lukanja coal beds* (Serbia) - fine grained quartz sandstones, intercalated upwards with clay and clayey sandstones with coal beds (8-150m thick).

*Tuden Formation* (Bulgaria) - predominantly clays, grey to black and coaly in lower part, higher intercalated with fine-grained, often laminated, sandstones (c. 30 m thick).

*Lukanja quartz sandstones* (east Serbia) (Andjelkovic et al. 1996, p. 86-87)/ *Kostina Formation* (Bulgaria) (Sapunov in Sapunov et al., 1967) - marine sandstones (fig. 2) lying on continental Lukanja coal beds and Tuden Formation, as well as directly on Triassic sediments. The Serbian early Early Jurassic *Lukanja quartz sandstones* (2.8 m near Rosomac, 8 m near Senokos and up to 120 m at Mala Lukanja River) are coarse- to medium- grained quartz sandstones with

silica cement and transitional to quartzite. The Bulgarian Middle Hettangian *Kostina Formation* (~12 m) is coarse- to medium-grained sandstones lying directly on Upper Triassic or on Tuden Formation.

The Lower Jurassic successions continue with calcareous sedimentation. In east Serbia the *Lukanja brachiopod beds* (Andjelkovic, 1958, p. 15) are dark grey to black crinoidal limestones (1.5 m thick), that contain many well-rounded pebbles of quartz, as well as many brachiopods and bivalves. The same limestones with quartz pebbles and fossils crop out also in the Bulgarian section at Komshtitsa – called the *Romanov dol Member*. Above them in Senokos crop out marls (4-5 m) with rare interbeds of clayey limestones (Hettangian-Sinemurian in age). Analogous sediments are distinguished in Bulgaria as the *Ravna Member* of the *Ozirovo Fm.* The *Lukanja brachiopod beds* are mainly composed of sandy and bioclastic dark gray bituminous limestones, with many brachiopods, bivalves and belemnites and are c.40-45 m thick. Near Senokos village they are distinguished by Andjelkovic & Mitrovic-Petrovic (1992) as *Senokos beds*. The analogous Bulgarian *Dolnilukovit Member* of the *Ozirovo Formation* (Sapunov, 1983) is represented by sandy and/or bioclastic (predominantly crinoidal) limestones, 20-40m thick, of Pliensbachian age.

Lower Jurassic sedimentation ended with sediments called in east Serbia the *Lukanja marlstones* (grey laminated marls, clays, aleurolites, and thin-bedded clayey sandstones) and the *Lukanja belemnite-Gryphaea beds* (thin bedded sandy marls and clays with predominance of small belemnites and brachiopods and many sideritic and phosphoritic concretions). Their Bulgarian correlative is the *Bukorovtsi Member* of the *Ozirovo Formation* (grey silty marls, interbedded with thin (10-15 cm thick) beds of clayey limestones with many sideritic and phosphoritic concretions). They contain many belemnites and large bivalves (*Aequipecten* and *Gryphaea*, and encompass the Upper Pliensbachian and Toarcian.

### MIDDLE JURASSIC

The Middle Jurassic succession in south-east Serbia is subdivided into the following lithostratigraphic units:

Senokos siltstones and shales in south-east Serbia (Aalenian) (dark grey to black aleurolitic argillites and marly sandstones with phosphoritic, sideritic and calcareous concretions, 50-70 m thick) which correspond to the Etropole Formation in western Bulgaria (black shales) (Aalenian-Bajocian); these two units resemble the “Black shales with *Bositra alpina* from the Alps);

Vodenica sandstones in Serbia (~40 m thick) (Middle Bajocian), correlated in Bulgaria with the sandstones (few meters only) of the Dobrogled Member of the Polaten Formation (Bathonian, lower part);

Senokos ammonitic beds in Serbia (Andjelkovic et al., 1996, p. 124-125) represented by grey-greenish sandy marls and clayey marls rich in ammonites (Upper Bajocian, Bathonian and Lower Callovian), corresponding to the Bov Formation in Bulgaria (Gornobelotintsi Member marls at the base and Verenitsa Member alternating clayey limestones and marls in upper part) (Upper Bajocian-Upper Bathonian).

### MIDDLE CALLOVIAN-TITHONIAN - BERRIASIAN

Near the Senokos and Rosomac villages in Serbia this sequence started with the Kamenica limestones (Andjelkovic et al., 1996, p. 133) - brecciated limestones at the base overlain by micritic, well-bedded limestones, of Early and Late (p.p.) Oxfordian age. In south-western Bulgaria the corresponding Javorets Formation (Nikolov & Sapunov, 1970; Tchoumatchenco et al., 2001) of Middle(?) - Late Callovian-Oxfordian - Middle Kimmeridgian (p.p.) age consists of ~20 m of grey, predominantly micritic, medium- to thin-bedded limestones with concretions of black to dark grey chert.

To the west of Rosomac village sub-reef sediments crop out – the Rzhana limestones, grey well-bedded limestones, 10 m thick, containing many bivalves, gastropods, bryozoas, brachiopods, sponges, etc.. There are no analogues in Bulgaria.

The Upper Jurassic succession continues in Serbia with the “ammonitico rosso” type Pokrovenik acanticum limestones (Kimmeridgian - Early Tithonian) (Andjelkovic 1958; Andjelkovic et al., 1996, p. 139-142) and its correlative in Bulgaria the Gintsi Formation Middle Kimmeridgian - Middle Tithonian).

The Jurassic section ends in Serbia with the Rosomac limestones represented by grey well-stratified limestones, containing dark grey to black interbeds of chert. These correlate with the Bulgarian Glozhene Formation (Nikolov & Sapunov, 1970), Middle Tithonian-Berriasian (p.p.) in age.

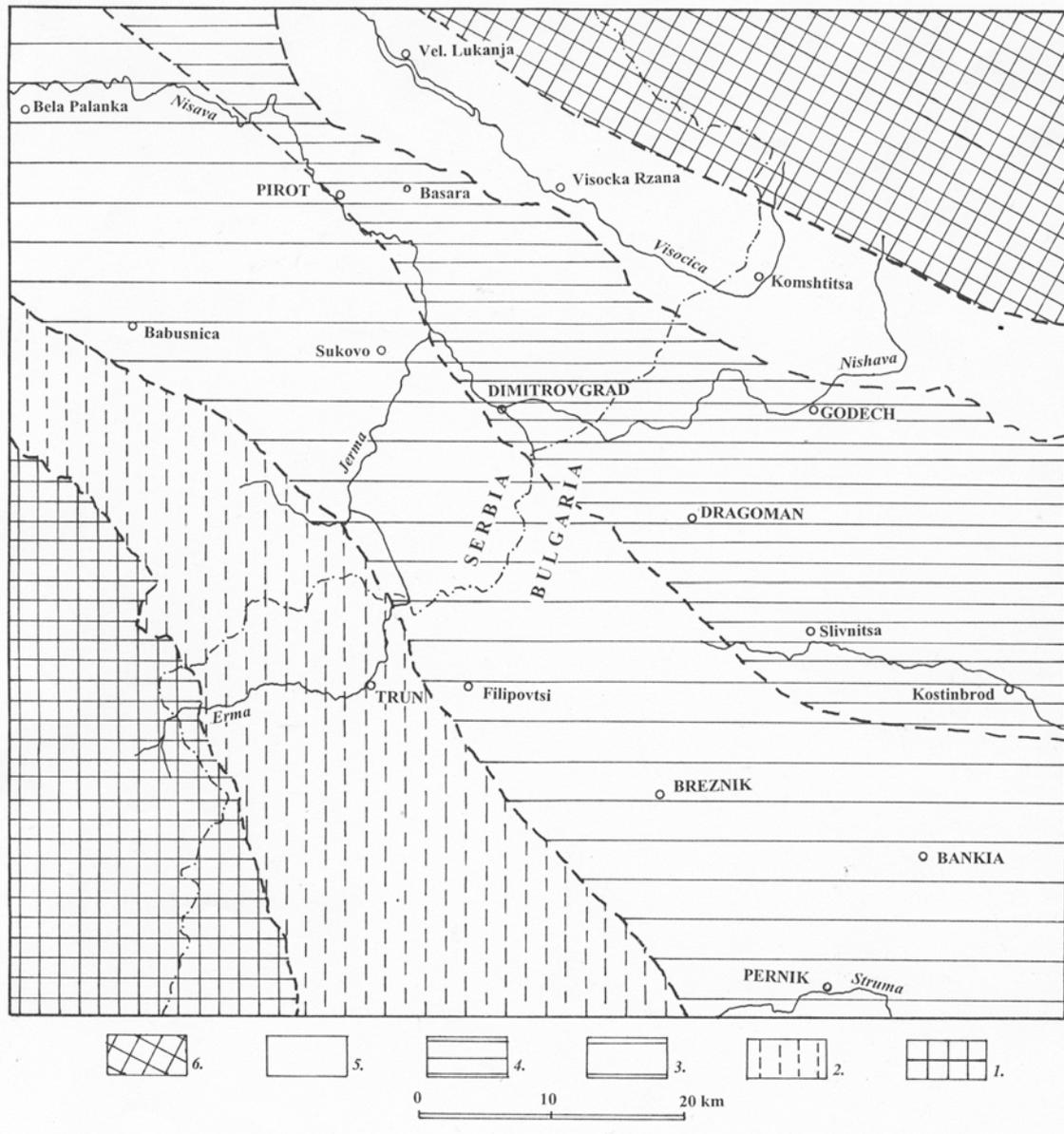


Fig. 1. Main Jurassic palaeogeographic units in eastern Serbia and in south-western Bulgaria (after Tchoumatchenco et al., 2006a). 1, Thracian Massif Unit; 2, Supra-Getic (Luznica–Koniavo) Unit; Getic Unit (Dragoman Palaeo- Horst); 3, Western Getic Sub-Unit; 4, Eastern Getic Sub-Unit; 5, Infra-Getic (Izdremets Palaeo-Graben); 6, Jurassic Moesian Platform.

	TRACHIAN MASSIF	SUPRA-GETIC		GETIC				INFRA-GETIC		
		SW Bulgaria Kraishite	SE Serbia Ruj	WESTERN GETIC		EASTERN GETIC		SE Serbia V. Lukanja	SW Bulgaria Komshitsa	
				SE Serbia Greben Mts.	SW Bulgaria Velinovo	SW Bulgaria Kalotina	SE Serbia Vidlič			
TITHONIAN	Neshkovič Fm. (10-20 m)	Koste Fm. (300-400 m)	Lužnica Flysch (1000 m)	Kučaj Reef Lmst. (> 300 m)	Dragoman	Slivnitsa Fm. (275-400 m)	Slivnitsa Fm. (400-500 m)	Crni vrh Lmst.	Rosomač Limestones	Gložene Formation
KIMMERIDGIAN		Gintsi Fm. (10-15 m)	Pokrovenik Acanth. Lmst.	Ždrelo Limestone					Pokrovenik Acanth. Lmst.	Gintsi Formation
OXFORDIAN		Javorets Fm. (7-10 m)	Kamenica Fm.	Beljanica Lmst. (40 m)	Belediehan Fm. (100-150 m)	Belediehan Fm. (150 m)				
CALLOVIAN	Rayantsi Fm. (100 m)							Basara Beds		
BATHONIAN	Sredorek Fm. (100 m)	Polaten Fm. (70 m)	Jerna Limestones	Kurilovo Lmst. Lialintsi Mb. (5 m)	Polaten Fm. (10 m)	Polaten Fm. (15 m)	Bov Fm.	Gulenovei Sandstones	Senokos Ammonitic Beds	Bov Fm. Dobrogled Member
BAJOCIAN		Gradets Fm. (50 m)	Jerna Clastites	Kurilovo Clastites	Gradets Fm. (20 m)	Polaten Fm. (13 m)	Etropole Fm. (10 m)	Gulenovei Beds	Senokos Ammonitic Beds	Etropole Formation
AALENIAN	Dobrodol Fm. (10-15 m)	Medohiya Fm. (10 m)	Jerna Coal Beds	Grešten Facies (20 m)	No Sediments	Homogeneous Ozirovo Fm. (6 m)	Boukovitsi Mb. (52 m)	Dark Grey Sandstones	Senokos Siltstones and Shales	Bukorovtsi Member
TOARCIAN	No Sediments	Zhablyano Fm. (60 m)	Grešten Facies (100 m)	No Sediments	Romanovdol Mb. (2 m)	Ravna Mb. (10 m)	Ozirovo Formation	Lukanja Cephalopod Limestones	Lukanja Belemnitic-Gryphean Beds	Lukanja Formation
PLIENSBACHIAN	No Sediments	No Sediments	Grešten Facies (100 m)	No Sediments	Kostina Fm. (5 m)	Touden Fm. (25 m)	Vidlič Clastites	Lukanja Brachiopods Beds	Lukanja Quartz Sandstones	Dolniloukovit Member
SINEMURIAN	No Sediments	No Sediments	Grešten Facies (100 m)	No Sediments	Kostina Fm. (5 m)	Touden Fm. (25 m)	Vidlič Clastites	Lukanja Coal Beds	Lukanja Coal Beds	Ravna Mb. Romanovdol Member
HETTANGIAN	No Sediments	No Sediments	Lužnica Clastites	No Sediments	Kostina Fm. (5 m)	Touden Fm. (25 m)	Vidlič Clastites	Lukanja Clastics	Lukanja Clastics	Kostina Formation

Fig. 2. Correlation of the Jurassic lithostratigraphic units in the Supra-Getic, Getic and Infra-Getic in south-eastern Serbia and south-western Bulgaria (after Tchoumatchenco et al., in press)

### Getic - Dragoman Paleo-Horst

The Getic paleogeographic unit had been divided into two sub-units on the basis of the presence (in the Eastern Getic) or the absence (in the Western Getic) of Early Jurassic sediments.

### LOWER-MIDDLE JURASSIC

#### Eastern Getic.

The Eastern Getic coincides more or less with the Vidlicka and Tupizhnicko-Teposhka edinici of the Karpatikum of ANDJELKOVIC et al. (1996).

The Lower-Middle Jurassic sediments are the same as in the Infra-Getic: at the base of the Jurassic in east Serbia occur the Lukanja clastics, overlain by the Lukanja coal sediments to which correspond in Bulgaria to the continental clays and sandstones of the Tuden Formation (SAPUNOV et al. 1990) - Hettangian. The succession continues in east Serbia with the Lukanja quartz sandstones (Hettangian p.p. - Sinemurian) and the Hettangian quartz sandstones of Kostina

Formation. Upwards there follows dark grey sandy bioclastic limestones and calcareous sandstones with brachiopods and bivalves and sandy limestones and clayey sandstones - in east Serbia the Lukanja brachiopod beds (ANDJELKOVIC et al. 1996), and in Bulgaria the Romanovdol, Ravna and Dolniloukovit Members, Sinemurian-Pliensbachian (p.p.), of the Ozirovo Formation. The Lower Jurassic continues with clayey sandstones and sandy limestones with brachiopods, bivalves and belemnites, the Late Pliensbachian-Toarcian Lukanja belemnite - Gryphaea beds (ANDJELKOVIC et al. 1996) in east Serbia and the Bukorovtsi Member of the Ozirovo Fm. in Bulgaria. During the Aalenian-Bajocian (p.p.) in Bulgaria the black shales of the Etropole Formation were deposited, to which in Serbia the Senokos siltstones and shales and the Gulenovac Beds correspond. In Bulgaria sedimentation continued with the Late Bajocian-Bathonian marls and clayey limestones of the Bov Formation and in east Serbia the Gulenovac sandstones. On the western edge of the

Eastern Getic in Bulgaria ferruginous limestones of the Homogenous Ozirovo Formation (Sinemurian-Toarcian-Aalenian) were deposited, and the “Dark-grey sandstones” in the Vidlic zone of the Eastern Getic.

In the western part of the Serbian Eastern Getic, in the Vidlic basin (ANDJELKOVIC *et al.* 1996, p. 114) were deposited the Gulenovac beds, sandy clays with intercalations of bluish limestones and in Late Bajocian aleurolites, clays, sandy limestones, which can be assigned to the Gulenovac Sandstones. During the Early and Middle Bathonian the Gulenovac sandstones were deposited. These sediments can be correlated partly with the Bulgarian sandstones of the Gradets Formation (Aalenian) and with the bioclastic and sandy limestones of the Polaten Formation (Bajocian-Bathonian), but there are many differences between them.

#### **Western Getic**

In the Western Getic there are no Lower Jurassic sediments. Only in a few isolated localities (in Bulgaria in the Liubasha Mts and near the Trun gorge of the Erma River, in Serbia in Greben Planina Mts) there are continental Lower Jurassic sandstones and clays, which in Bulgaria are correlated with the Zhabliano Formation, and in Serbia they are involved in the Gresten Facies.

In the Greben Planina Mts, the lithostratigraphic unit called Gumpina limestones (*sensu* KRÄUTNER & KRSTIC 2003) is described as “Dogger – conglomerates, sandstones, sandy-limestones, marly-limestones, marls”, about 40 m thick and represents the Middle Jurassic. These are correlated with the Bulgarian Polaten Formation. Below them, in some localities crop out the Kurilovo Clastites, analogous to the sandstones of the Gradets Formation in SW Bulgaria.

#### MIDDLE CALLOVIAN-TITHONIAN

##### **Eastern Getic**

The sediments of the Lower Callovian of the Vidlic basin of east Serbia (Eastern Getic), assigned to the Basara beds (ANDJELKOVIC *et al.* 1996, p. 129) are pinkish and reddish sandstones and sandy limestones with Macrocephalites macrocephalus Schloth.

They can be correlated to the Javorets Formation in SW Bulgaria.

A new sedimentary cycle started above the Basara beds with calcareous rocks, the Basara limestones (ANDJELKOVIC *et al.* 1996, p. 136) - grey limestones with chert nodules and rare ammonites (thickness 40-120 m) overlain by the Vidlic limestones, grey to blue, well-bedded limestones (ANDJELKOVIC *et al.* 1996, p. 137). The Basara and the Vidlic limestones are often show horizontal and vertical transitions; these limestones encompass the Late Callovian to Kimmeridgian. The Basara limestones are related to the Belediehan Formation in western Bulgaria, and the Vidlic limestones can be correlated to the Javorets and Gintsi Formations in south-western Bulgaria.

During the Early Tithonian shallowing of the basin started with deposition of the Crni Vrh limestones, thick bedded reef- and sub-reef limestones, (thickness ~350 m), analogous to the Slivnitsa Formation in western Bulgaria. ANDJELKOVIC *et al.* (1996) showed that the reef and sub-reef limestones occupied only one part of the lithostratigraphic column. The same situation exists also in western Bulgaria – from the Liubasha Mts. to east of Slivnitsa, Beledie Han, there is a belt with many coral reefs that rimmed the Getic carbonate platform, while the other part of the column consists of thick-bedded, shallow water limestones. In eastern Serbia all these limestones are assigned to the Crnivrh limestones and in western Bulgaria to the Slivnitsa Formation, Tithonian to lowermost Lower Cretaceous age. Probably the Crni Vrh limestones marked the north-eastern rim of the Getic carbonate platform.

##### **Western Getic**

Here sub-reef (platform) limestones crop out, in east Serbia called Belanica limestones (or Zdrelo Limestones) (~40 m) by ANDJELKOVIC & MITROVIC-PETROVIC (1992, p. 94). The Belanica limestones can be correlated directly with the Basara limestones of the Vidlic Mts. (Callovian-Kimmeridgian), and with the Belediehan Formation in south-western Bulgaria. These are overlain by reef and sub-reef limestones, which represent the southward extension of the Koucaj reef limestones (ANDJELKOVIC &

MITROVIC-PETROVIC (1992, p. 94), with age “early Malm, Tithonian and passes into Berriasian” and can be regarded also as a western extension of the Crni Vrh reef and sub-reef limestones from the Vidlic Mts. (of the same age). They can be correlated with the Slivnitsa Formation in south-western Bulgaria.

### Supra-Getic (Luznica-Koniavo Unit)

#### LOWER-MIDDLE JURASSIC

The Jurassic transgression in the Supra-Getic (Luznica-Koniavo) Unit, as well as in the Western Getic, started in SE Serbia with the Middle Jurassic Gumpina limestones (Middle Jurassic), “conglomerates, sandstones, sandy-limestones, marly-limestones, marls” (KRÄUTNER & KRSTIC 2003) (40 m thick) corresponding in SW Bulgaria to the Gradets Fm (sandstones) (SAPUNOV 1969) (50 m, Toarcian – p.p. Aalenian) and the Polaten Fm. (bioclastic and sandy limestones, Bajocian-Bathonian, 70m). In some localities in SE Serbia, below them are distinguished the Jerma Clastites (Aalenian?), analogous to the Gradets Formation in south-western Bulgaria. Below them, in some isolated exposures, there are sandstones, clays and conglomerates with coal measures (e.g. the Jerma Coal Beds), ~100m thick of Gresten facies (Lower Jurassic), analogous to the Zhabliano Formation in Bulgaria. In the region of Luznica River they are separated as Luznica Clastites. There are no marine Lower Jurassic sediments here.

In the Bulgarian parts of the Supra-Getic (Luznica-Koniavo Unit) the more characteristic feature is the presence of few palaeo-grabens, which controlled sedimentation. In one, the Svetlya Graben, the Lower Jurassic begins with continental sediments – fire proof clays and sandstones (Zhabliano Formation, Hettangian-Sinemurian-earliest Pliensbachian – 60 m). These are overlain by shallow-marine sandy, bioclastic limestones (Ozirovo Formation, Pliensbachian-Toarcian, p.p. – 10 m).

In the western part of the Supra-Getic in Bulgaria, in the Trekliyono palaeograben in the Kraishte Mts., were deposited sandstones, black shales and radiolarites with Radiolaria of Aalenian-Bathonian age, the Dobridol Formation (Toarcian?-Aalenian c.10-15 m)

and the Rayantsi Formation (Aalenian-Bathonian, c.100 m), ZAGORCHEV & TIHOMIROVA (1986); BONCHEVA et al. (2004). The western shallow-marine edge of the Trekliyono Middle Jurassic Graben may have been the site of the Methohiya Formation (sandstones and conglomerates (Toarcian?-Aalenian, 10 m), and of the Sredorek Formation – bioclastic limestones (Aalenian-Bathonian, 80 m). There are indications (BONCHEVA et al., 2004) that these formations crossed the Serbia/Bulgaria state border.

#### CALLOVIAN (MIDDLE?) - TITHONIAN

After a submarine break in sedimentation, the succession restarted with limestones containing chert nodules (10-20 m), in Bulgaria called the Javorets Formation (NIKOLOV & SAPUNOV 1970) embracing the Middle Callovian-earliest parts of the Oxfordian) and in E. Serbia probably corresponding to the Kamenica limestones. Above the Kamenica limestones, the succession continues with nodular limestones, which may represent the extension through Bulgaria of the Pokrovenik Acanthicum Limestones (~20 m) from the Infra-Getic. Corresponding to these Pokrovenik limestones is in Bulgaria the Kimmeridgian Gintsi Formation (ammonitico rosso facies) (10-15m) (SAPUNOV et al. 1985). During the Middle (?) Callovian to Tithonian-Berriasian the Luznica-Koniavo (Supra-Getic) unit shows continued (since the Early-Middle Jurassic) formation of graben with specific sedimentation, especially in the Svetlya Graben. During the Middle (?) Callovian – Kimmeridgian (p.p.) the sedimentation in the Svetlya Graben continued with calcareous conglomerate – the Lobosh Formation (SAPUNOV et al. 1985), which is a lateral equivalent of the Javorets and the Gintsi formations.

The Jurassic section in east Serbia ends with flysch type sediments, known as the Luznica flysch, later named by DITRIJEVIC & DITRIJEVIC (1987) as Ruj flysch. The name Luznica flysch has priority and we retain this term. It consists of turbidity alternation of sandstones, marls, clays, aleurolites with fallen blocks (olistolites) and is more than 1000 m thick. In Serbia its age is reported as Tithonian (DITRIJEVIC & DITRIJEVIC 1987,

etc), as Tithonian-Berriasian (GRUBIC 1980), or as Tithonian-Hauterivian (KRAÜTNER & KRSTIĆ 2003). In Bulgaria it corresponds to the pre-flysch *Neshkovtsi Formation* (marls) (Upper Kimmeridgian) and the *Kostel Formation* (SAPUNOV *et al.* 1985) (Upper Kimmeridgian to earliest Lower Cretaceous). In the *Kostel Formation* the *Bobovo* and the *Gorochevtsi Members* are distinguished. In the vicinity of Sredorek Village a very important phenomenon is recorded – a basal conglomerate of the *Kostel Formation* (*Antovo Member*) lying directly on Middle Jurassic black shales.

### **Paleogeography of the Infra-Getic, Getic and Supra-Getic units during the Jurassic**

During the Early Jurassic most of the Getic and the Supra-Getic units were dry land; the eastern part of the area was on the western edge of a basin with shallow water sediments – sandstones and ferruginous limestones in the area of Slivnitsa and Dimitrovgrad towns. To the east there was the relatively deep-water basin of the Infra-Getic. The western part of the Getic and all the Supra-Getic represented dry land cut by variably deep grabens (on Bulgarian territory the Svetlya Graben and the Rayantsi Graben), with distinctive sedimentation.

Differentiation of paleogeography began at the end of the Middle Jurassic (probably at the end of the Early Callovian). In the Getic area the formation of a carbonate platform was initiated with a slope to the south and passing progressively to a deep-water environment. In the Supra-Getic generally relatively deep water sedimentation began, with pelagic micritic and nodular limestones (“*ammonitico rosso*” type) interrupted by the calcareous clastic sedimentation of the Lobosh Formation in the Svetlya Graben. The greatest diversification of sedimentation started at end of the Kimmeridgian and continued during the Tithonian and the earliest Early Cretaceous with turbidite sedimentation (at the base with pre-flysch marls) established in the Supra-Getic and reef and/or sub-reef in the Getic.

**Acknowledgement.** This new research has been made under a bilateral scientific project between the Bulgarian and the Serbian

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## BOOK ANNOUNCEMENTS

### STRATIGRAPHY : TERMINOLOGY AND PRACTICE.

Jacques THIERRY

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In 1997, initiated by the French Committee of Stratigraphy, a work was published, written by 25 stratigraphic experts [« *Stratigraphie : terminologie française* », Comité Français de Stratigraphie, J. REY (coord.), *Bull. Centres Rech. Explor.-Prod. Elf Aquitaine, Mém.*, **19**, 164 p.]. A few years later, this successful, educational, professional and attractively illustrated book was out of print.

Enthusiastic from reading the French language version, Felix GRADSTEIN, Chairman of the International Commission of Stratigraphy (I.C.S.), recommended Jacques REY and Simone GALEOTTI to assemble a team to translate the book into English and also update it, resulting in a second edition. This has now been accomplished (2008 - « *Stratigraphy. Terminology and Practice* », J. REY & S. GALEOTTI (Eds.), Technip Édité. - B.R.G.M. - TOTAL, 176pp. ISBN 9782710809104

(<http://www.editionstechnip.com/>)

The book, written by 33 stratigraphic experts, presents the various processes available for the location in time of all rock bodies in outcrop and subsurface: sedimentary, metamorphic, plutonic and eruptive. The terminology and the practices for each method are illustrated with real examples in separate chapters :

Chapter 1 . *Fundations and perspectives of stratigraphy* by J. REY.

The successive chapters follow the progression of the stratigraphic process, from the descriptive to the interpretive, from the methods of geometric stratigraphy, to chronological stratigraphy and chronometric stratigraphy :

Chapter 2 : *Lithostratigraphy ; from lithologic units to genetic stratigraphy* by L. COUREL (coord.), J. REY, P. COTILLON, J. DUMAY, P. MAURIAUD, P.

RABILLER, J.-F. RAYNAUD & G. RUSCIADELLI.

Chapter 3 : *Chemostratigraphy* by M. RENARD, J.-C. CORBIN, V. DAUX, L. EMMANUEL, F. BAUDIN & F. TAMBURINI.

Chapter 4 : *Magnetostratigraphy* by B. GALBRUN (coord.), N. K. BELKAALOU & L. LANCI.

Chapter 5 : *Biostratigraphy ; from taxon to biozones and biozonal schemes* by J. THIERRY & S. GALEOTTI.

Chapter 6 : *Isotope Geochronology* by N. CLAUER & A. COCHERIE.

Chapter 7 : *Specific Stratigraphies* by P. LEBRET, R. CAPDEVILLA, M. CAMPY, M. ISAMBERT, J.-P. LAUTRIDOU, J.-J. MACAIRE, F. MENILLET, R. MEYER, & A. DE GOËR DE HERVÉ.

The two final chapters are dedicated to chronostratigraphic units and correlations :

Chapter 8 : *From chronostratigraphic units to Earth history* by J. REY (coord.), L. COUREL, J. THIERRY, J.-F. RAYNAUD & S. GALEOTTI, which combines the contributions of various methods (integrated stratigraphy).

Chapter 9 : *The Geological Time Scale - GTS 2004* by F.M. GRADSTEIN, J. OGG & G. OGG, is a new chapter which presents the latest version of the Geological Time Scale.

Finally, the definition of most of stratigraphic terms can be found in a glossary while selected references, classified following each chapter, are listed at the end of the book.

This new edition is an important addition to the limited literature on stratigraphy, an indispensable discipline which deals with time for all the geological sciences. The book is aimed at all professional geologists from the university and industrial sectors, including teachers, students, researchers and petroleum company graduate engineers who would like to enlarge and deepen their knowledge of the vocabulary, the concepts, the methods, and the practical applications of the different approaches of stratigraphy at the beginning of the 21st century.

**PROCEEDINGS OF THE  
GEOLOGISTS' ASSOCIATION VOL.  
119, PART 1  
SPECIAL ISSUE ON THE JURASSIC  
EDITED BY BERIS M. COX &  
MICHAEL G. SUMBLER**

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The Geologist' Association is a special institution in Great Britain that is particularly known for its membership mix that includes a high proportion of 'amateur' (i.e. not employed as geologists) as well as 'professional' geologists. It was founded in 1858 (so this year celebrates its 150<sup>th</sup> anniversary), exists to foster the progress and diffusion of the science of Geology, and to encourage research and the development of new methods. It holds meetings for the reading of papers and the delivery of lectures, organizes museum demonstrations, publishes Proceedings and Guides and conducts field meetings. A particular strength is its regional group structure, each specialising in the geology of the local area. For further information consult the website : [www.geologistsassociation.org.uk](http://www.geologistsassociation.org.uk)

The first issue of the Proceedings for 2008, Volume 119, Part 1, issued February 2008, was a special issue to celebrate the 150<sup>th</sup> anniversary and is devoted to the Jurassic, with guest editors Beris Cox and Mike Sumbler. It contains nine invited papers covering a broad range of topics on the Jurassic:

COX, B.N. & SUMBLER, M.G. Editorial pp. 1-3;

SELLWOOD, B.W. & VALDES, P.J. Jurassic climates pp. 5-17;

HESSELBO, S.P. Sequence stratigraphy and inferred relative sea-level change from the onshore British Jurassic pp. 19-34;

PAGE, K.P. The evolution and geography of Jurassic ammonoids pp. 35-57;

VAN KONIJNENBURG-VAN CITTERT, J.H.A. The Jurassic fossil plant record of the UK area pp. 59-72;

WIGNALL, P.B. & BOND, D.P.G. The end-Triassic and Early Jurassic mass extinction records in the British Isles pp. 73-84

PALFY, J. The quest for refined calibration of the Jurassic time-scale pp. 85-95;

MORTON, N. The International Subcommission on Jurassic Stratigraphy pp. 97-103;

COPE, J.C.W. Drawing the line: the history of the Jurassic-Cretaceous boundary pp. 105-117.

The journal is at present published for The Geologists' Association by the Geological Society Publishing House. However, from the beginning of 2009 it will be published by Elsevier and then all papers will be accessible in pdf form via Science Direct.

## *IN MEMORIUM*

**LARBI MEKAHLI (1952-2008)**

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Larbi MEKAHLI, Professor in the Department of Geology (University of Oran), died suddenly on April, 26, 2008 in Oran and was buried the same day in the beautiful village of El Betaïm, situated a few kilometres from the Algerian-Moroccan border. His collaborators, his friends, and his students mainly retain the memory of a tireless researcher with a vast knowledge in Algerian geology, always ready to render service.

Larbi MEKAHLI was born on November 14th, 1952 in Beni-Ouassine (Maghnia, Wilaya of Tlemcen). After four years in the primary school of El Betaïm village (from 1963 to 1967), he followed his secondary education in high school Doctor Benzerdjeb (Tlemcen), where he successfully won, in 1973, his baccalaureate diploma (diplôme de Baccalauréat). His university studies were in the Department of Geology (University of Oran), where he obtained his first diploma D.E.S (Diplôme d'Etudes Supérieures, 1978) then the D.E.A (Dipôme d'Etudes Approfondies, 1979) in Stratigraphy-Sedimentology. At that time, Larbi was not interested in higher education, and he chose a job as prospector in the oil company SONATRACH (1981 to 1983). However, his

career was going to be followed at the University of Oran where he joined the Department of Geology (1983) as "Maître-Assistant", with the late Professor M'Hamed Ameur. Having recognised his seriousness, M'Hamed Ameur offered Larbi a Master's thesis project on the Lower and Middle Jurassic of the western part of the Rhar Roubane Horst (1984-1988). A few years later, under the scientific direction of the late Professor ELMI (University Claude Bernard Lyon 1), he presented his doctoral thesis (1995) on the Lower and Middle Jurassic of the Ksour Mountains. The main biostratigraphic, sedimentological and palaeogeographical results were later published, in 1998, in the "*Documents des Laboratoires de Géologie de Lyon*".

In 2000 Larbi MEKAHLI was appointed director of the Laboratory 'Magmatism and Geodynamics Synthesis of Algerians Basins' (2000), then Professor of higher education (2002) and finally 'Doyen' of the Faculty of Earth Sciences, Geography and Territory Management (2003). For more than 25 years, and along with his activity as a teacher-researcher, he contributed to the training of new generations of geologists, supervising several Master and Doctoral theses on topics dealing with the palaeontology, biostratigraphy, sediment-ology and geodynamics of the Algerian basin.



*Last PhD thesis headed by Prof. Larbi MEKAHLI at University of Tlemcen, Nov 25th, 2007)*

Larbi MEKAHLI leaves the image of a rigorous scientist. His death was felt with much grief and pain by all Algerian and North African geologists. This biography is

for me, a tribute of deep gratitude to this generous and helpful man.

### Selected publications

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**René MOUTERDE (1915-2007)**

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[translated NM]



René Mouterde ('l'abbé' for many geologists) was born on 16<sup>th</sup> October 1915 at Ambérieu en Bugey (Ain). The mobilisation of his father into the 5<sup>th</sup> Engineers forced his mother (née Lancrenon) to take refuge with her father, chief engineer at PLM. After the armistice in 1918, the family was reunited in the north of France at Wasquehal, where the head of the family became director of a very important chemicals factory of the St Gobain group. René's primary and secondary education was in this area.

Following his baccalauréat in 1932, wishing to become a priest, he entered the St Sulpice Seminary at Issy les Moulineaux. After two years studying philosophy, he interrupted his studies for health reasons and returned north to his family. There he began his studies in science at the Catholic University of Lille: mathematics, chemistry, physics and geology under the leadership of His Grace Delépine, Canon Gonzague Dubar (who would always remain his mentor) and Professor Pierre Pruvost.

His health improved, so he sought to resume his vocation as priest. He entered

the University Seminary of the Diocese of Lyon in 1937 to obtain his Theology degree. During holidays in the family home at Paray-le-Monial, encouraged by G. Dubar, he prepared his *Diplôme d'Études Supérieures* thesis, presented in 1939 at the University of Lyon.

Mobilised in 1939, René Mouterde was assigned to the *Service Météorologique* at St Cyr l'Ecole and found himself in Périgord until he was demobilised. His time with the meteorological service made a big impression on him and he liked to refer to it during fieldwork!

He was ordained priest in 1941 at the Fourvière Basilica in Lyon, obtained his degree in Theology in 1942 and the same year his degree in Natural Sciences.

The diocese suggested to him reopening the geology laboratory of the Science Faculty and gave him a teaching post within the Institute of Industrial Chemistry of the Catholic University. He was appointed lecturer in the Science Faculty in 1943.

It was again his mentor l'abbé Dubar who proposed that René extend the field of study of his DES on the Jurassic (Lias and Bajocian) of the N and NE borders of the Massif Central to a Higher Doctoral thesis. He defended this thesis in Lyon in January 1951. Very soon he extended his geographical field: the Lias of the Alps, of Spain, of Portugal, of Italy, of North Africa and to the Himalayas where he undertook two expeditions in 1963 and 1966. He became the acknowledged expert on the biostratigraphy and ammonite palaeontology of the Lias, leading to the creation of a *Centre International d'Études du Lias* (C.I.E.L.). From his researches came many publications (more than 400!) and numerous national and international responsibilities:

First President of the *Groupe Français d'Études du Jurassique* (1968-1974);

President of the *Association des Géologues du Sud Est* (1976-77 and 1982-83);

Vice-President of the *Société Géologique de France* (1979);

Member of the Jurassic Subcommission and the International Commission on Stratigraphy;

Chairman of the Working Group on the Triassic/Jurassic boundary.

Several honours were conferred on him:

*Prix Fontannes* of the *Société Géologique de France* (1957);

*Prix Prestwich* of the *Société Géologique de France* (1984);

Doctor *Honoris Causa* of the New University of Lisbon (2001);

*Jubilairé d'Honneur* of the Moroccan Jurassic (2004);

Titular Member of the *Académie des Sciences et Belles Lettres et Arts de Lyon* (1988).

Rene Mouterde was a teacher-researcher. He was appointed *Maitre de Recherches* with CNRS in 1968 then *Directeur de Recherches* in 1974 until his retirement. He did much teaching and gave great attention to the teaching given in the Faculté Catholiques des Sciences in Lyon, of which he was Dean for many years.

Cartography was also one of his activities, as coordinator for the Carte Géologique de France, participating in the completion of seven geological maps, and also in Portugal. In the field of applied geology he mapped, for EDF, the site of the Serre-Ponçon dam situated on the Lias and as Professor for ISARA directed studies of the soil-subsoil and their links with wine-growing.

His links at Dijon with his friend and colleague Henri Tintant led him to modernise his palaeontological research. The 'biological concept of the species' developed by Tintant helped René and his team to get away from a palaeontology that was too morphotypic. Problems of Science and Faith led to many meetings resulting in the formation of a research group '*Des Naturalistes aux Théologiens*' that for about thirty years brought together researchers to reflect on the 'origin of life', and on 'time' .... giving rise to

publications in the *Cahiers scientifique de l'Université Catholique*.

When he retired René Mouterde became 'non-resident priest' in two parishes situated at the foot of Mt. Pilat. It was in this rural environment, very close to our home and his (*Le Chipier*), that he lived fully his vocation of 'priest-worker-geologist' as he liked to define himself.

L'abbé left us quietly on 28<sup>th</sup> July 2007 (during the holidays). Among the messages of condolences I received, I recall this: "Science has lost a colossus of the geological world". A man passionate about the Earth, anxious to transmit his knowledge, he is the testimony of a Man of Faith.

At the funeral ceremony in one of l'abbé's churches, our geologist colleague Jacques Perriaux, who became a priest after the death of his wife, gave witness:

"Priest, geologist, palaeontologist, in the wake of Theillard de Chardin, René Mouterde knew throughout his life how to achieve a happy synergy between FAITH and SCIENCE and to be the active witness of the creation that he will contemplate henceforth."

## **COLIN F. PARSONS (1945-2008)**

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Colin Parsons died at St Christopher's Hospice in Sydenham, South London following a six-month battle with motor neurone disease, a very aggressive strain that reduced him from actively collecting fossils in Dorset in June 2007 to being bedridden within a few months. Colin will be remembered for his great contribution to Middle Jurassic ammonite biostratigraphy in the 1970s and 1980s.

Colin was born on 9<sup>th</sup> November 1945 at Isleworth and attended school at Spring Grove House Grammar School, in London Road, Isleworth. He first demonstrated his investigative skills in science by blowing up the family greenhouse with a homemade bomb! Colin studied at Leicester University completing his B.Sc. degree (upper second) in 1968 and then, with the encouragement of Prof. Peter Sylvester-Bradley, went to the University of Keele to be supervised by Dr Hugh Torrens for his Ph.D. thesis on the ammonites and stratigraphy of the Inferior Oolite. His Ph.D. thesis was finally submitted in 1977, though several chapters had been already published by that date. These included important papers (for example, Parsons 1974, 1976) reviewing and revising the zones and subzones of the Bajocian Stage. Particularly valuable is his detailed work on the Aalenian and Bajocian correlation charts (in Cope 1980).

Colin's subsequent rather varied career included:

- (a) Research Assistant to Prof. Anthony Hallam at University of Oxford, 1971;
- (b) Demonstrator at University of Liverpool, from 1972;
- (c) Nature Conservation Council, England until 1981.

During his time at the Nature Conservation Council, Colin prepared reports on Aalenian and Bajocian Sites of Special Scientific Interest. These later became the basis for the Middle Jurassic Geological Conservation Review (Cox & Sumblar 2002).

In 1981 Colin left geological employment, retrained as a science teacher and eventually became Senior Lecturer in Computer

Technology at the London College of Printing. In 2006 he retired from this post and returned to Jurassic ammonites, his earlier field of research, but just one of his diverse interests.

In 2002 he became a member of the Geologists' Association and, in 2003 he participated in a fieldtrip to the Inferior Oolite of Dorset that I led. As a result he returned to active collecting and research on Bajocian ammonites, adding to the gigantic collection he had amassed over the years.

Recently, Colin began to produce papers on his web site, now available to the public domain through the British Library website, including on recent finds made at Redhole Lane. He was also in the process of producing a modern revision of the plates and text of S.S. Buckman's Type Ammonites in the light of modern findings.

In his very short retirement Colin offered his services as a volunteer at the Natural History Museum in London. By the time of his death he had already integrated a proportion of his own material into the cabinets there. It had been his intention to place all the specimens under his personal supervision but this was not to be. Lorna Steel of the Natural History Museum has been instrumental in removing Colin's collection to the museum and erecting a small exhibition that Colin was able to visit before he died.

The real value of the Parsons Collection lies in the detailed way that Colin recorded field sections, subdivided beds by fossil content and made accurate lists of what occurred in each horizon. It helped John Callomon and I compile our first list of faunal horizons (Callomon & Chandler 1990).

In what turned out to be a rather short life Colin contributed much to the sum of our knowledge of the Jurassic. He will be sadly missed by his friends and colleagues. Colin's ashes were cast from East Cliff at West Bay in Dorset by his wife Marion and the children on the 4<sup>th</sup> of May - below which lie the boulders of fallen Inferior Oolite which had taken his interest early in life. His contributions to biostratigraphy will be long remembered.

I thank Marion Parsons and Hugh Torrens for their help in compiling this tribute.

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**Bruce W. SELLWOOD (1946-2007)**

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Bruce Sellwood, who died of cancer late in 2007 at the age of 61, was my first research student during my years at Oxford. I set him the task of exploring the environmental changes in the United Kingdom across the Sinemurian-Pliensbachian boundary, a time marked by a significant marine transgression and episode of marine deepening in northwest Europe and elsewhere. This task he tackled with his characteristic gusto, which led in particular to especially interesting discoveries concerning the ichnofauna and formation of sideritic nodules. We afterwards collaborated in investigating two fuller's earth clays in the Mid Jurassic and Early Cretaceous of southern England, which resulted in the earliest recognition of bentonites and hence contemporary volcanicity in that region. This in turn led on to our investigating Bathonian volcanicity in relation to rifting in the North Sea, then being newly explored by oil companies, a study which expanded into a more comprehensive analysis of mid-Mesozoic sedimentation and tectonics in the British area.

Thereafter we went our separate ways as regards research, but we continued to keep in

close contact. As for career, Bruce returned to his alma mater, Reading University, where a succession of staff promotions led eventually to appointment to a personal chair. After spending some time consulting for oil companies he eventually returned to 'pure' research by effecting a highly fruitful collaboration with his Reading colleague the meteorologist Paul Valdes, developing and testing a succession of global climatic models for the Late Jurassic and Early Cretaceous, the results of which he summarised at one of the annual addresses given to the Palaeontological Association in London.

Bruce had only just retired early, at the age of 61, when the cancer that had troubled him for several years returned. He did his best to ignore it by throwing himself into a range of activities including extending his palaeoclimatic interests to the Pliocene. It was thus all the more tragic that he died so prematurely. One of the most dynamic and vibrant of all the students I have had, such a larger than life character still had so much to give.