

Newsletter of Micropalaeontology



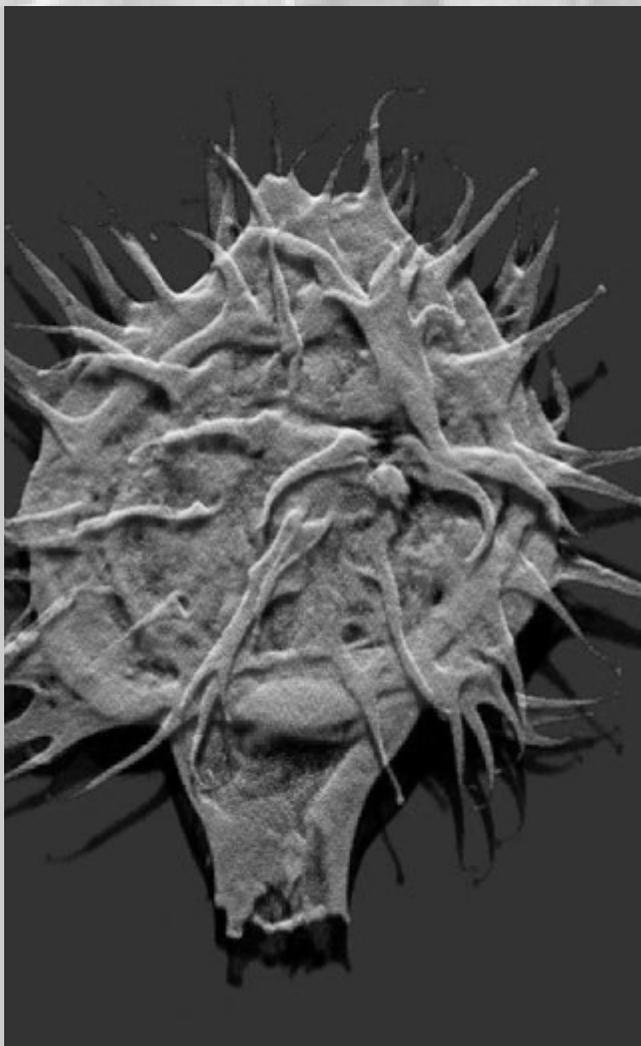
Jan 2004
Number 69

Edited by Jennifer Pike

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Registered Charity No. 284013
ISSN 0140-6730



The Micropalaeontological Society

The Micropalaeontological Society

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Dr. G.A. Booth, Millennia Ltd., Unit 3, Weyside Park, Newman Lane, Alton, Hampshire, GU34 2PJ.

TMS FOUNDATION

The Micropalaeontological Society Foundation is a sponsorship scheme to help support the *Journal of Micropalaeontology*. The Foundation is made up of members, non-members and institutions who wish to support the science of micropalaeontology via the production of the *Journal*. Any level of subscription is welcome. A minimum annual donation of £25 is suggested; donors of £25 or more will be acknowledged in the *Journal* and the *Newsletter*.

Subscription is welcome at any time. Please send donations to Steve Packer, Treasurer, TMS, Milleninia Ltd., Unit 3, Weyside Park, Newman Lane, Alton, Hampshire, GU34 2PJ, UK. Please make cheques/money orders/bankers drafts payable to “**The Micropalaeontological Society Foundation**”. If you wish to pay by Visa or Mastercard, please include amount you wish to donate, the card number, expiry date and cardholders address. If you wish to pay by Switch, please include the amount you wish to donate, the Switch Number, card issue number, expiry date and cardholders address.

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L Trevisan

K. Ishizaki

H. Ujiie

Editors, Stereo Atlas of Ostracod Shells

Notes from the Chair

Haydon Bailey

<hwb20@aol.com>

By the time this Newsletter hits your desk the AGM will have been and gone, committee changes will have been voted on and passed and plans will be being made for the New Year. Before I go any further I wish to thank two of the retiring committee members who have served this Society with unsurpassed dedication. Jamie Powell has retired from the post of Secretary after what seems to be a very rapid six years. He's done a remarkable job behind the scenes, taking care of the Society and generally looking after three Chairmen during this period. Not an easy task.

On behalf of the Society I also must thank Jim Riding as he retires (yet again) from his role as Treasurer. Having completed his full six years in 2002, Jim was co-opted back in to the post when his successor found that he was unable to take on the role. Jim came back on board and carried on where he had left off. Thank you for all you've done to maintain the financial stability of the Society.

One other note of thanks also goes to Malcolm Hart who has retired from his position as Journal Editor. The maintenance of the high quality of this publication under Malcolm's guidance is clearly a reflection of the time and effort he has shown. I'm very glad he's keeping his place on the committee through his role as Special Publications Editor as his advice on all matters is very much appreciated.

My last set of notes were written after my return from the Foraminifera Group meeting in Germany and I was full of praise and delighted with how the meeting had been organised. The converse of this can also occur at times and it can be really frustrating when it does. In September the Ostracod Group trip to Yorkshire was postponed due to lack of potential attendees (I was looking forward to that). This was followed shortly afterwards by the cancellation of the North Wales meeting when I found it impossible to put a viable programme together. I don't intend to be a winging old f....oraminiferologist, but I will use this opportunity to say, I know you're all very busy, but there are times when a little bit of extra commitment to the science that keeps you in a job wouldn't go amiss. Take advantage of the opportunities presented to you by the organisers of these events, if you don't it'll be too late when these same organisers cease to do it due to lack of participants.

So that's my serious moan over with and I'm pushing on in to a more optimistic phase. Steve Starkie, Emma Sheldon and Andy Henderson are doing a great job organising the next European event with a joint Nannoplankton Group/Foram Group meeting taking place in Copenhagen from May 14th - 16th, 2004. I can promise you that Stevns Klint in the Spring can be a wonderful venue for a field trip and you'll really regret it

if you don't go. This is also a good opportunity to mention the joint Palynology Group/Siliceous Microfossil Group meeting in Cardiff next June (possibly 9th/10th). Again it's great to see another co-operative venture which has obvious potential for collaborative research spin-offs. My thanks to Catherine Stickley and Susanne Feist-Burkhardt for pushing ahead with the organisation of this joint session.

We sometimes get a little too bound up in the Group structure of the Society. It can be extremely useful in providing, as it does, a framework for members with common interests, however it can also act as a barrier. Questions such as 'Can Forum Group members go on Ostracod Group trips?' do actually come up occasionally. If you're a paid up member of the Society, you are at liberty to attend any function organised by any part of the Society. In fact I would positively encourage you to do so; you may just find out that integrating your results with other microfossil groups may be rewarding, sometimes distressing, but often rewarding.

For those members with a memory slightly longer than mine, I'll remind them that when I joined the Society there wasn't really an 'active' Forum Group. However, there was an extremely active Ostracod Group and in September 1973 they came for a weekend 'meeting' in Plymouth where I'd just registered as a research assistant. I can still recall the seven course dinner we enjoyed at the Dartmoor Union inn. What is worse, is my memory of a boat ride across Plymouth Sound the following morning and being told that, as the newest recruit to micropalaeontology, I was 'expendable'. I therefore inherited the task of standing on the lurching bow of a very small boat and launching the grab sampler in order to collect sea floor sediments and hopefully a few unlucky ostracods. Although this experience underlined my intention never to take ostracods seriously ever again, I met characters fully immersed in their science and managed to have a wonderful time, which is still locked in my brain.

This is what the Society is really about. We're here to promote micropalaeontology, to our colleagues and, where possible, to the wider public. If we can do this and enjoy ourselves at the same time then we're in profit. When I left Plymouth to take up my first post as an 'industrial micropalaeontologist' at Paleoservices I was greeted with the comment from one of my new colleagues "You work on Chalk! You can have Denmark then". I just couldn't believe that I was getting paid for doing a job I really enjoyed and I got a country thrown in as well! So book up now for your trip to Copenhagen. It's a great place with "probably" some of the best chalks in the world or am I thinking of something else?

Cover photo: *Florentina abjuncta* DUXBURY 1983.

CLSM shadow projection of the holotype. Specimen height: 70 µm. Dinoflagellate cyst from the Early Cretaceous of the Isle of Wight, Southern England (image supplied by Susanne Feist-Burkhardt)

Copy deadline for next Newsletter is 1st July 2004.

Society News

Secretary's Report

James Powell

<hystrichosphere@btopenworld.com>

Introduction

2002/2003 has been my sixth, and final, year as TMS Secretary. My activity during the past 12 months has been focused on coordinating the design of a new letterhead and logo for the Society, arranging the 2003 AGM, administering the Grants-in-Aid scheme and the Charles Downie Award, maintaining the membership database, compiling the Directory of Members and co-editing (with Jim Riding) a volume in the Society's Special Publication Series resulting from last year's joint meeting of AASP, TMS and NAMS at University College London.

Letterhead and Logo

The Committee has agreed on a final design for the Society's new letterhead and logo in line with the change of name. Following ideas provided by a professional designer, Stephen Starkie has completed the new design. The new 'house style' will be in time for Volume 23 (Part 1) of *Journal of Micropalaeontology* and Number 69 of *Newsletter of Micropalaeontology*.

2003 AGM

The 2003 AGM took place in Cruciform Lecture Theatre 1, University College London, on Wednesday 26th November at 2:00 pm. Following reports by the Chair, Secretary, Treasurer, Journal Editor and Special Publications Editor, a vote was taken on changes to the Constitution and Rules. Dr M. Kucera was elected unopposed as the Society's new Treasurer, Dr S.R. Packer as the new Treasurer, Dr F.J. Gregory as the new Journal Editor, and Professor M.B. Hart as the Special Publications Editor. Following Society business, two talks were presented:

Micropalaeontology in the service of archaeology: Advances in Quaternary biostratigraphy and palaeoenvironmental analysis using foraminifera and ostracods

J.E. Whittaker assisted by Dave Horne and Bob Wynn Jones (Department of Palaeontology, Natural History Museum, Cromwell Road, London)

had been the foremost tool in the micropalaeontological interpretation of the Quaternary. At the world-famous Boxgrove archaeological site (of Cromerian age), West Sussex, however, poor preservation of palynomorphs resulted in a need to consider other options; consequently I was asked, about ten years ago, to assess the potential of ostracods and foraminifera as palaeoenvironmental proxies and dating tools at Boxgrove. Results were encouraging and led to further requests to analyse calcareous microfossils from other archaeological sites, including the Aldingbourne, Brighton-Norton, and Selsey raised beaches in Sussex, as well as further afield. Soon, however, it was realised that taxonomic nomenclature in both microfossil groups needed substantial revision if they were to be used effectively to circumvent the loss of valuable climatic, environmental and biostratigraphic information due to misidentifications. Case histories from several UK sites are presented here and provide examples of successes resulting from exciting new discoveries, as well as some cautionary tales. A case is made for a renewed effort to establish a standard taxonomic database of Quaternary ostracods and foraminifera that extends well beyond the boundaries of NW Europe. The need for a harmonisation of biological and palaeontological classifications, particularly of freshwater ostracods, is also highlighted.

The use of reworked palynomorphs in the provenance analysis of the Crag Group (Pleistocene) and the pre-Devensian glacial deposits of East Anglia

J.B. Riding¹, J. Rose², R.J.O. Hamblin¹, B.S.P. Moorlock¹, S.J. Booth¹, J.R. Lee² and S. Pawley²
¹British Geological Survey, Keyworth, Nottingham, Nottinghamshire
²Department of Geography, Royal Holloway, University of London, Egham, Surrey

Allochthonous palynomorphs have proved extremely useful in the provenance analysis of the Crag Group and the overlying pre-Devensian glacial succession in East Anglia, southeast England. The Crag Group is dominantly fluvial and palynomorph-bearing sedimentary clasts picked up inland to the north and west, especially where the rivers were of high erosive force, can help model the paths of these major drainage elements. Likewise, the palynological content of Till sheets can also provide valuable evidence of provenance. In both the Crag Group and the Till succession, Carboniferous and Jurassic

It all started with Boxgrove! Traditionally, palynology

palynomorphs may be especially common, with lesser proportions of Cretaceous and Palaeogene elements. Palynomorphs of Silurian to Quaternary age have been observed.

Both derived palynofloras and clast lithologies from river and shallow marine sediments have been used to correlate pre-Anglian fluvial and coastal deposits in eastern England. The results are used to provide a lithostratigraphical framework for the Early and early Middle Pleistocene sediments, and to derive sedimentary models that can be linked to the tectonic and climatic processes that determined the behaviour of the geological systems. Three geological systems are recognised. i) The river Thames, which drained an area from Wales through Midland England to the Thames basin and southern East Anglia and reached the southern North Sea delta in the region of southern East Anglia. ii) The Bytham river which drained midland England and the southern Pennines and reached the southern North Sea delta in the region of north central East Anglia. iii) The Ancaster river which drained the southern Pennines and received sediment from northeast England. This river reached the sea in, and north of, northern East Anglia and

contributed to some of the Cromer Forest-Bed. Each of these rivers contributed to the shallow marine sediments that formed around the eastern margin of the southern North Sea delta/estuary and are known as the Red, Norwich, and Wroxham Crag formations.

Similarly, the study of allochthonous palynomorphs can be effectively applied to the provenance of the pre-Devensian glacial deposits of Norfolk. Traditionally these deposits have been divided into a Lowestoft Formation, overlying a North Sea Drift Formation, the latter including three or four tills. All were considered to be Anglian, Oxygen Isotope Stage (OIS) 12. However, detailed mapping has demonstrated that the Lowestoft Till equates to the Walcott Till or Second Cromer Till, the second of the North Sea Drift tills. The deposits underlying the Lowestoft Till are now termed the Happisburgh Formation and were derived from northern Britain and the North Sea. The Lowestoft Formation is overlain by the Bacton Green or Third Cromer Till, for which derivation from northern Britain and the North Sea is also proposed; no Scandinavian erratics have been found in this till. The Bacton Green Till is overlain by the Overstrand Formation. This includes

Grants-in-Aid 2004

Grants-in-Aid are awarded annually to help student members of TMS in their conference attendance, or any other specific activity related to their research which has not been budgeted for. Grants cannot be awarded for miscellaneous expenditure (e.g. slides, sample bags, sample preparation, laboratory costs, SEM photography or producing, photocopying, printing and binding of theses), nor can they be awarded retrospectively.

A maximum of £200 can be awarded to each successful applicant, and a total of £600 is available annually. Awardees are also expected to write a short report for the *Newsletter of Micropalaeontology* once their grants have been used.

Application forms may be obtained from the Secretary Michal Kucera
<m.kucera@rhul.ac.uk>

Deadline for applications: 28th February, annually

take on the Treasurer's job, because I have thoroughly enjoyed all aspects of this task. My sincere thanks too go out to the many committee members whom I have worked with over the years, for making my job as first Secretary and then Treasurer so pleasant. Jamie Powell and I both step down from the committee in November; we are sure that both our respective replacements will bring youth, vigour and vitality to the committee. Unfortunately I will not be at this year's AGM due to a project meeting which I must attend that week.

As I write this report, I am preparing the accounts for our financial year 2002-2003. Happily, the finances of the Society are reasonably healthy. I always give a caveat here because we have never been in the fortunate position of having a large cash reserve. Our publishing costs are high and despite my efforts since becoming Treasurer in 1995, I have not managed to generate a financial reserve sufficient to pay for one entire volume of the *Journal of Micropalaeontology*. I recently sent out subscription reminders for 2003 to several members who have not paid for this year. Please check if you have paid your subscription for this year by examining the date on your address label for this newsletter. If you have not paid your 2003 subscription, please send a cheque as soon as possible.

NEW MEMBERS

We welcome the following new members to the Society: Assimina P. Antonarakou, R. Thomas Becker, Barry Carr-Brown, Hara Drinia, Jayne Dunn, Robert L. Fleisher, Kevin Keatings, Tanja J. Kouwenhoven, Rossana Martini, Anthony Mitchell and John Russell.

NOTES ON THE ACCOUNTS

The accounts for our financial year 2002-2003 show a balance of just over £5K. This is a somewhat reduced surplus in comparison to previous years. The balance from fy 2001-2002 was unusually high because of the London meeting in September 2002. Around £5K of liabilities from this meeting paid out during 2002-2003 has, however, remedied this anomaly. With the exception of the London conference, our income via subscriptions and miscellaneous items this year was virtually identical to 2001-2002, indicating that the increase in subscriptions has not given a rise in income. However, this may be revised if most of the late payers in 2003 renew their membership. The editors of the *Stereo Atlas of Ostracod Shells* are thanked for donating £710 from sales of backparts.

Several items of expenditure in 2002-2003 were rather high. We issued a *Directory of Members*, which pushed our cost up by around £1K. The 2002 AGM was unusually expensive and expenses claims for attending committee meetings were rather high. Furthermore, the Secretary's expenses reflect the relatively high costs of postage and photocopying. Overall this has been a moderate year financially. In the future, the Society should look to maximize subscription income, perhaps with a new corporate rate and instigating deeds of covenant, and cutting costs wherever this is possible.

FOR SALE

Catalogue of Foraminifera by
Ellis & Messina.

Published by the American Museum of
Natural History.

Vols 1-60 in their original binding (except
Vol 1a). Complete up to 1987
with approx 25 box files of inserts that
have not been inserted into the
appropriate volumes. £2000 or reasonable
offer.

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University of Leicester, LE1 7RH, UK

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THE MICROPALAEONTOLOGICAL SOCIETY

STATEMENT OF ACCOUNTS FOR FINANCIAL YEAR 2002-2003

INCOME:	EXPENDITURE:
Balance from 2001/2002: £15,333.95	<i>Journal of Micropalaeontology:</i> Volume 22, Part 1 (inc. postage) £11,472.00 Volume 22, Part 2 (inc. postage) £11,472.00 Total printing costs of the JoM: £22,944.00
<i>Membership Subscriptions:</i> Individual/Student for 2002 £559.00 Individual/Student for 2003 £10,516.00 Individual/Student for 2004 £147.00 Individual/Student for 2005 £30.00 Subtotal individual/student: £11,252.00 Library Subscriptions £12,093.47	<i>Newsletter of Micropalaeontology/Directory:</i> Number 67 £753.32 Number 68 £759.20 Directory of Members, 2003 £759.20 Postage £495.34 Total N/L and Directory costs: £2,767.06
Total subscription income: £23,345.47	<i>Annual General Meeting 2002:</i> Hire of lecture theatre at UCL £549.00 Reception £419.59 Speaker's expenses £364.52 Total AGM 2002: £1,333.11
<i>Miscellaneous Income:</i> Sale of Journal backparts V1-V21 £319.00 Advertising revenue £100.00 BMS Foundation £1,105.00* Interest from two bank accounts £69.63 Interest on the C. Downie Fund £87.83 Sponsorship Foram. Gp. meeting £70.00	<i>Miscellaneous Outgoings:</i> Secretary's expenses £588.17 Treasurer's expenses (stationery) £20.25 Foraminifera Group Meeting £196.86 Ostracod Group Field Trip £38.00 Grant-in-Aid £200.00 Editors visit to GSPH (travel) £16.50 Credit card company fees £299.74 Direct Debit fees £88.20 Bank charges £7.50 Refunded Subscriptions £180.00 IFPS subscription £100.00 Charles Downie Award 2002 £200.00 Ctee. meeting expenses (Nov. 02) £179.10 Ctee. meeting expenses (March 03) £140.56 Ctee. meeting expenses (July 03) £326.89 Design fee for new TMS logo £352.50 Liabilities from 2002 conference £1,876.75 2002 conference surplus - AASP** £3,424.00 Total: £8,235.02
(* - this includes £710.00 from sales of the <i>Stereo Atlas of Ostracod Shells</i>)	(** - from operating surplus of the joint conference organised in 2002)
Subtotal of misc. income: £1,751.46	
TOTAL INCOME £40,430.88	TOTAL EXPENDITURE £35,279.19
BALANCE FOR FINANCIAL YEAR 2002/2003: £5,151.69	
This financial year 2002/2003 ran from 13th November 2002 to 19th November 2003 James B. Riding (Honorary Treasurer) Michael H. Stephenson and Ian P. Wilkinson (Honorary Auditors) 17 November 2003	

CHARLES DOWNIE AWARD

The late Charles Downie was one of the pioneers of palynology in the U.K. and a mentor who guided the thinking and development of a large number of postgraduate students who passed through the University of Sheffield. Through the efforts of former colleagues at Sheffield, a permanent memorial has now been established to recognize Charles' contribution to micropalaeontology. An annual award will be made to The Micropalaeontological Society member, who in the opinion of The Micropalaeontological Society Committee, has published the most significant paper, in any journal, based upon his or her postgraduate research.

An award of £200 will be made for the best paper published during 2004 and will be presented at The Micropalaeontological Society AGM in November 2005. Nominations for the best paper published in 2004 should be submitted either to the appropriate TMS Specialist Group, or The Micropalaeontological Society Secretary by 28th February 2005.

Michal Kucera, TMS Secretary,
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Tel: +44 (0) 1784 443586 Fax: +44 (0) 1784 471780;
Email:m.kucera@gl.rhul.ac.uk

Charles Downie Memorial Award Contributors (Dec 2003)

R. L. Austin	W.A.M. Jenkins
G. A. Booth	J. K. Lentin
B. Braham	R. S. W. Neville
J. P. Bujak	B. Owens
G. Clayton	T. L. Potter
M. D. Crane	A. J. Powell
S. Duxbury	S. M. Rasul
G. L. Eaton	M. Razzo
G. A. Forbes	J. B. Riding
K. J. Gueinn	W. A. S. Sarjeant
A. M. Harding	J. E. Thomas
R. Harland	J. Utting
K. Higgs	D. Wall
P. J. Hill	M. J. Whiteley
A. Hossein Zahiri	G. L. Williams

Specialist Group News

Microvertebrate Group

Henning Blom

Microvertebrate Group Secretary

<hb269@cam.ac.uk>

The Second Gross Symposium 'Advances of palaeoichthyology' was held September 4-17 in Riga, Latvia, and attended by a few of the group members. Three days of talks, including numerous on microvertebrates, were followed by excursions focusing on famous microvertebrate localities of Latvia and Estonia. Apart from this major excitement, the second half of 2003 has been quiet for the majority of group members. Of particular interest, however, is that Giles Miller has now released a web-based database for the conodont collections at the Natural History Museum. It can be found at <http://www.nhm.ac.uk/palaeontology/micro/collection/s/conodont/index.html> and is collections based rather than specimen based. Searches using collector, donor or publisher names return information about discrete collections within the NHM conodont collection. The database can also be searched by country and Geological System. Taxonomic names can also be searched for but at present this part of the database is incomplete as there are many picked slides containing unidentified material. The database gives broad information about discrete collections within the conodont collection housed at the NHM. Generic, specific and subspecific names are included in the database, and the data is being updated regularly. As a result, the database is best searched by name of donor/collector/publisher or by geological period. Links to images are included with some collections.

Nannofossil Group

Emma Sheldon

Nannofossil Group Secretary

<es@geus.dk>

In June's newsletter we put a few suggestions forward as to what we could include in this edition, and we've succeeded to a large extent. If we've been doing our job properly, the Nanno group should have received a copy of the member's mailing addresses, an updated version will be sent out by email soon. If you did not receive the list please let me know.

We've also been on a bit of a recruitment (involving press-ganging!!) drive regarding new members and have a positive response from both industry and academic folk, I guess everyone can help here by spreading the news amongst Nanno colleagues...our latest counts show we have a small but respectable 38 members in the Nanno group.

Several conferences have taken place over the last few months, including the ICDP (International Continental Drilling Program) workshop at Reston, Virginia, USA in September (see write-up by Dave Jutson), the INA Extant Coccolithophores workshop, Heraklion, Crete in October (see write-up by Jeremy Young) and the 6th Petroleum Geology Conference in London, also in October.

This time we thought it would be interesting to those who have never worked offshore or on an installation, to get an insight by including a typical diary...originally to be called 'a day in the life' but altered to cover a 'typical week' (although in reality each job is different and there is not such thing as a typical week...and also because sometimes we have days of downtime where all we do is play pool and eat all day long.....), see the write-up by Steve Starkie.

And finally the Nannofossil and Foraminifera Groups have decided to hold a joint meeting in 'Calcareous Plankton' next Spring. The meeting will take place in Copenhagen from May 13th-15th 2004, and is planned to promote co-operation between the groups in order to develop multi-disciplinary projects. We'd like to encourage folk to give short oral presentations or to show posters on any aspect of calcareous plankton, or failing that, just attend! The atmosphere will be informal and will include a field excursion to the K / T boundary section at Stevns Klint and hopefully to the neighbouring Østsjælland museum. So far we have had an encouraging amount of interest over email (from Germany, Italy, the UK, America and Denmark), but what we would really like is some positive feedback with talk / poster titles, and the subject does not have to cover 'boundary events'. It's been suggested that folk could even use this meeting to practice their presentations for the INA conference next September. The program has not been put together as yet, but a keynote speech at a planned ice-breaker on the first evening by Dr. Scient. Hans Jørgen Hansen (interesting alternative theories on the K / T event in Denmark) promises to be entertaining. We hope to hold talks and a poster session on the Friday and if we have enough interest, this will run on into the Saturday before we head off on our short field excursion.

More information about the meeting will follow by email and on the website.

Finally, as this part of the newsletter belongs to the Nanno group, we'd like to encourage anyone from the group to contribute, so if anyone has anything interesting to let folk know about...informal or not, then this is the place to say it!

Well that's it for now.

Ostracod Group

Alan Lord

Ostracod Group Secretary

<a.lord@ucl.ac.uk>

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Palynology Group

Susanne Feist-Burkhardt

Palynology Group Chair

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The 2004 Palynology Group meeting will be held jointly with the Silicofossil Group at the University of Cardiff, 9th-10th June 2004. For details see announcement in this newsletter, or contact Dr. Catherine Stickley (cathy@earth.cf.ac.uk) or Dr. Susanne Feist-Burkhardt (S.Feist-Burkhardt@nhm.ac.uk). Members are also invited to attend the IFPS 11th International Palynological Congress, Granada, Spain, 4th-9th July 2004. For details of events and registration, see <http://www.11ipc.org>. There are already plans to hold the 2005 Palynology Group meeting in Paris, 3rd-6th October 2005, as a joint meeting with other European palynological societies.

See article in *Micropalaeontology News* section of this Newsletter about the *Duxbury (1983) database of Cretaceous dinoflagellate cysts that is now online.*

Silicofossil Group

Cathy Stickley and John Gregory

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A brief glance through any palaeoceanographic journal shows that micropalaeontologists who work with marine silicofossils and those who specialise in marine organic-walled microfossils don't tend to collaborate. Such avoidance is, it seems, largely unintentional. Rather, both sets of workers have habitually moved within their own circles for a number of reasons; the most obvious perhaps that opaline silica and organic-walled microfossil remains are 'rarely' preserved together in abundance. Unfortunately, where they are preserved together, laboratory procedures for one group intentionally destroys the other. Another communication barrier is a reflection of the separate ways the two fossil groups are employed in the geosciences, and the groups of people who work with them. Generally speaking, palynologists have traditionally veered into the petroleum industry, given the strength of e.g., dinocysts as an excellent facies-independent biostratigraphic tool. Palynology-based reports are bountiful and their biostratigraphic schemes detailed and functional works of art. Unfortunately, with confidentiality such treasures are 'lost' to the public sector. Marine diatomists (for example) are, on the other hand, relatively fewer in numbers but remain within the academic sector, where their work is public and easily obtainable. The virtues of diatoms as sensitive and meaningful palaeoenvironmental indicators are well-known, particularly in regions where calcareous microfossils are not preserved. It seems that in 'non-calcareous microfossil world', never-the-twain shall meet on the pages of a book. Of course silicofossils are also useful in biostratigraphy, and by the same token, dinocysts for palaeoenvironmental reconstruction. Moreover, there are of course successful palynologists in the academic sector—although you can count them on one hand (diatoms are not likely to make it big in industry). Where silicofossils and palynomorphs *are* preserved together in the fossil record (and you'd be surprised how often this is!), the potential for both groups to be of mutual benefit is enormous, e.g., the SW Pacific Pliocene dinocyst-diatom study of McMinn et al., 2001, *Marine Micropaleontology* 43: 207-221; and the Tasmanian Gateway Eocene-Oligocene dinocyst-diatom study of e.g., Sluijs et al., 2003, ODP Scientific Results, Leg 189 (on the ODP website). In this sense, diatomists (for example) and palynologists

do work together, albeit rarely, and generally only in the academic sector. It seems a pity that for two groups with such potential for mutual benefit, they are not integrated more often. In light of this, next summer we hope to make some progress in bringing workers from both groups together to form new collaborations. TMS is the perfect vehicle for doing this. The first joint TMS Silicofossil-Palynology group meeting will take place on 9-10th June 2004 at Cardiff University, UK. This meeting will be a good opportunity for academia and industry to meet and discuss ideas for mutual gain. See meeting announcements in this newsletter and on TMS website, for further details and instructions on how to submit an abstract and/or to pre-register. Contact the silicofossil or palynology group committee for further details at any time.

Other news from the silicofossil group comes from Jenny Pike Eleanor Maddison (both at the School of Earth, Ocean and Planetary Sciences at Cardiff University), who attended the AGU Chapman Conference on **The Role of Diatom Production and Si Flux and Burial in the Regulation of Global Cycles** at Paros, Greece. The conference was exceptional in bringing together a large and international collection of marine diatom specialists, geochemists and palaeoceanographers. Jenny and Eleanor presented posters on the current work of the diatom group at Cardiff University ædeglaacial ocean and climate seasonality recorded in laminated diatom sediments from East and West Antarctica. You can read their report of the conference in Conference Reports, later in the *Newsletter*. If you would also like to report on a conference or meeting with a siliceous microfossil theme or component, which you have recently attended, or if you have presented any siliceous microfossil work at any conference and would like to tell us about it, please write to Catherine Stickley or Ivo Grigorov by email.

Further good news comes from Claire Allen, who was successfully awarded a PhD from Cardiff University in May 2003, under supervisors Jenny Pike (Cardiff) and Carol Pudsey (British Antarctic Survey). The title of her thesis is "Late Quaternary Palaeoceanography of the Scotia Sea, Southwest Atlantic: Evidence from the diatom record". Claire is now a permanent member of the Geosciences Division at BAS (Micropalaeontologist) and her work follows on from her PhD using marine diatoms as proxies to reconstruct ocean conditions in the Antarctic Peninsula and Scotia Sea region. This work is a component of the SAGES (Signals in Antarctica of Past Global Changes) programme at BAS, which is

concerned with integrating data from marine, terrestrial and ice core records in order to provide a comprehensive reconstruction of Antarctic climate on glacial-interglacial cycles.

If you know of research theses completed recently or in the future, on any silicofossil topic, let us know and we will tell the world!

Finally, John Gregory has stood down as the Chair of the Silicofossil Group to take over as the editor of the *Journal of Micropalaeontology* and would just like to thank everyone, particularly the diatom workers, who have supported the silicofossil group over the last few years. Cathy Stickley has taken over as Chair and Ivo Grigorov has taken over as Secretary.

If you have news you would like to announce to TMS through this section in the Newsletter and on the website, then please write to us at any time. We welcome, for example, any information on recent silicofossil-related degree awards or abstracts of your recent conference presentations/ publications.

Micropalaeontology News

Dinoflagellate cysts from the Cretaceous: the DUXBURY (1983) database now online

A new searchable database of type and figured dinoflagellate cysts is now available free of charge on the web site of the Micropalaeontology Division at The Natural History Museum, London. The database contains new, high quality, colour images, and confocal 3D images and video clips of the original specimens from Stan DUXBURY's (1983) classic publication on Early Cretaceous dinoflagellate cysts of the Isle of Wight, Southern England. This is the first of a series of illustrated, searchable online databases featuring type material housed in the NHM palynology collections. This database presents an outstanding new research tool for experienced researchers, lecturers, students and all those wishing to learn about Cretaceous dinoflagellate cysts. It provides instant access to important taxonomic information and first class illustrations of the original specimens. It can be accessed under the following URL:<http://www.nhm.ac.uk/palaeontology/micro/collections/duxbury/dux.html>

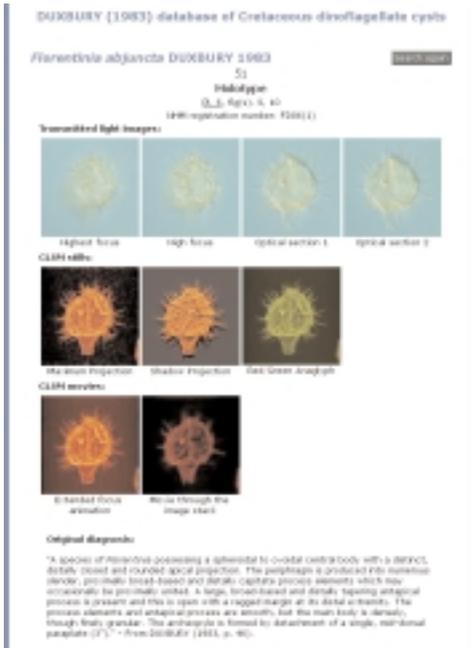


Screen Shot 1: *Database search.*

DUXBURY (1983) is one of the most important publications for workers in Cretaceous dinoflagellate cysts. The collection of type and figured specimens in this publication is housed in the Micropalaeontology Division and consists of over 100 slides. The publication describes 102 taxa of which 2 genera and 20 species are described as new.

All of the important taxa have been re-imaged using modern digital photomicrography and are illustrated in this online database. In addition, and most importantly, many of the original specimens have been imaged using Confocal Laser Scanning Microscopy (CLSM), an innovative way for illustrating palynomorphs. CLSM can produce extended-focus images but without the time-consuming preparation required for SEM images. This technique is non invasive, so type collections can be re-imaged and re-illustrated to provide extra information for the palynologist. Three-dimensional images can also be constructed which can be viewed from different angles as animated movies.

This database includes all the original plates from the publication and augments these substantially with new digital colour images, CLSM extended focus images, red/green anaglyphs (please use red/green glasses to appreciate the 3D effect), 3D animations and animations of the image stack from the original specimens. The original diagnoses and emendations by DUXBURY (1983) are included for each taxon with added notes inferring subsequent changes in taxonomy.



Screen Shot 2: *Specimen page.*

The database allows greater access to this collection while conserving the condition of the original specimens. It has been developed mainly as an aid for palynologists who seek unbiased taxonomic information on the type material. This kind of database also represents an excellent research tool in its own right by providing images and taxonomic information via an easy-to-use interface on the Internet. Its full potential is reached when used in conjunction with other databases (e.g. the web-browser-based database DINOFLAJ) so that all the important taxonomic and image information are readily available on one computer screen. In addition to the role as a specialists' application, the online database serves as a resource for educators developing and teaching courses in palynology and for students interested in Cretaceous dinoflagellate cysts.



Screen Shot 3: *Pop-up window with specimen details.*

The DUXBURY (1983) database of Early Cretaceous dinoflagellate cysts is the first of a planned series of illustrated, searchable, online databases featuring type material housed in the NHM palynology collections. Work has started on the type material of DUXBURY (1977) and (1980), thus completing the series on Lower Cretaceous dinoflagellate cysts. Next in the pipeline are the superb collections of Tertiary dinoflagellate cysts from the classic publications of EATON (1971, 1976), BUJAK (1976, 1979) and BUJAK et al. (1980).

Susanne Feist-Burkhardt
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Iona McLachlan
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PS:

The Natural History Museum is interested in increasing their collections and providing the best possible accessibility, i.e. by developing web-based catalogues and databases and exploring the possibilities of the Internet. We therefore encourage all colleagues to consider deposition of type and figured palynological specimens in the Micropalaeontology Division at the NHM. If you would like further information, please contact Susanne Feist-Burkhardt (S.Feist-Burkhardt@nhm.ac.uk) or Andrew Henderson (A.Henderson@nhm.ac.uk).

Plymouth Micropalaeontology Research Post-Graduate Student Reunion, August Bank Holiday, 2003

Micropalaeontology research has been part of Plymouth University since the mid 1970s when Dr Malcolm B. Hart (Professor since 1982) established a small research group at what was then the Plymouth Polytechnic. The first Ph.D students in the 1970s to study under the guidance and supervision of Malcolm

were: Haydon Bailey (Turonian foraminifera), Phil Weaver (Turonian ostracods), Tony Swiecicki (Campanian and Maastrichtian foraminifera), Colin S. Harris (Albian foraminifera and ostracods), Stephen Crittenden (Lower Cretaceous foraminifera and ostracods), Kim Ball (Upper Cretaceous foraminifera), Colin Williams (Mid Cretaceous foraminifera), Mike Simmons (Cretaceous microfaunas from Oman) and Mike Bidgood (Lower Tertiary microfaunas).

Since then many other students of micropalaeontology have successfully completed programmes of research and study at Plymouth (at least 25) and subsequently all have gone out into the world to practice effectively and in some cases lucratively their art. Accordingly when it was decided that there would be a reunion of Malcolm's students in the summer bank holiday of 2003 there was an enthusiastic response from 'old boys and girls' across the world. The cynic might conclude that this eager response was triggered by the inclusion in the two day programme of a 'Beer Trip' to the East Devon Coast; part of England's First National World Heritage Site. Beer to a geologist / micropalaeontologist acts as a magnet second only to strong spirits, bright lights, bed form phenomena, 100% exposure and fossils. Unfortunately however, despite the passionate initial response, work commitments and perhaps the realization that by Beer was meant the sea-side village of Beer near Seaton, precluded a large gathering of micropalaeontologists to celebrate Malcolm's nearly 30 years of Ph.D research supervision at Plymouth.

Accordingly Dr Mike Bidgood, Dr Haydon Bailey and Dr Stephen Crittenden with teenage son Oliver Crittenden met early Sunday morning in the car park at the top of the cliffs next to the small fishing village of Beer in East Devon. From there it was a short walk down to the village and a gentle stroll to the Beer Quarry caves. These underground workings have been the site of hard labour for at least 2000 years with quarrymen using methods and tools virtually unchanged since Roman times. Beer Stone is a 13ft seam of crystalline granular limestone mainly composed of the comminuted shells of *Inoceramus* and other calcareous shelled organisms together with fine sand and clay, in the Upper Cretaceous Middle Chalk of Turonian age. The sheer grandeur of the great halls, the vaulted roofs, lofty caverns and connecting galleries and massive supporting pillars is awe inspiring. All is comparable to a huge cathedral the size of a hundred football pitches. Indeed the comparison is apt as the creamy-white Beer Stone

which when newly quarried is soft and easy to carve but hardens upon exposure to the air, has been used since Mediaeval times in the building of the majority of English Cathedrals (at least 45), including Exeter and Winchester, and the Tower of London, Westminster Hall and Westminster Abbey. The stone has even been exported to the USA for use in the construction of churches and cathedrals.

Lunch was at a public house where the four of us sat down with Malcolm, his wife Yvonne and daughters Clare and Marie to pint mugs of foaming best bitter and plates of freshly fried cod and chips. After lunch we all followed the cliff path from Beer to Annis' Knob; an exposure of Upper Chalk characterized by lines of hard black flint. From here splendid views were had eastward over the sea to the low red cliffs of Seaton (Triassic age Mercia Mudstones) and the alluvial floodplain at the mouth of the River Axe. An equally splendid view to the west was had of Beer beach crowded with sunbathing holiday makers and the Chalk cliffs running out to Beer Head where two bright white columns of Upper Chalk lean (drunkenly?) seawards. The junction of the Chalk and the underlying Upper Greensand is well exposed in the cliff at the back of the beach and marked by the thin Beer Head Limestone.

After a look at the cliffs behind Beer beach beneath Annis' Knob we all assembled for the team photograph showing us looking a little older, plumper and perhaps a little wiser since our student days, said our goodbyes and then departed for our homes until the next reunion.

Oliver found the day both enjoyable and amusing. He recommends the Beer Quarry Caves to all. But how on earth, he said to me in the car on the way home, can four grown men all middle aged be so enthusiastic over what is essentially boring white Chalk and at the same time ignore all that exciting bare female flesh exposed to the August sun on Beer beach. I said it was a matter of dedication to Chalk, with thankfully for all his students past and present the most dedicated being, of course, Malcolm.

Stephen Crittenden
(Plymouth 1979-1982).

Calling all Jurassic micropalaeontologists

I am currently resident in the north Wiltshire area, plumb in the middle of the thick Jurassic sections representative of the Worcester Graben. There are

numerous working quarries nearby which are exposing fresh sections in various parts of the Jurassic ranging from the uppermost Triassic Penarth Group, through the Lias, the Middle Jurassic (Inferior Oolite, Great Oolite, Cornbrash, Kellaways Formation, Oxford Clay) to the Upper Jurassic Kimmeridge Clay Formation. The reasons for the exposures are several; new landfill sites being opened up in clays, Middle Jurassic oolites being quarried for aggregate, Kellaways sandstones being quarried for building purposes and gravel extraction in the Cotswold Water Parks exposing Jurassic sediments below. In addition, I am also involved in the Gloucestershire Geoconservation Trust (formerly the Gloucestershire RIGS group) which is probably the most active group in the country in conserving and regularly cleaning up classic Jurassic sections in the county (including SSSIs). While some of the sections in the region are permanent, others are temporary (e.g. in the gravel pits, which will fill up with water once the gravel has been extracted).

Here are some of the potential projects that interest me (but there are many other sites that could be studied):-

- selected Lower Lias sites, including a rare and extensive exposure of the oxynotum Zone (which is missing from the Dorset coast, is highly indurated on the Yorkshire coast and is thin/inaccessible in western Scotland)
- Robins Wood Hill, Tuffley; new JCB digging has exposed a complete succession from the margaritatus Zone through to the falciferus Zone. Some palynology would be very useful. The basal clays of the Whitby Mudstone Formation above the Marlstone Rock are cleanly and continuously exposed but as there are no ammonites in the section, some micropalaeo work is needed, including palynology. This SSSI is of national importance and offers probably the thickest inland section at this level in the UK.
- Lower/Middle Jurassic boundary; there are several sections which expose the sediments around the boundary, from the Toarcian Whitby Mudstone and/or Cephalopod Bed through to the Inferior Oolite above. Many of these sections don't contain ammonites and micropalaeo/palynology would be very useful for dating purposes. In addition to Cleeve and Leckhampton (see below) there are several other sections across this boundary.
- Inferior Oolite and Great Oolite; too many sections to mention, but there are many extant sections, plus some new quarries (usually building stone sections) exposing fresh material. Also some SSSIs have been

cleaned up in recent years.

- Cleeve Hill, Cheltenham; a lot of clean up work has been done on this site over the last three years, which displays the thickest development of Inferior Oolite in the country. In addition to cleaning up some old sections, e.g. Rolling Bank Quarry SSSI, the only section to show certain members of the Middle Inferior Oolite (which is very thin in Dorset), many new exposures have been created on this hill. For example, at the base of the Inferior Oolite, a new section has been cut exposing the junction with the underlying Toarcian. As there are no ammonites in this, micropalaeo could provide some valuable dating evidence.

- Leckhampton Hill, Cheltenham; similar to Cleeve, very thick section of Inferior Oolite, new sections recently exposed, including an apparently transitional Lias/Inferior Oolite succession, also without ammonites.

- Cotswold Water Parks, Cirencester; many fresh sections exposing an almost complete succession from the Forest Marble, through the Cornbrash, Kellaways Formation and into the overlying Oxford Clay (up to the Jason Zone of the Early Callovian).

- A landfill site in the Lower Oxfordian south of Purton, north of Swindon

- three large Kimmeridge Clay quarries (Swindon, Calne, Westbury), exposing fresh sections in the mutabilis and cymodoce zones.

Although I have tried to resist it, due to pressures of other work (micropalaeontology is no longer my day job), I have finally caved in and started to sample some of the sections for microfossil content from some of the more interesting sites. I feel that as several of the sites are temporary, if not collected, they will soon be lost. My problem is that I don't have processing facilities and I am therefore looking for other specialists to co-operate in joint projects whereby I could provide the samples (or advice on where to collect particular stratigraphic horizons) to individuals who could offer to processing for forams. There is also a huge potential for new postgrad research projects in this area. It would be good to see some multidisciplinary projects carried out on some of these sections.

I hope there will be some in the society who may be interested in seeing some of this material, so please get in touch if you are wish to get involved in some of these projects (email; philip.copestake@ihseenergy.com; philipcopestake@supanet.com).

Regards,

Philip Copestake

A lapsed Jurassic foram worker.

Article: Offshore Life as We Know It ...

Steve Starkie

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Introduction

After completing academic studies, a stint offshore can be a bit of a shock. Conditions are far from ideal; the area we work in is not as clean as a laboratory and we generally have only a 50cm² square space to work in. However, this does not prevent good science from being maintained and the value of the nannopalaeontologist to operations from being shown. This said, the nannopalaeontologist has to consider several things when working offshore including how the sample is collected, how robust the zonation scheme being used is and what is happening downhole. The diary below outlines a 36 hour stint offshore and is designed to give the reader a flavour of what could happen, and hopefully will entertain the more experienced offshore workers in our fraternity.

Leaving *Terra Firma*

Having been delayed (delayed = being given a 'definite' date to go offshore, and this date being shifted forwards...indefinitely) a month the first time and a week the second time due to operational problems with the up-hole section of the well, I find myself in the queue to check in at the heliport. I have stripped my baggage weight down to the statutory 10 kg, which includes my PPE (Personal Protective Equipment, coveralls, hard hat, safety boots and eye protection). This leaves about 4 kg for the rest of my personal items, logging sheets and zonation schemes. I have known colleagues who take mini bottles of sample shampoo and throw away all unnecessary packaging just to save on weight.....! I could take more than one bag of course but having to carry the microscope and a holdall is awkward enough in my opinion. One expert who remains nameless likes to carry that little bit more for those 'home comforts' but, as he explained to me, "As I weigh about half the average weight of a drill crew worker I feel my baggage weight should be higher to compensate for my lack of stature"!!

I packed down my small Zeiss standard microscope yesterday into its carry case after checking that everything was functioning. I also carry all the preparation equipment I need for the job including,

smearing sticks, glass slides, u.v. glue and plenty of immersion oil. It is also necessary to carry spare microscope bulbs as the power in the unit (mud logging cabin) we work in offshore can fluctuate causing the bulbs to blow on occasion. The total weight of this equipment (around 16 kg) means that it is transported as cargo.

I have to arrive at the heliport before check-in time, to have the equipment checked and to fill in a cargo manifest form outlining the equipment I am taking offshore. I keep a copy of this form offshore and have to return it again on arrival back to town (town = land) after the job is completed. This procedure is necessary so the authorities can check that I am not smuggling any dangerous chemicals or alcohol to the rig, or that on my return I am not smuggling exotic items such as Kumla (a frightening, jellied, grey, excuse for mashed potatoes.....a Norwegian delicacy eaten on Thursdays offshore).

Having gone through check-in I put my personal survival suit on, give it a quick 'once-over' to check that it is not worn and is up to the job, and then meet some familiar faces; the mud loggers and geologists who I have had the pleasure of working with before. We are then called to the gate and watch the safety video and get ready to board the helicopter for the hour or so journey to the rig (on a good, clear, sunny day a lovely view can be seen of the fields, coast, ships and other rigs, but on a bad day, we'll be



Helicopter on the rig heli-deck (courtesy of Dave Jutson)

buffeted about like a plastic bag in the wind.....sick bags are provided!).

Arriving on the Iron Giant

Having landed on the rig I check in and gather my belongings. As I have not been on this particular rig for a year I have a safety tour where I am shown the facilities and where the muster station and lifeboats are in case of an emergency. There is a weekly,

unannounced safety drill where we have to muster in the survival suit we arrived in plus warm



Kolskaya Platform (courtesy of Richard Goodman)

clothes...this can happen at any time of the morning or night to make the drill as realistic as possible.

Having completed the tour I get my PPE on and take the microscope to the logging unit to set it up ready to start work probably by the late evening or early hours of the morning. This is also a good opportunity to meet the current mud logging crew, it is a good idea to be on good terms with them as i'll be spending most of the next fortnight in close contact with them. I usually go offshore with a biostratigraphy colleague as we have to provide 24 hour monitoring of the well. This time it is a



Biostratigraphers and mudloggers in the logging unit (courtesy of Emma Sheldon)

micropalaeontologist who is working day shift (7am-7pm) and I am working nights (7pm-7am).

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This particular well is a horizontal section; the aim is to keep in a fairly narrow reservoir zone that is marked by a particular fossil assemblage. The zonation scheme used on the operation has robust events (it has been previously successfully used on a number of wells on this field) so I am able to evaluate my position fairly rapidly. Academically, the zonation could be said to be relatively 'broad brush', as all detailed influxes encountered are not noted on the scheme I am carrying. In fact the biostratigraphic company that designed the zonation is expert in the subtle biostratigraphic changes in each stratigraphic level in the field. However the detail I am able to see during rapid drilling and therefore while rushing through 4 samples an hour (including sample preparation) is limited. Therefore the zonation scheme has to be designed with a certain 'robustness' in mind.

The logging unit is often home to the mud logger, directional driller (the DD), MWD (real time wireline logging) and data engineer. We also have occasional visits from the mud engineer, geologist and company man so things can get very cramped in the 30' x 8' pressurised unit along with all the computer equipment, the oven and the sink. I am set up near the sink at the far end of the unit and I am fortunate to have a sea view (though often enough these units have no windows so if I am doing a long stint in the unit I won't know whether it is day or night); the oven is on the wall above me and I have a very limited space to work in.

In the job the biostratigrapher carries out, the most important person for us is the mud logger. These hard-working individuals collect all the samples we look at and it is important we all get along. Things can get very busy and stressful in the unit, and without the samples being collected correctly, I will not get the correct results, and will then pass on poor information to the geologist, which could be disastrous. The second most important person we communicate with is the geologist, we inform him of what exactly we are seeing and whereabouts in the section we think we are. He then takes this information along with that obtained from the DD on the bit inclination and angle, and the wireline log information. He must make the decision on whether to steer the well up or down and by how much, or whether to continue drilling at the present rate and angle.

The Shift Begins

I attend the evening meeting at 7:30pm; this is where the company man (or woman) discusses any safety issues, as safe operations are a must. On most rigs a

'stop card system' operates where any personnel can raise safety issues on the rig. These are read out at the start of each meeting and if not already passed on are discussed with the relevant section leader. Next, the company man discusses the previous 12 hours and future 12 hours operations. He also discusses any overall plan changes for the well. At the end of this speech he gives everyone the opportunity to contribute. He asks about the geology including comments from the micropalaeontologist and nannopalaeontologist, along with notes from the driller, MWD, mud engineer, mud logging and data engineer.

When I go onshift, the drilling has begun. 'Bottoms up time' (the time taken for the sample being currently drilled to arrive at the shakers) is 62 minutes.

On a computer screen where the data engineer is situated I can see the ROP (rate of penetration; basically how fast the well is being drilled and how fast I am going to have to work), information on all the mud pits to see if there are any losses (due to high mud weight / under pressured reservoir being penetrated, geological faults being encountered), the angle and direction of the drill bit and the wireline log traces. This information is important as it can give clues to whether I am 'climbing' or 'diving' in the section. The ROP is important as the reservoir section we are drilling is divided by 'tighter zones' that are marked by slower drilling. In addition by keeping an eye on the wireline logs I can see if the reservoir parameters are improving or dropping based on a view of the resistivity and bulk density tools. We also have the gamma trace but as we are drilling a thick chalk reservoir this tends to be relatively featureless.

The drill rate is slow at first; around 60-70' per hour. This means that I will have around 30 minutes to view a sample at a 30' sampling interval so that will break me in gently. The mud is oil-based (this means that we have to use industrial protective gloves while handling our samples and have to spend more time washing them with detergent to remove the oil – especially when looking at nanofossils made with a 'water smear slide') and contains all sorts of additives. On one recent job 'loss circulation lime' was added to the hole. I tested this and found it to be very fine Maastrichtian chalk and as we were drilling in Maastrichtian chalk this was a bit of a problem. The only difference between the two was preservation. No such problems on this job.

However, this time they are using high amounts of emulsifiers in the mud so that water in the formation and oil do not separate and cause swelling in the chalk cuttings. This has an interesting effect on the

cuttings (the mixture of mud and rock that comes over the shakers; I derive my nanno sample from this mixture); when I crush my sample it turns to a jelly-like mass on the slide. I have had a similar problem elsewhere so fortunately I have developed the technique of heating the sample on the slide in the oven unit until it dries and re-suspending it. This does the trick but the processing time is lengthened which may become a problem when rapid drilling resumes. I mention all the results to the geologist and also mention the difficulties in processing so he is aware of possible future problems in advance.

We have now passed into the reservoir zone proper and the drill-rate has shot up to around 150' per hour, it looks as if I will miss my evening meal at this rate so I ask the mud logger when he goes off for his to bring back a sandwich and banana. This increased ROP also means I will have to look at between three and four samples an hour (collecting the sample, preparing it, making a decision and telling the



Biostratigrapher Jan Rasmussen at work in the logging unit (courtesy of Dave Jutson)

geologist where I think we are in the section, all within 15-20 minutes.

The pace is relentless. It is now 3 in the morning; the worst time for me, as when I switch to the night shift, the time I get most tired is around 3-4am. I make a strong coffee for myself and all members in the unit (as a happy unit means the job is done better!). We also tend to pump up the music (most units come complete with a CD player and 2 loggers and 2 palaeontologists with totally different tastes in music!).... at this point, anything to keep us alert. The drilling has slowed again and geologist is not sure whether we have come out of the top or the bottom of the reservoir and has decided to stop drilling and circulate for samples to check on exactly where we are. The whole rig is waiting for a decision from me made upon what I see down the microscope

(no pressure.....). Nannofossil indicators in the samples tell me we have headed up out of the reservoir section; the drill bit inclination may suggest a slight build but according to the seismic model we should be in thick reservoir section. I inform the geologist after viewing a few samples to double-check that we have in fact drilled out of the top of the reservoir. The geologist informs the DD to steer the bit down, he angles the bit down and we continue drilling. The ROP steadily increases again as we re-enter the reservoir once more. Good decision! The seismic model is now being re-evaluated.

I now have time to start my morning report, as it is still 62 minutes 'bottoms up time' for the sample. The morning report comprises the zones and changes in formation we have seen in drilling in a 24 hour period. This is sent to the operations team in town every morning by e-mail at 7am. In addition to looking at samples I need extra time in order to complete the report by this deadline.

The report is completed up until the next sample, it is now 6am, just one more hour of shift to go. The drilling is going well but the MWD man looks a bit stressed as the amount the bit is 'sticking' and then 'slipping' as it drills has increased again. This has a bad effect on the wireline tools he looks after and if the tool breaks, the drill string will have to be pulled out of the hole, and the tool or BHA (bottom hole assembly) including the bit will have to be replaced. The mud engineer has added graphite to the mud to try and help lubricate the bit and alleviate the 'stick-slip' problem. Unfortunately for us, graphite badly contaminates our samples and makes preparation even trickier.

The MWD people announce that they do have a problem with their wireline tools. Drilling has stopped once more in order for them to try and re-establish a link with the tool. It appears that the MWD tool has failed and they put it down to the high 'stick-slip' we experienced earlier. All drilling has stopped, time to POOH (Pull Out Of Hole) and change out the BHA. This operation will mean we will not be drilling again for at least 24 hours, so tomorrow will be a day off, and time to recover ready to do battle again!

My relief comes on-shift with a big smile, "Thanks for arranging the tool failure!" The MWD covers his stress by half-heartedly saying "Anything for you". The MWD has a busy day and night ahead to get the new tools ready to change out the BHA. Each group on the rig has its stresses at some point during the operation so it is always best to bear this in mind. Generally the good-natured way the rig works, but

particularly in the logging unit in my case, means you can often feel the sympathy around you, which lightens the burden somehow.

Time for Rest!

I go off-shift and arrange to have a game of badminton in the gym next to cement room with the micropalaeontologist when I get up. I go to bed and the general alarm sounds at 11am when I am fast asleep, "ATTENTION! ATTENTION! THIS IS A DRILL! THIS IS A DRILL! FIRE IN THE PAINT SHOP! ALL PERSONNEL TO MUSTER AT YOUR MUSTER STATION". I groan, get up, dress rapidly in warm clothes, put on the survival suit, go to lifeboat number 2 and register. I then put on a life vest and queue at the lifeboat. The nightshift geologist is there with his 'bed-head' on and the micropalaeontologist and dayshift geologist make fun of us. The drill is over and after the blast of cold Norwegian fresh air I go back to bed.

I surface at around 5pm and call the micropalaeontologist for lunch / breakfast (breakfast

is often pie and chips!); time on a rig seems to slip you by on the night shift. We head to the 'mess' for breakfast, the smell of Kumla ...mmmmmm... hits me before I get halfway down the stairs, I will be eating from the cold-counter today I guess! I attend the evening meeting once more and discuss the previous events and the coming shift. The meeting is over, we are running back in hole and it looks as if we will be drilling late on my shift or even early on the day shift, so I now have time for that game of badminton.

The Post Mortem

This a fairly typical 36 hour period. Some folk reading this will undoubtedly say either, "He was making it all up" or "Easy life" as rig workers always seem, like fishermen, to have an extreme story to tell like "The One That Got Away!". But all would agree I think, working offshore can be exciting, fun and a rewarding experience, where good science can be displayed, add value and be appreciated as a result.



View over the edge of the platform towards a lifeboat, with container ship below (courtesy of Ricahrd Goodman)

Forthcoming Conferences

LYELL MEETING

LYELL MEETING, SPRING 2005

SECOND FIRST CALL FOR PAPERS

The 2005 Geological Society of London Lyell Meeting, sponsored by the Joint Committee for Palaeontology, is to be convened organised by The Micropalaeontology Society (Joint Convenors Haydon Bailey & John Gregory). This prestigious one day-one-day meeting, to be held at Burlington House, London is currently being planned for February 9th, Spring 2005 and this is the secondfirst call for papers on the theme of 'Applied Phylogeny'. It is intended that the meeting will comprise three sessions, arranged stratigraphically (Palaeozoic, Mesozoic and Tertiary), each session with an invited keynote speaker, with the opportunity to discuss a complete range of macrofossil and microfossil subject areas within the proposed theme.

Authors Contributors are asked to consider a single phylogenetic lineage and to pursue it's development and application, both stratigraphically, and in to any other area of applied usage. It is intended to publish the proceedings of the meeting at the earliest possible opportunity as a Special Publication of the Geological Society (authors notes will be distributed prior to the meeting).

Proposed titles and abstracts should be sent to Haydon Bailey either via e-mail at haydonbailey@btconnect.com, or to the address below, as soon as possible so that a complete programme can be drawn up.

Further details of this meeting will be made available as soon as possible once an initial programme has been established. Details will also be posted on TMS website at www.tmsoc.org .

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TMS Silicofossil and Palynology Group Meeting

**Cardiff University, UK
9th-10th June 2004**

The first joint meeting between TMS Silicofossil and Palynology Groups is planned for 9th-10th June 2004. The meeting will be hosted by the School of Earth Ocean and Planetary Sciences, Cardiff University. The goal of this meeting is to bring together siliceous microfossil workers and palynologists who often work in the same palaeoenvironments but rarely together!

Talks and posters are invited from siliceous microfossil workers and palynologists on any topic. Abstracts should be submitted by the end of April 2004. Please watch TMS website for a confirmed date and further details.

If you wish to receive the First Circular, please send your expressions of interest and request for further details to either Cathy Stickley (Silicofossil group Chair) or Susanne Feist-Burkhardt (Palynology Group Chair) as soon as possible.

Cathy Stickley & Susanne Fiest-Burkhardt
cathy@earth.cf.ac.uk s.fiest-burkhardt@nhm.ac.uk

Conference Reports

AGU Chapman conference: The Role of Diatom Production and Si Flux and Burial in the Regulation of Global Cycles

Paroikia, Paros, Greece, 22-26 September, 2003

The AGU Chapman conference on the role of diatom production and silica flux and burial in the regulation of global cycles was organised by Alan Kemp (Southampton Oceanography Centre) and Richard Dugdale (Romberg Tiburon Center, San Francisco State University). The objectives were to review and

improve our knowledge of the production, export, preservation and burial of silica in the marine system. It was aimed to bring together and promote discussions between chemical oceanographers, biological oceanographers, ecologists, diatom taxonomists, palaeoceanographers and of course micropalaeontologists. More than 70 delegates from across all these disciplines attended the conference.

The five day conference was held on the beautiful Greek Aegean island of Paros, for purely inspirational purposes only! Each day talks were held in the mornings with poster sessions and discussion groups in the evenings. Evening discussion groups were alternately lead by established researchers and postgraduate students, which was a refreshing deviation from the norm – nice to see some new faces up on the platform!! Afternoons were left free for siestas, island exploration or discussing diatoms on the patio! The conference dinner was accompanied by traditional greek music and dancing.

Talks were wide-ranging in their topics with particular highlights for us being a presentation of the

Diatom Genome Project by Ginger Armbrust (Univ. Washington, USA) called "Molecular bases for diatom competitiveness: new insights from molecular biology", and a series of talks about the potential role of glacial dust in promoting diatom growth around the Southern Ocean, kicked off with a presentation from Kevin Harrison (Boston College, USA) asking "Can Si control atmospheric carbon dioxide levels?". Other themes included the principal controls on diatom production, different styles of diatom production and implications for diatom-mediated export production, controls on preservation and burial, the role of diatom production and export through time in relation to climate change, and modelling of diatoms in biogeochemical cycles. As fossil diatom workers, we were massively enlightened by the presentations from modern chemists and biologists. It is exceptionally rare to attend such a conference which is truly cross-disciplinary, if under the broad umbrella of diatoms and silica flux. The convenors deserve congratulations for putting together such a stimulating series of talks. The overwhelming message that come out of the meeting was that there is some fascinating work going on out there, we need to read more widely ... and there is still a lot that we don't know!

Beyond the science, the polar diatomists managed to get their heads together over an icecream or two, and our new Silicofossil Group Secretary could be spotted tearing around the island in a red open-top jeep!!

Details of the meeting can be found at:
<http://www.agu.org/meetings/cc03dcall.html>.

Eleanor Maddison and Jennifer Pike
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6th Petroleum Geology Conference 'North West Europe and Global Perspectives'

Queen Elizabeth II Conference Centre, London, 6th – 9th October 2003

Previously this conference has been held at the Barbican Centre, leading to the conference being widely known as the Barbican Conference. This year the Queen Elizabeth II Conference Centre was used as the new venue, enabling both a core workshop and a 3D visions session to run alongside poster presentations and up to 4 parallel talk sessions. I think everyone would agree that the setting for the conference was unsurpassable, even for those working in London, with Big Ben, Westminster Abbey and the Houses of Parliament on the doorstep.



Finn Jacobsen and Jon Ineson from GEUS at the core workshop with their chalk core display.

The conference, though still mainly concentrating on exploration and development in north-western Europe, did this time include presentations of global interest. And although initial registration numbers showed a slight decrease in numbers since the last time the conference was held, by the time the late entrants had registered, the number of delegates was on par with previous years.

The Minister of State for Energy and Construction, Stephen Timms MP opened the conference at the ice breaker with a speech emphasising the fact that the ageing industry in the North Sea is increasingly looking towards development rather than to exploration. He went on to say that we have to realise that not too many significant, new discoveries are going to be found. Having said that, 'old' fields that have been closed-in, are currently being re-opened as recent advances in technology have allowed uneconomic oil reservoirs to be economically put back on stream.

Three or sometimes four sessions ran in parallel, making things a wee bit difficult if you wanted to visit talks in different parts of the building, but the short question-and-answer sessions at the end of the talks allowed for a quick dash out of one hall, up a few flights of stairs to arrive out of breath just in time for the next talk! In fact I was extremely impressed how the speakers and the organisers managed to keep everything exactly to time!

'The Atlantic Margin; new insights, Better Recovery through Better Reservoir Characterisation, Structural Application in Exploration and Production, 3D visions, Deep Water Plays and Reservoirs and Gas Renaissance' were just some of the diverse session titles, plus an on-going session on Exploration Histories and Future Potential.

The 3D visions session was particularly innovative; the delegates were given a pair of 3D glasses to wear

while watching the presenter 'steer' his way 'through' a reservoir. For me, a 3D presentation given by Jarle Pedersen of ConocoPhillips Norge on the Ekofisk Field was of particular interest as he used 3D visions of horizontal sections on this Norwegian Chalk field to 'fly' around the Danian and Maastrichtian chalk.

One of the most popular talks was presented by Graham Dore of EnCana (UK) Ltd on the 'new (2001)' Buzzard discovery, one of the largest to be found off the UKCS in the last 25 years and illustrating that the North Sea does still have some exploration potential.

A large poster display and core workshop proved very popular, allowing more informal discussions to be held over lunchtime or in coffee breaks.

From a biostratigraphic point of view, it was encouraging to see that biostratigraphy (including nannopalaontology) is still extensively used in the well planning and execution and in field-wide studies. In his talk on turbidite reservoirs of the Sele Formation, Mark Hempton of Shell UK emphasised that without recent biostratigraphic work (albeit palynology!!), their reservoir model would be a mess! A poster on the Norwegian Oseberg Field (Britze *et al.*) demonstrated how foraminifera and nannofossils have been used to untangle the complicated reservoir in a part of the North Sea where chalks interfinger with fine-grained clastics.

From an informal point of view and apart from the diverse and interesting presentations, I saw this conference as a great place to meet lots of familiar faces. Biostrat folk I bumped into inside included Andy Henderson (Foraminifera Group Chair), and Matt Hampton, Keith Guinn and Tim Wright from Network Stratigraphic. Conveniently, outside the conference hall, the Westminster Bar catered for those who needed stronger refreshment than coffee, and also allowed a couple of biostrat folk who shall remain nameless to join in on the social side of the conference without having to listen to any talks!!

In all a great conference to be able to go to if you can afford the registration fee!

Emma Sheldon
<es@geus.dk>

6th conf shows Finn Jacobsen and Jon Ineson from GEUS at the core workshop with our chalk core display!

Chesapeake Bay Impact Crater Workshop
Reston, Virginia, U.S.A. 21st-23rd. September 2003

In late September, and immediately after the landfall of Hurricane Isobel, the U.S. Geological Survey hosted an ICDP (International Continental Drilling Program) workshop at Reston, Virginia to define the scientific criteria which will decide the location for a deep well to be drilled in the centre of the Chesapeake Bay Impact Crater (CBIC).

The CBIC impact occurred approximately 35 million years ago (Late Eocene) when a meteorite or comet came to earth on the U.S. Atlantic continental shelf at a location that is currently occupied by the southern part of the Chesapeake Bay and neighbouring land, within the Virginia Coastal Plain. The crater as currently defined is approximately 84 km (53 miles) circular structure. This lies under several hundred feet of younger Tertiary marine sediments.

The structure of the crater has a direct and important effect on the groundwater circulation in the State of Virginia, so any research undertaken will have a strongly economic interest, as well as having an academic side.

The workshop was attended by workers from a wide range of geological disciplines who have been working with impact structures. Notable amongst these, for nannofossils workers, was Jean Self-Trail who presented a poster on the nannofossils biostratigraphy of the CBIC, together with a description of her innovative work on shock fracturing in nannofossils. I was invited to attend by virtue of my current research work on the nannofossils of Silverpit Crater, British Sector, North Sea.

It was notable, and gratifying, that in both the main meetings and break out groups, biostratigraphy (which in this case is dominated by nannofossils studies), was seen as an integral and essential component of both the well drilling program and the post-drilling research.

It's planned to spud the well during 2005, and the drilling platform will be sited near Cape Charles, at the south east end of Chesapeake Bay. It is presently planned that both Jean Self Trail and I will take duties as wellsite geologist/nannopalaontologist during the drilling of the well.

Dave Jutson
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INA Workshop on extant Coccolithophorid research

Institute of Marine Biology of Crete, Heraklion, Greece, October 1-6, 2003

Extant coccolithophores have attracted a wide range of research over the past decade including much research on topics such as dimethyl sulphide and alkenone production, physiological ecology, carbon uptake mechanisms, remote sensing and modelling of blooms, but also taxonomy-based research on biodiversity, molecular genetics, ecology, biogeography and flux estimation. As a result of the latter strand of research there is now a significant number of specialists world-wide who are identifying and studying extant coccolithophores.

This workshop was proposed to allow these specialists to share research results, gain some training, and discuss methods and research priorities. The workshop was proposed at the INA9 conference in Parma in 2002 and Dr. Maria Triantaphyllou of Athens University who has recently commenced a very productive study of coccolithophores in the Aegean Sea offered to host it. Through collaboration with the Institute of Marine Biology of Crete, Maria was able to organise the meeting at minimal cost in a superb venue. The IMBC is located on the Aegean coast of Crete and we stayed in a very civilised tourist hotel 15 minutes walk down the beach at a specially negotiated discount rate. Late summer is probably an ideal time to visit Greece with the climate still consistently sunny but not oppressively hot, the sea pleasantly warm and the main tourist hordes back home. Needless to say we thoroughly enjoyed the swimming, bars, food, archaeological excursions and remarkably friendly environment.



Minoan Bull ... on the organising committee apparently !

We also did, however, manage to have a very useful meeting scientifically. In total about 40 people attended the workshop including a large home team from Athens and Crete. There were also substantial contingents from Germany, Italy, the USA and Portugal and a scattering from other countries across Europe and beyond. The British contingent was a bit tricky to enumerate but arguably included in addition to myself, three exiles Ian Probert (Caen), Ric Jordan (Yamagata) and Pat Quinn (Zurich) and two recent imports Jens Herrle (now at Southampton) and Sebastian Meier (now at the NHM working on calcareous dinoflagellate with Susanne Feist-Burkhardt), plus Markus Geisen who is now at Bremerhaven after his extended stay with me at the NHM. Just as importantly as the international diversity there was a wide age range with a healthy predominance of PhD students and young post-docs, and a 50:50 balance of men and women.

We had one training day plus two and a half days of scientific sessions including 17 talks, 15 poster presentations (with 10 minute introductory talks) and 4 workshop sessions. This was a relatively relaxed schedule which allowed everyone to present their work and with a small specialist audience there was an excellent level of discussion, and if the time keeping was rather lax at times it did not seem to matter as we just continued a bit later.

The training day was arranged by Ian Probert and Colomán de Vargas (Rutgers University, New Jersey), with assistance from Markus Geisen and Pat Quinn. Ian and Colomán gave extended overviews on the biology of haptophytes and on application of molecular genetics to planktonic protists. Then Ian, Pat and Markus organised a practical on isolation of cultures of coccolithophores; including demonstration of plankton sampling from the beach and a chance to test our manipulation skills by isolating cells with a micropipette (which makes picking small forams seem very easy). Since most nannoplankton workers still come from a geological background this session was very welcome.



Jeremy Young and Colombam de Vargas pipetting living coccolithophores

The presentations were organised into sessions on Coccolithophorid Ecology, Biology, Biogeography, Coccolithophores and marine carbonate cycles, and Evolutionary Biodiversity – Taxonomy. In terms of taxonomy we are at a relatively advanced stage, as symbolised by the publication, in time for the meeting, of a new CODENET sponsored Guide to Extant Coccolithophore Taxonomy (Young et al. 2003). However, recent research has highlighted the fact that many conventional species are actually clusters of cryptic or pseudo-cryptic sibling species. New work in this area included documentation of fine scale variation in *Florisphaera profunda* by Pat Quinn in *Coccolithus pelagicus* by Aurea Pariente, and in the Papposphaeraceae by Lluisa Cros. In parallel the recent work documenting holococcolith-heterococcolith life-cycle associations continued, with new results from Maria Triantaphyllou and extended workshop discussion on the nomenclatural implications. These themes in turn strongly influenced presentations and discussion on ecology of coccolithophores. A key presentation by Patrizia Ziveri on distribution of selected species in the Atlantic based on a large database of Holocene sediment samples both revealed patterns which had previously been barely recognised and showed that this type of biogeographic data urgently needs to be re-collected using modern taxonomy.

There was fine set of sediment trap studies, including a three year series described by Meral Kobrich from off NW Africa with intriguingly strong inter-annual variation. New lines of ecological research were suggested by research of Maria Triantaphyllou on the potential of coccolithophores as pollution indicators using both assemblage reduction and malformation as proxies, with disticty

encouraging preliminary results, and of Markus Geisen on testing of functional hypotheses through measurement and modelling of the mechanical properties of coccospheres.

Information preservation in the fossil record was a less expected theme but reflects the fact that a key objective of much work on extant coccolithophores has been to provide data for palaeoecological analyses. Harald Andruleit and Jeremy Young highlighted the problem of information loss with only a fraction of the extant biodiversity and assemblage variability being transmitted into the fossil record or even the sediment trap record. Conversely Karl-Heinz Baumann showed that on a large scale there was remarkably high fidelity between the biogeography of coccolithophores in Nordic Seas as observed in the plankton and in the surface sediments. In parallel Marie-Pierre Aubry argued that large scale patterns in the Cenozoic fossil record indicated strong differences from modern ecology and could not be explained away by taphonomic processes. She argued that a major challenge for palaeontologists was to interpret this record, informed by knowledge of modern coccolithophore ecology but aware that the present may be only a partial key to the past.

Perhaps the overall conclusion of the meeting was that we now have firm foundations for future research, especially on coccolithophore ecology, as a result of finally having a reasonable understanding of the biology and taxonomy of coccolithophores. Typical questions identified during the workshop sessions include (1) Will the pattern of global pandemicity indicated by current taxonomy prevail at the finer taxonomic level of pseudo-cryptic species? (2) Is the pattern of holococcolithophore life-cycle stages occupying more oligotrophic niches than the heterococcolith life-cycle stages valid as a general model? It is an interesting phase of research and clearly coccolithophores do have the potential to become the best understood group of oceanic phytoplankton.

Jeremy Young
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Rogues Gallery

Ever wondered what your Officers and Group Representatives looked like??



Haydon Bailey
Chair



Michal Kucera
Foraminifera Group Secretary



Steve Packer
Treasurer



John Gregory
Journal Editor



Malcolm Hart
Special Publications Editor



Jenny Pike
Newsletter Editor



Rachel Preece
Publicity Officer



Andrew Henderson
Webmaster



Andrew Henderson
Foraminifera Group Chair



Paul Smith
Microvertebrate Group Chair



Henning Blom
Microvertebrate Group
Secretary



Steve Starkie
Nannofossil Group Chair



Emma Sheldon
Nannofossil Group Secretary



Ian Slipper
Ostracod Group Chair



Alan Lord
Ostracod Group Secretary



Susanne Feist-Burkhardt
Palynology Group Chair



Paul Dodsworth
Palynology Group Secretary



Cathy Stickley
Silicofossil Group Chair



Ivo Grigorov
Silicofossil Group Chair

Book Shelf

If there are any books out there that you would like to review, contact Jenny Pike <pikej@cardiff.ac.uk> and I will obtain a review copy for you!

Radiolarians in the Sedimentary Record

De Wever, P., Dumitrica, P., Caulet, J.P., Nigrini, C. & Caridroit, M. 2002. Gordon & Breach Science Publishers in association with Société géologique de France. ISBN 90-5699-336-4, price approx £70 (order through the Amazon link on TMS web-page)

For some time now there has been a need for a detailed text book on fossil radiolarians and De Wever et al. have produced a remarkably practical tome which will be of much use to those wanting an introduction to this group, as well as for seasoned researchers/biostratigraphers. The only previous modern publication was by Anderson (1983), who concentrated mainly on the biology of living radiolarians. This new volume is in the same league as Haynes' (1981) book on Foraminifera, or Bown's (1998) text on nannofossils.

Chapter 1 deals with the physiology and distribution of living radiolarians, and covers the same ground as Anderson (op. cit.), but updates it with more recent work carried out in the last 20 years on the physiology and skeletal growth patterns of the radiolarians. It is obvious that there is still much to be done on the actual distribution of modern taxa; even their method of reproduction is still under debate. Detailed coverage of skeletal growth is included here as it underpins the new hierarchical taxonomy developed within this volume.

Chapter 2 takes the radiolarian test from life as part of the plankton to death as a sedimentary particle and in doing so discusses vertical and geographical distribution, seasonality and productivity. Of importance for palaeoecologists is the radiolarian's susceptibility to dissolution and the result this may have on the final fossil assemblages. The estimate is that less than 10% of siliceous material is deposited as sediment, and that spumellarian taxa are more abundant in sediments than in the water column, a ratio that is reversed for nassellarians. Diversity and geographical/vertical distribution has really only been studied over the last 20 years with the introduction of sediment traps, however there are some good examples included of the biogeography of bottom sediments. Overall, these studies are still patchy and

the authors have not considered that there is an intrinsic problem in distinguishing between live and dead assemblages, as all organic matter is destroyed with the use of acids for preparing the material. This means that the Rose Bengal protoplasmic test cannot be used to differentiate between assemblages as in modern foraminiferal studies. Until there is a way of actually quantifying this ratio, the overriding assumption is still being made that the fossil record reflects the living distribution, even though there is likely to be a significant difference brought on by dissolution. However, temperature estimates and fertility studies will still prove to be of use for palaeoecologists/oceanographers.

Chapter 3 takes the next step from sediments to rocks via the various diagenetic processes (epigeny) and covers the more pervasive Palaeozoic and Mesozoic radiolarian rich rocks and cherts of the Tethyan regions of Europe, America and Japan. Radiolarite formation models are presented and discussed in detail, as well as sedimentation rates (slow) and conditions of deposition (shallow to deep). Of note is a short section on radiolarians as organic providers for hydrocarbon rich deposits.

Chapter 4, at over 200 pages, represents the most important part of this book covering the taxonomy and the advancement of a new, more integrated, natural hierarchical classification system. The authors, and in particular Dumitrica, the main instigator, have to be commended on their bold attempt to bring together several disparate taxonomic systems in use today. The status quo has been Haeckel's (1881; 1887) classification system which has held sway for over 100 years, and is still in use. However, it has long been recognised as being flawed with a division based solely on strict geometry which does not reflect the polyphyletic evolution of this group. To compound matters, there has been a polarisation of taxonomic approaches over the last 40 years between Mesozoic and Tertiary workers. This has arisen mainly due to preservational factors; Mesozoic forms have often been diagenetically altered, with internal features obscured, so reliance has been upon SEM and external features, hence the erection of many species on minor morphological features. Tertiary workers have almost exclusively relied on the light microscope and therefore rely on distinguishing internal features such as the initial spicule and its relationship with subsequent features. The present authors have tried to unify all existing systems, but problems still remain, for example the internal morphology of many Palaeozoic and Mesozoic types has not been preserved or observed

and the jury is still out on the exact importance of the taxonomic features selected. To combat this, a combination of 2 or more key morphological characters is used, with the most important related to the initial test development. As far as possible, families are defined on the internal skeleton and the authors admit that a large number of families are still poorly defined, but the system appears to be robust enough to absorb any modifications/redefinitions needed; only time will tell.

In a little detail, seven orders are erected (Archaeospicularia, Albaillellaria, Latentifistularia, Spumellaria, Collodaria, Entactinaria and Nassellaria). Two orders are relatively new, namely Archaeospicularia (Palaeozoic and ancestral) and Latentifistularia (Early Carboniferous-end Permian). Some confusion may arise as the latter order includes 3-rayed forms which superficially look like Mesozoic forms such as Paronaella. Another surprise comes with the order Entactinaria, which resemble spumellarians but possess an initial spicule and as a result of this redefinition many families and taxa previously included in Spumellaria have been relocated. This leaves the spumellarians somewhat emended and denuded which may cause problems for more conservative taxonomists. Additionally, most of the remaining spumellarians have been placed into the Superfamily Actinommacea which has been informally divided into three morphogroups.

Of the new system, 23 groups have been emended (mainly families) and 4 are new (family and subfamily). All orders and groups down to family level are briefly defined and the families/subfamilies are well illustrated with either SEMs, or line drawings of several typical genera. All formalised genera have additionally been listed with their type species and author, but are not discussed in detail, nor are the author references included in the bibliography.

Chapters 5 and 6 provide an overview of the biostratigraphical uses of radiolarians and overall evolutionary changes through the Palaeozoic, Mesozoic and Tertiary. Chapter 5 begins with the basics of biostratigraphy and zonal definition through to a detailed description of Unitary Association (UA) techniques prevalent in radiolarian biostratigraphy. Each geological interval is presented in turn with the most detailed and up to date zonation available. The Palaeozoic is broken up into discrete intervals of interest, namely the Cambrian-Ordovician, the Silurian-Middle Devonian, the Late Devonian-Middle Carboniferous and the Late Carboniferous to the end of the Permian. The Mesozoic is covered in more detail with all UA zones discussed in terms of

defining events and assemblages developed and also reflects the divisions into the Boreal and Tethyan regions for the Jurassic. The only comment I have, and it is certainly not a complaint, is that the authors have not addressed the areas which are not within their immediate experience, so the more marginal areas such as the Jurassic and Early Cretaceous of the North Sea (Dyer and Copestake, 1989), the Barents sea, Russia (Blueford and Murchey, 1993), and the Antarctic regions (Kiessling, 1999) are either scantily covered, or not at all. Whilst not important in terms of the total assemblages recovered, these more marginal areas may have significance when it comes to investigating rates of species migration and palaeoceanographic consequences.

The Tertiary is split into low and middle/high latitudinal areas with various problems such as diachrony and the problems of regional zonations against palaeomagnetic data touched upon. The tropical area is best known and this is reflected in the detail with all zones defined and described briefly. The lesser studied mid/high latitude areas warrant only a couple of pages of the more complete zonal schemes.

Chapter 6 on evolution provides an excellent overview for each era and also discusses in some detail specific radiolarian responses (at order, family and even specific level) to crises and boundary events (muted or non-existent), including the P/T, T/J, Cretaceous events (i.e. the oceanic anoxic events; OAEs), K/T and the Eocene/Oligocene.

The appendices are comprehensive and include the preparatory techniques available for processing rock and sediment types including cherts. It must be noted, however, that radiolarians can also be retrieved from many lithologies via normal paraffin/white spirit micropalaeontological processing techniques, particularly the more argillaceous, less indurated shales and claystones.

The most ambitious preparatory method is the slicing technique which has been used by Dumitrica to analyse the internal structures of individual radiolarian tests; possibly not one to attempt after a heavy night out! The glossary is also comprehensive running to 22 pages.

The bibliography is comprehensive, with the exception that the generic author citations are not included, which is a shame (but excusable due to book size/cost limitations) as many users of the book will undoubtedly want to follow up on initial identifications. The final section is a taxonomic index, which is essential for navigating around the taxonomy section.

In conclusion, this volume has been well researched, well illustrated and achieves all its stated aims and is noteworthy for introducing a novel and robust taxonomic classification. The book also includes significant summaries of Palaeozoic to Tertiary biostratigraphy and evolution.

An additional use for this book may arise as many micropalaeontology courses do not cover radiolarians due to a lack of specialists to teach and so this volume could be used by any competent micropalaeontologist to put together a very complete course. Hopefully, this volume may even tempt more people to work on this diverse group, and it will certainly prove to be an invaluable source for biostratigraphy and interpreting palaeoenvironments from the Palaeozoic to the modern day.

I would not hesitate to recommend this book to anyone who needs to utilise radiolaria in their work, as well as students who need to get a good grasp on this important group. As with all volumes partly aimed at students, the cost may prove prohibitive, but certainly all university libraries should obtain a copy. This volume would not disgrace any professional/academic micropalaeontologist's bookshelf either.

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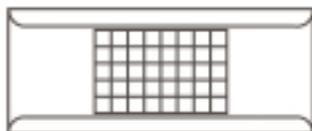
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