Newsletter of Micropalaeontology

August 2004
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Edited by Jennifer Pike

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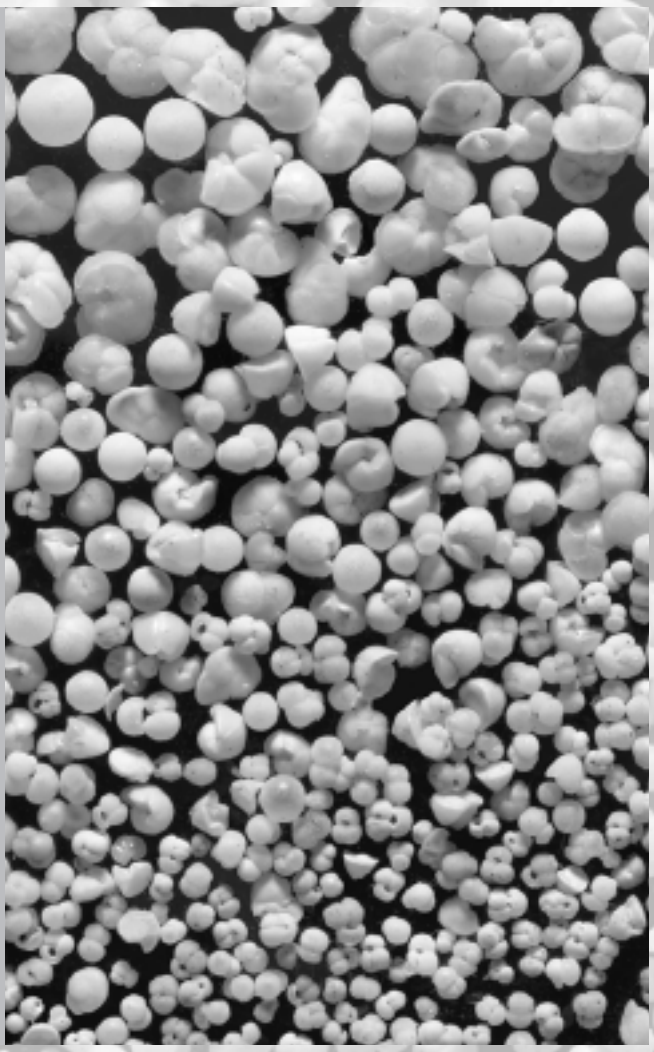

The Micropalaeontological Society

The Micropalaeontological Society
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Waves of change

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, The Micropalaeontological Society, Millennia 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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Chris Denison	Silvia Spezzaferri
Dermeval Docarmo	Lavinia Trevisan
Pete Green	Henning Uffenorde
Kunkiro Ishizaki	Hiroshi Ujiié

Editors, Stereo Atlas of Ostracod Shells

Notes from the Chair

Haydon Bailey
<hwb20@aol.com>

About six weeks ago I was asked by a couple of students from Brighton University if I was willing to be interviewed as part of their undergraduate courses. The subject area was to be career pathways in micropalaeontology. Simple I thought – there aren't any. Micropalaeontology is an occupation, maybe even a vocation, but it doesn't have any obvious career pathways. Micropalaeontologists who seek career pathways tend to end up not working as micropalaeontologists. The interview moved in to slightly more difficult areas such as - what training does a micropalaeontologist require and how do you get it? It would be obvious to answer "Do an M.Sc. course and then hope to get a job", but even this is getting more of a minefield with only the UCL course running full time with a limit on NERC funding we're already back at pre-1960's levels when it comes to training and courses.

So where do we go from here? There were positive aspects to my interview answers. Yes, there were jobs coming up on a semi-regular basis and yes, U.K. students were also filling research posts in European and other overseas academic institutions, so the picture's not all bleak. In fact with jobs continuing to come up the difficulty soon will be finding the right people to fill them. I've been down this route before and if you've read this slot previously you will already know of my concerns. Put simply we all have to encourage good quality students to follow a non-existent career pathway, but they may end up with a very fulfilling job.

Following the interview I understand from the course supervisor that I had managed to convince at least one of the two students that she desperately wants to be a micropalaeontologist. Have I done the right thing? I'll watch her progress (or not) with interest. I've recently also had the pleasure of helping out with an 'A' level project for which the student concerned studied microfossil recovery from chalk pits in eastern Hertfordshire. She is incredibly keen, very capable and, following her 'A' level results this summer, intends to study earth sciences with the hope of becoming a micropalaeontologist. I really hope that she can and has the chance to pursue her goal. It would be an incredible loss if such enthusiasm was frittered away through lack of opportunity and funding.

This, you may be pleased to hear, will be my last set of Chairman's notes a I stand down from this position at the November AGM. So I'm now at the reflections stage of wondering what we've achieved whilst I've been here. I can definitely see the beginning of a successful trend with the move away from our more parochial base as a purely 'British' institution. Having just attended the foraminifera/nannoplankton group meeting in Copenhagen which was a major success (thanks to all involved), following on from the Foraminifera Group meeting in Kiel last year there are very good signs that this trend will continue. Joachim Schoenfeld has agreed to become the Foraminifera Group chair which is a very welcome move.

We've also just had the very successful siliceous microfossil/palynology group meeting in Cardiff and, whilst I realize that Wales is still part of Britain, the important follow on from this meeting were the invites to Utrecht and Lausanne for future group sessions. The Palynology Group also has plans for a meeting in France in the not too distant future which will again take us into an area where previously we have not had a strong representation. I don't know if these meetings have had a positive affect on membership yet, but I'm sure in time they will and consequently this will provide the underlying financial security that the Society needs.

I guess that the differing threads of this discourse are leading to the conclusion that I trust I've helped maintain the Society on its continuing course so that it develops as a positive and growing organization which will be there in the future for the students I've kick started into micropalaeontology. Maybe, just maybe, in fifteen to twenty years time one of them will be sitting in this position wondering where the next generation of micropalaeontologists will be coming from and in what areas their science will be used for the greater good. I'm sure it will be and there'll still be a job for a micropalaeontologist

Front cover credits: Picture showing size variability of Pleistocene planktonic foraminifera in a sample from the Caribbean. The largest specimens are *Globorotalia menardii* the smallest *Globigerinoides ruber*. Taken by Ursi Brupbacher and Urs Gerber, ETH Zürich, to illustrate a study by Daniela Schmidt *et al.* on planktic foraminiferal size variation in the Cenozoic.

Copy deadline for next Newsletter is 1st November 2004.

Society News

Secretary's Report

Michal Kucera
<m.kucera@gl.rhul.ac.uk>

Annual General Meeting 2004

The 2004 Annual General Meeting will be held at University College London in the Cruciform Lecture Theatre on Wednesday 17th November, commencing 2 pm. Items for the agenda should be presented to the Secretary by e-mail or in writing by Wednesday 27th October 2004. The agenda for the AGM will then be displayed on the Society's website <www.tmsoc.org>.

Following Society business, two talks will be presented (see larger meeting advert for details):
'Pteropods - what the heck are they?'
Arie W. Janssen (National Museum of Natural History, Leiden, and Gozo)
'Ancient Glacier Bodies, The case of Oetzi, The Tyrolean Iceman: Clues from Microscopic Plant and Animal Remains'
Dr James Holms Dickson (University of Glasgow)

Following the AGM, a wine reception will be held in the South Cloisters at UCL together with a display of posters. Those wishing to contribute a poster should contact the Secretary by Wednesday 3rd November to ensure adequate space is available. Poster boards have dimensions of 1m x 2m.

Changes to the Committee

The terms of office of the following Officers of the Committee come to an end at the 2004 AGM: Newsletter Editor and Publicity Officer. Nominations for these positions should be submitted to the Secretary by Wednesday 27th October 2004. Nominees, proposers and seconders should all be members of the Society.
The Chairman will stand down at the 2004 AGM, and the incumbent is ineligible for re-election. If you wish to consider standing for this position, please contact the Chairman <hwb20@aol.com> for information about the duties and responsibilities entailed.

Charles Downie Award 2004

The Charles Downie Award is an annual award made to the member of the Society who, in the opinion of the Committee, has published the most significant paper, in any journal, based upon his or her postgraduate research. The Committee has awarded the 2004 Charles Downie Award (best paper published in 2003) to *Dr Martin Pearce* for his paper: **Martin A. Pearce,** Ian Jarvis, Andrew R. H. Swan, Amanda M. Murphy, Bruce A. Tocher and W. Michael Edmunds, 2003. Integrating palynological and geochemical data in a new approach to palaeoecological studies: Upper Cretaceous of the Banterwick Barn Chalk borehole, Berkshire, UK. *Marine Micropaleontology* 47 (3-4): 271-306.
The committee received three nominations for the award. Dr Pearce will receive his award at the 2004 AGM.

Charles Downie Award 2005

Nominations for the best paper published in 2004 should be submitted either to the appropriate Specialist Group representatives or directly to the Secretary by 28th February 2005. Nominated papers can have either single or multiple authorship as long as the nominee is the senior author.

Honorary Membership

Honorary Memberships are offered to those individuals who have, in the view of the Committee, made an outstanding and sustained contribution to the Society. This year, the Committee decided to confer Honorary Membership to Prof Robin Whatley for his lifelong contribution to micropalaeontological education in Aberystwyth. Prof Whatley will receive his award at the 2004 AGM.

Grants-in-Aid 2004

The Secretary received three applications (Helga Bara Bartels Jónsdóttir, Jayne Dunn, Eleanor Maddison) for Grants-in-Aid by the deadline of 28th February 2004. The committee decided to support the applications by Jayne Dunn and Eleanor Maddison.

TMS Grants-in-Aid are awarded annually to help student members of the Society in their fieldwork, conference attendance, or any other specific activity related to their research which has not been budgeted for. Grants-in-Aid 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 once their grant has been used. Applications forms may be obtained

The Micropalaeontological Society AGM

The Cruciform Building, University College London
Wednesday, November 17th, 2004 at 2 pm

The AGM will be followed by two presentations:

"Pteropods; what the heck are they?"
Dr. Arie Janssen
National Museum of Natural History, Leiden, and Gozo

Pteropods are familiar to most people only as a name, primarily from 'Pteropod Ooze' the deep-sea sediment mapped by the Challenger Expedition in the nineteenth century. The talk explores the nature of pteropods as living animals and as fossils, with particular emphasis on biostratigraphical applications.

"Ancient Glacier Bodies, The case of Oetzi, The Tyrolean Iceman: Clues from Microscopic Plant and Animal Remains"
Dr. Jim Dickson
Institute of Biomedical & Life Sciences, University of Glasgow

Dr. Jim Dickson is highly involved in the forensic examination of the pollen and mosses associated with human remains found entombed within glaciers. He will be presenting the results of his detailed research on Oetzi, the so-called Tyrolean iceman who was discovered in September 1991 high in the Alps close to the Austro-Italian border. This 5,000 year old body has been thoroughly examined by numerous specialists and this presentation will illustrate the value of micropalaeontological remains in these investigations. Dr. Dickson is currently closely involved in the investigation of the first human remains ever discovered entombed in a glacier in North America. This specimen, whose native American name translates as Long Ago Person Found, may well provide interesting comparisons with the Tyrolean remains.

The presentations will be followed by a wine reception in the South Cloisters of UCL, sponsored by Ichron Ltd.

Grants-in-Aid 2005

TMS 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 that 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 expected to write a short report for the *Newsletter of Micropalaeontology* once their grants have been used.

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

Deadline for applications: 28th February 2005

from the Secretary <m.kucera@gl.rhul.ac.uk>. Deadline for applications is 28th February 2005.

Membership Database

The Society's database currently comprises 421 (435) individual members of which 222 (235) are resident in the UK, 102 (99) in Europe and 97 (101) in the rest of the World (2003 figures are in brackets). Your address label indicates whether or not you have renewed for 2004. Bold "LP" letters indicate you have not paid yet. Members who do not renew their subscriptions by the AGM (17th November 2004) will be struck off the database and will receive neither *Newsletter of Micropalaeontology* vol. 71 nor Part 2 of Volume 23 of the *Journal of Micropalaeontology*.

Treasurer's Report

Steve Packer
<s.r.packer@btinternet.com>

As the new TMS Treasurer may I firstly take to opportunity on behalf of the Society to thank Jim Riding for undertaking the Treasurer's job since 1995, and also not forgetting Mike Stephenson who stood in for a year whilst Jim was in Australia (1999-2000). On a related note, some of you are still sending TMS Treasurer post to Jim & Mike, so please now direct these items to me. If you have sent something to Jim or Mike recently however, don't worry it will get forwarded to me.

On assuming the Treasurer's position I undertook a review of the society's finances. Over the past few years Jim has been attempting to build up a working reserve equivalent to one issue of the Journal (c. 12K GBP). Having looked at the finances it is clear to me that the TMS needs to pursue this policy in order to have reasonable financial reserves to give us the flexibility to deal with changing or unforeseen circumstances. It is also clear that with an ever increasing commitment to electronic publishing and the associated costs the society will need to be able to provide the financial base to stay up to date. This is

likely to include funding a number of different set-up costs, for example paying for the conversion of back-parts of the Journal to pdf format, and the cost of subscribing to electronic publishers.
In order to meet new commitments, as well as deal with annual inflationary price increases for the Journal for example, we are as committee looking to increase revenue whilst keep costs to a minimum.
The Society will be increasing library subscription rates for the Journal this year, in line with levels suggested by the Geological Society Publishing House. We are also suggesting an increase in individual subscription rates for 2005, which will be formally proposed and voted on at the next AGM in November. The suggested subscription rates for 2005 will be:
Ordinary members £35.00 per annum (increase of £5.00)
Student / retired members £ 20.00 per annum (increase of £5.00)
The change to the student/ retired rate represents a greater percentage increase, however it should be noted that this rate has not increased for a number of years, whilst the ordinary member rate was raised in 2002 (to £30.00).
If have views on this proposed increase in subscription rates please feel free to contact either myself or other members of the committee and express your opinions prior to the AGM in November.
On related point, at the time of writing there are approximately 37 late payers for 2004. I have recently sent out reminders to those concerned and would be grateful if you could pay as soon as possible. The Society's policy in the past has been to remove non-payers from the mailing list if payment has not been received once reminders have gone out. (Copies of the 2004 subscription invoice can be downloaded from the website).
The Society does now have Gift Aid in place, which will allow us to reclaim tax on subscriptions and donations. I would urge UK tax payers to complete and return GA form if possible. The GA form can also be downloaded from the TMS website. Thank you to those of you who have already completed and returned forms.
The Society is also in the process of establishing a fund in memory of Alan Higgins who passed away this year. Proceeds from the A.C. Higgins fund will go towards helping students. If you would like to make a donation to this fund please send your cheques etc. to me. I would also remind members of the society that donations can be made to both the Higgins and Downie funds at any time.
The Society has run two very successful joint group meetings (Foram/Nanno, Copenhagen and Silicofossil/Palynology, Cardiff) this year. The Copenhagen meeting was part funded by a number of companies as well as the TMS. I would therefore take the opportunity to thank Shell, Amerada Hess, RWE-DEA, and ChevronTexaco for their contributions. This level of corporate sponsorship is much appreciated by the Society and provides an important source of funding for specialist meetings.

I look forward to seeing many you at the AGM.
Stephen Packer

New Members
We welcome the following new members to the Society:
Simon Cole
James Evans
Sean Feist
Tom Jones
Michael Knappertsbusch
Suzanne Maclachlan
Sebastian Meier
Richard Messenger
Olubunimi Olugbode
Ralf Schiebel
Pam Sidgwick
Charlotte Taylor
Stephen Whitehead
Brett Woodhouse

Journal Editor's Report

John Gregory
<john@jgregory.demon.co.uk>

I am pleased to report that the editor handover proceeded smoothly and I would like to thank Malcolm Hart on behalf of TMS members for safely steering the journal through the last 6 years.
Volume 23, issue 1 went out to members in May and the contents are listed below as well as at TMS website (www.tmsoc.org) and Ingenta (www.ingenta.com).
In terms of paper submissions, these have increased this year with 18 papers already submitted by June and as usual are represented by a wide range of topics and geographical regions.
One observation I have made already is that some

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.

Dr Michal Kucera, TMS Secretary,
Department of Geology, Royal Holloway, University of London, Egham Hill,
Egham, Surrey, TW20 0EX
Tel: +44 (0)1784 443586; Fax: +44 (0)1784 471780;
email: m.kucera@gl.rhul.ac.uk

Charles Downie Memorial Award Contributors

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

Higgins Fund

The Society is in the process setting up a fund in memory of Alan C. Higgins (1936-2004) whose full obituary will be printed in the next part of the *Journal of Micropalaeontology*. Alan Higgins was a founder member of the British Micropalaeontological Society (now The Micropalaeontological Society) and was founding Chair of the Conodont Group (now Microvertebrate Group) in 1970, and served again as Secretary from 1982-1983. Alan served as Society Secretary from 1977-1980, and as Chair between 1986-1989. Alan played a leading role in developing the application of conodonts in Carboniferous stratigraphy. He was a member of staff at the University of Sheffield before becoming Chief Palaeontologist at the Canadian Geological Survey and later a senior research worker and manager at BP. Alan held offices in a number of other learned societies including the Geological Society and the IUGS Subcommission on Carboniferous Stratigraphy. He was awarded Honorary Membership of The Micropalaeontological Society in 2002 in recognition of his significant contribution to the activities of the Society, to conodont research and to biostratigraphy and micropalaeontology in general. The wish of his family is that the funds generated will be used to support students.

If you would like to contribute to this fund, in memory of Alan Higgins, please send your donations to the Treasurer (cheques should be made payable to 'The Micropalaeontological Society'):

Dr. Stephen Packer
TMS Treasurer, Millennia Stratigraphic Consultants,
Unit 3, Weyside Park,
Newman Lane, Alton, Hampshire, UK, GU34 2PJ

contributors have submitted their papers in a style and format that does not conform to the Journal style. Just to remind authors, instructions are listed at the back of every issue and are also posted on Geological Society (www.geolsoc.org.uk) and TMS websites. In future, I will consider returning papers which do not conform to the Journal style as I have no wish to take up reviewers valuable time. I would also like to take this opportunity to thank all referees for their sterling efforts in refereeing manuscripts.

One facet of the Journal I will be encouraging authors to consider is the use of colour plates and figures. The publishers are committed to keeping costs down, but as the society is not cash rich, we have to ask authors if they could approach their institutes or funding bodies for sponsorship of their colour plates. There will be one palynological article in the next issue which particularly benefits from the use of colour plates, and I hope to include a much bigger paper with colour plates in the first issue of 2005.

The journal has been online for a couple of years now with Ingenta (www.ingenta.com), but this has been only a pay per download service with free viewing of content and abstracts. The committee has decided that members should be able to freely download Journal papers as one of their subscription benefits (please see the announcement in the newsletter and on the TMS website). We are trialling this service and will be reviewing it regularly, so keep an eye out at the TMS website for any changes.

Journal of Micropalaeontology
Volume 23, Part 1, May 2004
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5. **Late Neogene-Quaternary radiolarian biostratigraphy: a brief review**
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10. **Cyclic changes in oxygenation based on foraminiferal microhabitats: Early–Middle Pleistocene, Lucania Basin (southern Italy)**
S. Stefanelli

Newsletter Editor's Report

Jennifer Pike
<pikej@cardiff.ac.uk>

It is not often that I say a few words about the Newsletter, however, on this occasion I would just like to apologise to those members who were impacted by the errors and missing pages in the last Newsletter. The Ostracod Group was particularly badly hit, as was Jim Riding's final Treasurer's Report and John Gregory's book Review. The review of "Radiolarians in the Sedimentary Record" is being reprinted in it's entirety in this Newsletter. My reign as editor of the Newsletter comes to an end at this year's AGM in November. Anyone who is interested in taking on this position within the Society is urged to either contact myself, or the Secretary or Chair.

Webmaster's Report

Andrew Henderson
<a.henderson@nhm.ac.uk>

The new Society website is now live, please check http://www.tmsoc.org. I would welcome any suggestions, comments and more importantly, any items for inclusion. I would like to see the website of

ANNOUNCEMENT

Journal of Micropalaeontology
Free Online Access and downloading of Journal Article pdfs from Ingenta (www.ingenta.com)

I am pleased to announce that all members of The Micropalaeontological Society with up to date subscriptions will be able to access and download pdfs of papers from the current issue of the Journal and any archived volumes uploaded to the Ingenta website.

We are trialling this type of online access and are using Ingenta (www.ingenta.com) as our online provider for the moment. At present anyone can view the Journal contents and abstracts for free, and can download papers as a Pay Per View service.

TMS has negotiated a trial period to allow society members to download pdfs of papers for free as one of their membership benefits. This service has now been activated and is password protected; for more information on how to register and obtain passwords please follow the instructions below, or see the TMS website (www.tmsoc.org).

John Gregory
(Editor, Journal of Micropalaeontology)

How to activate your personal TMS Journal of Micropalaeontology subscription via Ingenta

You will need your society membership number. This is printed on your Newsletter address label. Alternatively, you should obtain this from Michal Kucera, TMS secretary at m.kucera@gl.rhul.ac.uk.

1) First register with Ingenta by going to www.ingenta.com and following the "register" link.

N.B. If you have already registered with Ingenta, go to www.ingenta.com, log in and follow the "manage my Ingenta" links to request online access to your subscriptions.

2) Follow the "personal registration" links, where you will be asked to enter your contact details and select a username/password. You will be contacted by email to confirm your registration and username/password details.

3) Once registered, you will be given the option to activate your online subscriptions via the "add new subscriptions" page. To set-up your online subscription(s) please search and browse for a publication, select the relevant publication(s) and supply your subscription number(s). If you are a society member, please enter your society membership number in place of the subscription number.

You will be contacted by email once your subscription has been verified and online access has been enabled.

the Society become an important site for the micropalaeontology community so I would welcome any pictures, information or articles that members would like to see uploaded onto the website. It is your website and I hope to see more contributions in the future. I would be happy to publish anything pertinent to the field of micropalaeontology (e.g. forthcoming meetings, useful URLs, image galleries, field-trip photographs, "unknown" microfossils etc.). A website is only as good as its content, so let me know what's going on out there!

Specialist Group News

Foraminifer Group

Andrew Henderson
<a.henderson@nhm.ac.uk>

The Spring meeting this year saw the Foraminifera Group join forces with the Nannofossil Group for a very successful event. An excellent turnout of around 50 members provided a very busy meeting with a well attended field trip to the K-T sections at Stevns Klint. More details of the meeting are to found elsewhere in the Newsletter. This meeting marks the second venture out of the UK for the Foraminifera Group and a trend which I would like to see continue. The joint meeting also proved to be a huge success and I am sure we will see many more of this type of meeting (see below for details of next years meeting). This year was my final year as Chairman, Joachim Schoenfeld (GEOMAR, Kiel, Germany) has kindly accepted the position and I know that members will support him in future endeavours. I also would like to take this opportunity to thank Michal Kucera who has moved from his position as Secretary of the Foraminifera Group to Secretary of the Society. Welcome to Daniela Schmidt (Royal Holloway, London), who takes over from Michal. Thanks also to members of the Society for their support over the last three years.

As we go to print, we can announce that the next joint Foraminifera/Nannofossil Group meeting in Spring 2005 will be held in Southampton and organised by Ralf Schiebel and Jens Herrle. Further details from Daniela Schmidt <d.schmidt@gl.rhul.ac.uk>.

Microvertebrate Group

Henning Blom
<Henning.Blom@edc.uu.se>

The 2004 Microvertebrate Group Meeting will be held in conjunction with the Palaeontological Association Annual Meeting, December 17-20th, Lille, France. As usual we are planning a one day meeting (December 16th), spending the day looking for vertebrate bits in the field and the evening in a session of talks. Details are yet to be decided, but it is very likely that all activities will be held in the vicinity of Lille, which suggest that we will visit Devonian and/or Carboniferous localities. For further details please contact Henning Blom.

Nannofossil Group

Emma Sheldon & Steve Sarkie
<es@geus.dk>
<steve.starkie@datumstrat.com>

TMS Spring Meeting, Copenhagen
May 13th –15th 2004

The joint Nannofossil and Foraminifera Group Spring meeting took place in Copenhagen (May 13th-15th) and was kindly sponsored by RWE-Dea, Amerada Hess (Denmark) ApS, Shell Explaration & Production Europe, Chevron Texaco Energy Technology Company as well as GEUS (The Geological Survey of Denmark and Greenland) and the Geological institute (Copenhagen University). This meeting was attended by approximately 45 people from 10 countries. The short meeting kicked off in the Geocenter Rotunden with an evening ice breaker and welcome by Haydon Bailey.

On the Friday, after a brief welcome by Minik Rosing (Head of the Geological Museum in Copenhagen) Hans Jørgen Hansen gave a memorable opening speech ''Was there, or was there not a meteoritic impact at the K/T boundary?'' This was followed by four sessions of diverse, high quality talks (the speakers and chairmen are thanked for their precision timing, we successfully managed to keep to our timetable almost exactly!). The variety of subject matter presented was impressive, ranging from 'Foraminifera and nannofossils in the Western Interior Sea, Canada' (Claudia Schröder-Adams & Jim Craig) to Microfaunal and nannofossil analyses of samples from the Silverpit Crater, British Sector, North Sea' (Dave Jutson, Mike Bidgood & Ben Johnson) and from 'Comparison of Quaternary upper ocean water changes between the Southern and Northern South

Journal of Micropalaeontology Sale of Back Issues

TMS has a considerable number of back issues of past volumes of the Journal of Micropalaeontology and is having a one off sale in order to try and clear much of this back stock. Not all volumes are available, but we certainly have the majority of the Journal's first 21 volumes for sale at the give-away price of **£1 per issue** plus postage and packaging.

Should you wish to purchase back issues of the Journal, then please use the tear off slip below.

Volume 1 to Volume 4, part 1 are already sold out.

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Fax: (01707) 665248 email: haydonbailey@btconnect.com

China Sea' (Jian Xu *et al.*) to 'The effects of rising CO2 on coccolithophore calcification' (Markus Geisen *et al.*).

Presentations involving nannofossils, foraminifera, a mixture of the two and even calcareous dinoflagellate cysts were presented; as the aim of the meeting was to promote the integration of the disciplines, we feel that goal was successfully reached. A selection of foraminifera, nannofossil and multidisciplinary posters was also exhibited. The abstracts of all posters and oral presentations are presented in this newsletter and also as 'GEUS Rapport 2004/50' (Report of the Geological Survey of Denmark and Greenland).

A well attended meeting dinner took place on the Friday night after the presentation sessions; the amount of alcohol consumed probably explained a few of the absentees the next morning at the field excursion to Stevns Klint to look at the K/T boundary sections. Most of us arrived at Stevns by the coach transport provided, apart from Malcolm Rider who ''missed the bus'' (!) and arrived by taxi which only set him back £70! We started off at the old Højerup Church where Tove Damholt ran through a brief history of the church and the local history and Hans Jørgen Hansen and Eckart Håkansson explained the geology once down on the beach. Lunch was followed by a visit to the local museum and then we headed south to Rødvig to sample the K/T boundary section before heading back to Copenhagen. Those intrepid types who managed to collect samples, please let us know what you found, maybe just some good photos of what you find, or a taxonomic note, or a full blown joint paper for the journal…..it would be nice to see some joint cooperation here.

Thanks to Hans Jørgen, Eckart (both Copenhagen University), Tove (Østsjællands Museet) and Lars Stemmerick (GEUS) for leading the excursion. If anyone has any photos of the meeting / field trip, please mail them to Andy Henderson (A.Henderson@nhm.ac.uk) and they may be added to the TMS website. Thanks to everyone who attended for making this an enjoyable, informative and informal meeting. A special thanks to all the folk from behind the scenes; Steve Starkie and Andy Henderson, Svend Stouge (GEUS / The Geological Museum), Hanne and Jette from GEUS Stratigraphy Department, and Maria, Jakob, Line, Sara and Bettina from the Geological Institute, without whose help I would have gone mad!

Another Meeting

Due to the success of this small meeting, another joint meeting for next year or maybe the following year is presently being discussed….various locations have been discussed including France and the UK again. If any institutes or industrial bodies feel they would like to establish a meeting, would they please contact the TMS Committee directly. The success of forging links between the specialists working in various fossil groups is a noble thing and following on from the success of the Copenhagen meeting, should be encouraged in order to strengthen the TMS as a whole.

More Meetings?

If anyone has attended any meetings or courses over the last few months, this is the place to let folk know how they were.

New Chair and Secretary for the Nannofossil Group

At the next AGM in November Steve Starkie's and my time as the nannofossil group chairman and secretary will be up. At the Spring meeting, we had offers (or were they forced…?) from Michael Knappertsbusch (Switzerland) and Jeremy Young (The Natural History Museum) as possible candidates, but any other candidates will be considered for the posts (please contact your TMS Committee representative). The past two years have seen a slight 'industrial' bent to the nannofossil group and Steve and I are keen to see the industrial emphasis continue, at least to some extent when the new chairman and secretary take over. One way of ensuring this happens is to possibly have one person from academia and one person from industry filling the posts. We feel this will promote cross fertilisation between industry and academia (also a success in Copenhagen!) ….if anyone has comments or suggestions regarding this, please let us know.

Top Tips …

Ever had a problem with excess nearly cured glue around the edge of your coverslip when you have made a nannofossil preparation? Well read on. Try taking a baby wipe, or the wipes they give you on planes when you have had your meal, you know the ones in the foil packets in the plastic packs containing your really useful plastic knife and fork! Wipe your slide with one of these and you see it gently remove the excess glue with ease. The slight alcohol content of the wipe cleans the slide a treat. It also makes them smell good too!!!! Don't knock it until you try it!!! Have you any top tips you find useful when preparing or analysing your preparations? Let us know about them.

Up and Coming Meetings

Two meetings to note for the summer:

Pre IGC workshop, Florence, Italy (18th-19th August 2004)

Photos from the fieldtrip …

Stevns Klint showing Danian and Maastrichtian chalk

Jeremy young finds skull of 'Maastrichtian Man'

Steve Starkie and Matt Hampton point to the K-T boundary at Stevns Klint

Stevns Klint in the sun

As part of the 32nd International Geological Congress to be held in Florence a nannoplankton workshop entitled "Past and future contribution of nannoplankton research to global change questions" is being held before the congress begins. See **Forthcoming Conferences** later in this Newsletter for further details.

INA 10, Lisbon, Portugal (August 28th – 4th September)

Hosted by the University of Lisbon, the tenth International Nannofossil Association conference is running the theme 'Focus on the smallest, understand the global'. See **Forthcoming Conferences** later in this Newsletter for further details.

Short Course in Applied Micropalaeontology, Bonn, Germany (October 5th-8th 2004)

This short course is held at the Department of Palaeontology, Bonn University and is designed to give the participants an introduction to, and an understanding of, the methods that have been developed to apply micropaleontology to the

requirements of the hydrocarbon industry. Registration fees are 80 euros for students and 200 euros for professionals; registration can be carried out by mailing Dave Jutson (david.jutson@rwedea.com). For more information, please visit the course website at www.paleontology.unibonn.de/mitarbeiter/LANGER/INDEX.HTM

That's about it really, have a good summer
Emma & Steve

Ostracod Group

Alan Lord
<a.lord@ucl.ac.uk>

Meeting Reports:
Spring Meeting 2004, Chatham, 5-7 March 2004
Attendees: Dr Ian Boomer (Newcastle), Dr David Horne (Queen Mary University of London), Prof. Alan Lord (UCL) and Dr Ian Slipper (Greenwich).
A select group met in the University of Greenwich at Chatham Maritime, entertained by Ian Slipper as Local Secretary. On Saturday 6 March the following presentations were made:
Dave Horne '**Key Events in the Ecological radiation of the Ostracoda**'
A discussion of ostracod non-marine colonisation (once or twice?) and *Cypridea* ancestry and descendents.
Ian Boomer '**Size and sieve-pore variability in *Cyprideis torosa* (not again!)**'
New thoughts on an old and controversial topic.
Ian Slipper '**An Age Determination using Ostracoda**'
Cretaceous ostracods *can* help determine sample age.
Ian Boomer '**On the trail of the original *Limnocythere inopinata* (Baird, 1843)**'
Tracking down a nineteenth century type locality in modern urban west London.
Dave Horne '**Musings on Mars – *Spirit of Opportunity* for Micropalaeontologists?**'
A Business Meeting discussed:
1. Timing of meetings – first weekend of March not popular in 2004, in contrast to a well-attended Leicester meeting in 2003. Scarborough field meeting to be reconvened in September 2004.
2. History of Micropalaeontology book proposal to TMS. Distinguished ostracod workers who might be considered for inclusion: Anderson, Canon, Jones, Norman, Robertson, Sylvester-Bradley [Brady has been reviewed in *Journal of Micropalaeontology*].
On Sunday 7 March the group travelled to Charing, Kent to sample the 'Chalk Detritus', a Quaternary hill wash deposit of Cretaceous sediment from which many fossil species were described in the nineteenth century, particularly ostracods by T.R. Jones, and currently being studied by Ian Slipper. Temporary exposures in a building development yielded samples. Ostracods recovered from this site are listed in table below:
One sample (No. 1; grid ref TQ949495) was analysed for calcareous plankton to calibrate the age range of

Schuleridea jonesiana
Neocythere vanveenae
Neocythere denticulata
Bythoceratina umbonatoides
Mandocythere harrisiana
Protocythere albae
Cythereis thoerenensis
Cythereis humilis
Pterygocythere spinosa
Bairdoppilata spp.
Macrosarisa siliqua
Pontocyprella harrisiana
Rectangulocyprella bosquetiana
Cytherella truncata
Cytherella ovata
Cytherelloidea hindei
Planileberis foveata
Cythereis longaeva

ostracods described from the deposit: Late Cenomanian-Turonian with rare Albian species of planktonic foraminifera [M.K. BouDagher-Fadel (UCL)] and Early Cenomanian nannofossils [O. Varol (Varol Research)]. The unexpectedly short range nannofloral assemblage probably reflects different sampling methodologies for nannofossils as opposed to foraminifera.
The party also sampled a temporary pond south west of Charing (TQ 946492) from which Dave Horne and Ian Slipper had earlier found live *Eucypris virens* (Jurine, 1820), *E. lilljeborgi* (G.W. Mueller, 1890) [probably first genuine UK record] and *Bradleystrandesia fuscata* (Jurine, 1820).
After an abortive search for Pliocene Lenham Beds, and a large lunch in Charing, the party dispersed.
Many thanks to Ian Slipper and Dave Horne.

20ème Réunion des Ostracodologistes de Langue Française

Réserve Naturelle Géologique de Saucats-La Brède, Bordeaux, 7-9 May 2004.

Dave Horne and Alan Lord attended the meeting in Bordeaux, held in the area of the Aquitainian stratotype section reserve. The meeting was well attended with delegates from Australia, Germany, Italy, Portugal, Spain, Switzerland and Tunisia as well as France. On Friday 7 May, following the customary 'Tour de table', eleven presentations were given on ostracods and on the regional and local geological setting of the Réserve Naturelle Géologique de Saucats-La Brède. Following a reception in the reserve museum given by the Mayor of Saucats, and dinner, the company was entertained by the Eric Braccini Trio. Unfortunately Eric was without his two partners, but he gave fine solo performances reinforced by Dave Horne and Yves Gilly.

On Saturday 8 May the morning was spent examining a number of the geological sections of the reserve. The sections have been conserved and explained in an excellent fashion, although of course samples cannot be taken. In the afternoon a visit was made to the Station Biologique d'Arcachon.

The Réserve Naturelle Géologique de Saucats-La Brède is in the Graves wine region of Bordeaux and on Sunday 9 May a geological-viticultural tour was led by J.-L. Viviere. The geology of the area, including the terraces of the Gironde river, was explained, culminating at the Château La Louvière, Léognan with an inspection of the facilities and stored wine, and sampling of the fine (but expensive) product.

Many thanks to Pierre Carbonel, Jean-Paul Colin and colleagues for organising an excellent meeting. The 21ème Réunion des Ostracodologistes de Langue Française will be held in Tétouan, Morocco in 2006.

Forthcoming meetings:

TMS Ostracod GroupAutumn Meeting 2004

A field meeting will be held in Scarborough over the weekend of 17-19 September, in partnership with Hull Geological Society. Professor Pete Rawson (UCL) will lead collecting in the Lower Cretaceous Speeton Clay at Speeton and Upper Cretaceous chalk at Flamborough Head. Collection of living freshwater material is also planned. Please advise Alan Lord if interested in attending.

15th International Symposium on Ostracoda

Berlin, 12-15 September 2005. Organiser: Dr Michael Schudack.

Website: http://userpage.fu-berlin.de/~palaeont/iso15/iso15-main.htm

Publication

The ISO13 (Chatham, 1997) field guide 'In the Footsteps of T.R. Jones: Lower Palaeozoic of Shropshire and the Post-Palaeozoic of Avon, Dorset and Kent', D.J. Siveter and A.R. Lord (Editors) has been reprinted and copies are available from Alan Lord (£5.00 postage included).

Ostracod Group Membership

TMS members interested in receiving regular information about Ostracod Group activities are requested to contact Alan Lord.

Palynology Group

Susanne Feist-Burkhardt
<s.feist-burkhardt@nhm.ac.uk>

The **annual meeting of the Palynology Group** was held this year in conjunction with the Silicofossil Group, 9-10 June 2004 in Cardiff. It was a very successful meeting with this time even international participation. Quite a few TMS palynologists made their way to beautiful, sunny Cardiff to listen and exchange ideas on how silicofossil and dinoflagellate cyst studies can complement one another. Cathy Stickley from Cardiff, Henk Brinkhuis from Utrecht (The Netherlands), and myself acted as the convenors of the meeting. Cathy did a very good job as the local organiser of this most interesting and pleasant get-together and I want to express my sincere thanks on behalf of the Palynology Group to Cathy Stickley, Ivo Grigorov, and all the others involved in the organisation of this meeting. Cathy's report, including the abstracts of the presentations can be found elsewhere in this Newsletter.

Symposium conjoint/*Joint meeting*

APLF-TMS

(Palynology Group)

3-7 octobre 2005

PALYNOLOGIE
PALÉOLATITUDES,
PALEOALTITUDES

Répartition des ensembles continentaux et océaniques au cours du temps : influence sur le climat et la biodiversité

AUDITORIUM DE LA GRANDE GALERIE

Muséum national d'histoire naturelle

36 rue Geoffroy Saint Hilaire, 75005 PARIS, France

PALYNOLOGY,
PALAEOLATITUDES,
PALAEOALTITUDES

Land/ocean distribution patterns controlling climate and biodiversity

1ère Circulaire/1st Circular

Comité scientifique / *Scientific committee*

Jacques-Louis de BEAULIEU, IMEP-LBHP, Marseille
Ian HARDING, Southampton
Guy HARRINGTON, Birmingham
Martin HEAD, Cambridge
Marie-Pierre LEDRU, Montpellier
Jean-Marc MORON, TOTAL, Pau
Denise PONS, UPMC, UMR-CNRS 5143, Paris
Hervé RICHARD, UMR-CNRS 6565, UFR Besançon
Thomas SERVAIS, UMR-CNRS 8014, Villeneuve d'Ascq

Comité d'organisation / *Organising committee*

Edwige MASURE, UPMC, UMR-CNRS 5143, CEPAGE, Paris
Susanne FEIST-BURKHARDT, The Natural History Museum, London
Jean DEJAX, MNHN, USM 203, UMR-CNRS 5143, Paris
Paul DODSWORTH, ICHRON Ltd. Cheshire
Jean BROUTIN, UPMC, UMR-CNRS 5143, Paris
Jean-Louis TURON, DGO/UMR-CNRS 5805, Bordeaux, Président APLF
Nathalie COMBOURIEU-NEBOUT, LSCES, UMR-CEA-CNRS 1572,
Monique TROY, secrétariat, CNRS, UMR 5143, Paris

Frais d'inscription - ***Registration fee*** **: 100 € jusqu'au/*until* 15/7/2005 ; 110 € après le/*after* 15/7/2005 ; étudiants/*students* 50 € jusqu'au/*until* 15/7/2005 ; 55 € après le/*after* 15/7/2005**

Payment : next circular

Délais - ***Deadlines*** **: 15/11/2004 pre-inscription ,** ***pre-registration*** **; 15/7/2005 résumé,** ***abstract***

Publication : Revue de Micropaléontologie

Renseignements : (++33) (0)1 44 27 47 86 / (++33) (0)1 44 27 49 87 / palstrat@ccr.jussieu.fr

The Micropalaeontological Society

BULLETIN D'INSCRIPTION / *REGISTRATION FORM*

A renvoyer de préférence par courriel à l'adresse suivante / *The following information are to be sent preferably by email to :*

palstrat@ccr.jussieu.fr

Adresse/*Address* : Monique Troy, UMR5143 "Paléobiodiversité et Paléoenvironnements"
4 place Jussieu, case 117 – 75252 Paris cedex 05 France

Nom, prénom / *Last name, first name* .....
Organisme / *Affiliation* .....
Adresse / *Address* .....
.....
.....
Ville / *City* .....
Code postal / *Zip code* .....
Pays / *Country* .....
Téléphone / *Phone* .....
Fax .....
Courriel / *E-mail* .....

J'ai l'intention / *I intend*

d'assister au symposium / *to attend the meeting* ☐

de présenter une contribution / *to give a presentation* ☐

Orale / *oral* ☐
Poster / *poster* ☐

Titre préliminaire de la communication ou du poster / *Preliminary title of the oral or poster presentation :*

.....
.....
.....
.....
.....

Les instructions pour la présentation des résumés et posters, ainsi que les informations relatives au paiement des droits d'inscription seront incluses dans la seconde circulaire.
Details on abstract and poster format, and instructions for registration fee payment will be included in the second circular.

IMPORTANT: **Un dîner sera organisé le mercredi 5/10/2005-*A dinner will be organised on Wednesday 5/10/2005.***
Je suis intéressé de participer au dîner / *I am interested in attending the dinner*

Oui / *Yes* ☐ Non / *No* ☐

Pour organiser celui-ci au mieux, nous vous demandons de nous indiquer au plus vite si vous êtes intéressés. Nous disposerons de 50 places dans un restaurant situé à proximité de l'Université, le prix demandé *(à régler en même temps que les frais d'inscription)* sera de l'ordre de 45 €. / *To help in the organisation of this event, we ask you to indicate as soon as possible if you are interested in attending the dinner. We have made a reservation in a restaurant close to the University, where there are 50 places available. The price for the dinner (including wine) will be around 45 €, to be paid at the same time as the registration fees.*

The **next year's meeting of the Palynology Group** is in full preparation. This will be a special meeting again, since it will be held together with our French colleagues from APLF, the Association of French Palynologists, in Paris from 3 - 7 October 2005. As it is tradition in APLF meetings there will be a theme: *"Palynology, Palaeolatitudes, Palaeoaltitudes: Land/ocean distribution patterns controlling climate and biodiversity"* as well as open sessions. Edwige Masure from Paris University Pierre et Marie Curie is the local organiser. She was very busy already making all kinds of preparations for the meeting and thanks to her efforts our venue will be the *'Auditorium de la Grande Galerie'* at the Natural History Museum in Paris. We are currently trying to get the keynote speakers together who will give an overview of recent developments in their research areas pertinent to the overall symposium theme.
I want to urge you to make every effort to attend this, our (!) meeting in Paris. In many countries, and Britain is not excluded, training, research and job opportunities in palynology are becoming rare and rarer, and palynologists will become "endangered species". The more this trend continues, the more it is important to concentrate our forces and to strengthen our European bonds. So please come along to our joint meeting in Paris. The call for papers is out. You will find the first circular and the pre-registration form for the meeting in the present Newsletter. And remember to be quick in indicating your interest in attending the nice dinner we are going to have. There are only a limited number of places available and you won't want to miss it. We would appreciate to receive your pre-registration and indication of a title of your presentation by 15 November 2004.

Silicofossil Group

Catherine Stickley & Ivo Grigorov
<cathy@earth.cf.ac.uk>
<ivo_grigorov@hotmail.com>

The accidental and untimely death of our friend and colleague Jean-Jacques Pichon, on 9 November 2003 was a shock to us all. Jean-Jacques was a CNRS Research Scientist at the Department of Geology and Oceanography, University Bordeaux I, he was 49. We find the words of his former research students, Leanne Armand and Xavier Crosta, very fitting; they wrote to the DIATOM-L listserv, "As a diatom paleoceanographer for more than 20 years, he was a pioneer on quantitative Southern Ocean paleoceanography. Jean Jacques has always been very actively involved into the preparation and active running of research cruises in the Southern Ocean on the French RV *Marion Dufresne I* and follow-up RV *Marion Dufresne II* since their inception in the 1980s. Those who had the chance to share ship-time with him remembered his constant good mood, availability, and working efficiency. Jean Jacques Pichon is survived by his beloved wife and two children to whom we address our sincere condolences". The Micropalaeontological Society would also like to express condolences to his family, friends, and all those he inspired and influenced in diatom world, he will be sorely missed.
June saw the first joint meeting of the Silicofossil and Palynology Groups, held over 2 days (9-10th) in the School of Earth, Ocean and Planetary Sciences, Cardiff University. Judging by the turn-out and enthusiasm, it seemed such a gathering had been long awaited. You can read the meeting report and full abstracts of all the presentations elsewhere in this newsletter, but here we'd like to say a big thank you to all those who took part. It was a fun and informative meeting, a first-step towards spreading the word on the integration of both fossil groups and certainly worth the effort of organising. On the back of this initial success, we're motivated to continue holding joint meetings of this nature, say, on a regular basis (in addition to our regular group meetings). Watching this space for future announcements is a good idea, although for more frequent updates in-between newsletter editions, we recommend getting yourself on our email list since this is the way we can more effectively communicate with you. Contact Cathy or Ivo - we will be happy to add you to our list.
We're delighted to announce that Simon Nielsen successfully defended his Ph.D thesis in March this year. His research on "Southern Ocean Climate Variability", was supervised by Nalan Koc (Norwegian Polar Institute, Tromsø) and Xavier Crosta (Department of Geology and Oceanography, University Bordeaux I). He was connected to the University of Tromsø through Morten Hald. Simon has recently taken up a 3-year postdoctoral position at the University of Florida to work with David Hodell (University of Florida) for the first two years and Lloyd Burckle and Bob Anderson (both Lamont-Doherty Earth Observatory, Columbia University, NY) for the last year. The first 2 years will involve the study of ice-rafted sediments (petrological composition, geochemical analysis), stable oxygen isotope analysis and analysis of radiolarians, sponge spicules and bryozoans. The last year is dedicated to diatom work at LDEO. The aim of the project is to trace ice-rafted layers within South Atlantic sediment

cores to determine their provenance, while the microfossil work will be used to establish the boundary conditions during these 'South Atlantic IRD' events. We wish him the best of luck in the States.

It must be something in the air as we are also delighted to announce that our very own Group Secretary Ivo Grigorov (Southampton Oceanography Centre) passed his Ph.D. entitled *Southern Ocean Palaeoceanography of Laminated Sediments*, in July. Ivo was supervised by Alan Kemp (SOC) and worked on Ocean Drilling Program Leg 177 from the South Atlantic as well as USJGOFS-AESOPS moored sediment trap array in the Southwest Pacific with the aim to test whether deep-sea diatom mats can be used as a temperature-independent proxy for the location of the Antarctic Polar Front, on geological timescales.

A few thoughts about our future plans within the Silicofossil Group. We generally attract fewer participants to our meetings than do, say, the calcareous groups to theirs. This reflects, in part, a fewer number of silicofossil workers in general. However, it is also a reflection of our relative infancy as a group (founded in 1998) within the Society. It occurred to us that a good many European silicofossil workers probably are unaware that the group exists, judging by the list of names—and relative lack thereof of European silicofossil specialists, in the TMS directory. Without overlapping with other organisations, e.g., The International Society for Diatom Research, we feel we have a very worthy and necessary role to play in bringing together diatomists and radiolarian workers throughout the UK and Europe, via the web, email and workshops. Since the Society dropped the "British" part of its name a couple of years ago, there is no time like the present to push forward with promoting ourselves (and along with it, the Society in general) within Europe and elsewhere. This is our job (Cathy's and Ivo's) as the Silicofossil Group representatives. However, you could assist us greatly by providing us with some information regarding any recent silicofossil projects (that means anything from diatoms, radiolarians, silicoflagellates, Ebridians, phytoliths, etc.) you or your students have undertaken. You may have noticed in the past that our 'project news' has revolved around what's been happening within the UK—we're not biased, its purely that we're unaware what interesting things the rest of you have been doing! Tell us, and we'll print it in this newsletter—remember, it will be seen by over 400 TMS individual members globally, as well as be displayed by our ~200 library and instituional members.

The First Joint Meeting of the Silicofossil and Palynology Groups, 9-10 June 2004, School of Earth, Ocean and Planetary Sciences, Cardiff University, UK.

Question: What do you get if you mix ***dinoflagellates*** with ***diatoms***?

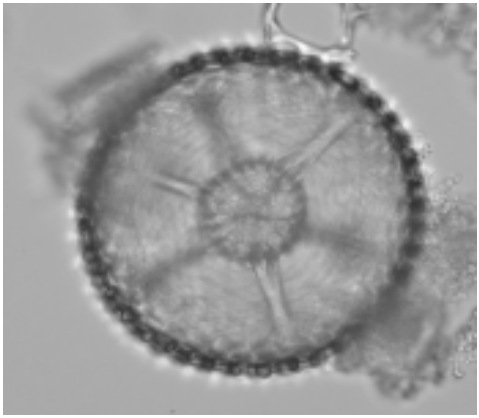
Answer: A ***daft diet, all slime ` n O_2-gas***! [anagram; go on, try it!].

While some diatomists may object to being described as specialists in the study of slime (apologies, but you know what we mean), it's a meaningful play on words. Firstly, dinoflagellates, at least the heterotrophic ones, are suspected to dine on such a diet of diatoms (there's another pun in there somewhere about delicious siliceous…!) and secondly both (phyto-)plankton groups have an extremely important role to play in the exchange of gases between ocean and atmosphere, and therefore in the carbon cycle. Applying such ideas to the past, these are two very good reasons for the joint study of both groups in the fossil record.

Question: What do you get if you mix dinoflagellate cyst specialists with silicofossil specialists?

Answer: A mini-symposium at Cardiff University on 9-10 June 2004.

The idea for such a gathering had been discussed a few years back between us (CES and HB) following our participation in ODP drilling to the Tasmanian Gateway (Leg 189, March-May 2000). Here, nearly 240m of Eocene sediments containing silicofossils (diatoms, ebridians, radiolarians, silicoflagellates) and dinoflagellate cysts, both in such abundance and beautiful state of preservation to keep any



Entapium regulare (?) Sanfilippo and Riedel. Palaeocene. DSDP 43-384-9-5 (38-40cm) northwest Atlantic. See Jackett & Baumgartner abstract p53.

micropalaeontologist busy for a lifetime. It was not, of course, the first time silicofossils and organic-walled microfossils had been recovered together, but it gave us the motivation to integrate our results, particularly in the absence of co-occurring calcareous microfossils. The idea behind a joint meeting of like-minded specialists was an attempt to demonstrate how effectively both groups can be integrated and to encourage discussion on how we, as specialists of either group, might work together in a broad sense. This of course, would be the way forward for any integrated microfossil study, however, the approach is more challenging than for, say, the calcareous groups since we tend to routinely destroy each others specimens in the lab even before we get to the microscope! Preservation may be another issue, but in fact you'd be surprised how often biogenic silica and organic matter are preserved together.

Unity of both silicofossil and organic-walled microfossil groups is, therefore, entirely achievable, as demonstrated by a number of the presentations at the meeting. Instead of summarising each presentation here, we invite you to read the abstracts printed below for a more detailed insight into the sorts of work being undertaken. We wish to extend our thanks to all those who took part in the meeting, contributor or spectator, and for helping to make it a success and lots of fun. We hope we got the message across that as specialists in either group we can work together in many ways and that you were inspired by the work of those you were not previously familiar with. In this respect, the meeting was a necessary first step in the right direction. Two of the presentations also involved calcareous nannofossil data, which goes to show there is no reason why we shouldn't also involve the other groups in future.

Despite a bomb scare at Swindon train station, which meant some unfortunate London delegates made it no more than halfway to Cardiff, we were very encouraged by the attendance of over 30 (more than expected). It was especially good to see quite a few of you from overseas, since one of our aims within the society, having dropped the "British" part of the Society's name 2 years ago, is to reach out beyond the UK. Judging by the excellent presentations and the lively follow-up discussions during the wine-reception and the group dinner at *La Trattoria Pulcinella*, we feel it was a very useful experience worth repeating, say, in another 2 years. Utrecht University has been offered as a possible venue for the next one (thanks Henk); we'll certainly keep you informed on progress towards that. In the meantime, HB and CES are convening the following session at the AGU Fall Meeting (San Francisco, December 13-17, 2004): **PP13: From Greenhouse to Icehouse: Palaeogene Global Change, Phytoplankton response, and atmospheric carbon removal**, which we encourage you to submit an abstract to. Further details on this session and how to submit an abstract are available at the American Geophysical Union website http://www.agu.org/meetings/fm04/ See you there!

At time of this newsletter going to print, there are a few copies left of the programme and abstract volume for the June meeting, which includes a participant list. If you'd like one, please contact Cathy (cathy@earth.cf.ac.uk)

Catherine Stickley (Cardiff), Susanne Feist-Burkhardt (NHM), Henk Brinkhuis (Utrecht)
The Meeting Co-Conveners

Specialist Group Meeting Abstracts

There have been two joint TMS specialist group meeting this year so far. The Foraminifera and Nannofossil Groups got together in Copenhagen in May, and the Silicofossil and Palynology Groups got together in Cardiff in June. The talk and poster abstracts from both meetings are reproduced below.

Joint Foraminifera and Nannofossil Group Spring Meeting, Copenhagen May 13th –15th 2004

Participants at the joint meeting, Copenhagen

Talk Abstracts

Keynote: Was there, or was there not a meteoritic impact at the K/T boundary 65 million years ago?
Hans Jørgen Hansen
Geological Institute, University of Copenhagen, Oster Voldgade 10, DK-1350, Denmark

Extended abstract printed in GEUS Rapport, available from Emma Sheldon <es@geus.dk>

Development and application of an integrated biostratigraphical model for the South Arne field, offshore Denmark.
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Prior to initiating the horizontal development well programme on the South Arne field, offshore Denmark, the operators Amerada Hess A.S. undertook a review of the existing micropalaeontological and nannoplankton database on the original discovery and exploration wells. Since 1998, as each additional well has been drilled the biostratigraphic data generated has been integrated into the existing model used on the rig by on site biostratigraphers.
The model for the main Tor Formation reservoir was tested, evaluated and updated with each new well into a different sector of the field. In addition to this, the biostratigraphic zonation of the Ekofisk Formation has been completely reviewed during a series of major studies through this formation. These have resulted in the

recognition of additional foraminiferid and radiolarian marker events which have been carefully calibrated with the controlling nannoplankton zonation. The current stratigraphic model for the south Arne field is presented. The microfaunal content has proved to be of primary value in the monitoring of wells within the Tor Formation, given the recognition that the reservoir section comprises a series of biofacies units within an allochthonous chalk, capped by a thin succession of autochthonous hemipelagic chalks. The whole of this succession is constrained within a single nannofossil zone. Conversely, the nannoplankton zonation through the overlying Ekofisk Formation is extremely refined, allowing accurate monitoring of wellpaths for casing picks and also for the development of potential reservoir units within the Ekofisk itself. The increased refinement of the biostratigraphic model during development drilling on the crest of the field has assisted in the interpretation of the hydrocarbon bearing chalk succession encountered on the flanks of the structure.

Changes in foraminiferal associations during southern Baltic Sea history

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The Holocene history of foraminiferal faunas during the evolution of the Baltic Sea is practically unknown compared to the adjacent areas of the Kattegat and the Skagerrak. We now have data on foraminiferal assemblages from the southern Baltic Sea coast from the last 8000 years. The studied sites lie in the coastal zone of north-eastern Germany and within the deeper basins offshore. They represent archaeological excavations and geological coring sites connected mostly to the SINCOS (Sinking Coasts Geosphere, Ecosphere and Anthroposphere of the Holocene Southern Baltic Sea) program. We studied four shallow water localities at the coast on the Isle of Usedom, in the towns of Greifswald and Stralsund in Pomerania and close to Oldenburg in Holstein as well as twelve sediment cores from Mecklenburg and Pomeranian Bay.

The marine/brackish history of the Baltic Sea starts about 7900 years BP with the 1st Litorina transgression. Since then, the sea level has risen gradually with a slowing down tendency and salinity has fluctuated within the brackish water range.

Mecklenburg Bay: The foraminifer *Eggerella scabra* indicates cool water and slightly higher salinity then today. *E. scabra* disappeared during the Main Litorina regression when the salinity dropped. Then, foraminifers are replaced mainly by characean oospores and plant detritus. Probably during the Second Litorina transgression, the salinity rose again – *Ammonia batavus* and *A. beccarii* appear as well as *E. scabra* and *Rheophax* spp. later. We found an *E. scabra* peak in most cores some centimetres below the sediment surface. This phenomenon is documented from further to the inner Baltic Sea in the Arkona basin too, pointing towards a main salt water input from the North Sea during historical times. Today, *E. scabra* is not so common and only patchy distributed in this part of the Mecklenburg Bay.

Pomeranian Bay: Very high numbers of elphidiids indicate the First Litorina transgression within the Pomeranian Bay. Later, they are only scarcely found. Today, *Miliammina fusca* dominates here, although with low abundance. We can conclude a major drop in salinity, which is documented from the coastal site on the Isle of Usedom too.

Coastal sites: The coastal site samples show high numbers and high diversity of foraminifers during First Litorina transgression. The main species are *A. batavus* and *Haynesina germanica*. Foraminiferal numbers and diversity drop markedly in relation to salinity later on. Nevertheless *A. batavus* stays the main element of the foraminiferal assemblages and is replaced only by trochamminids and *Cribroelphidium williamsoni* in very shallow water sites within the phytal zone. Also, trochamminids (*Jadammina macrescens, Balticammina pseudomacrescens* and *Haplophragmoides* spp.) and *C. williamsoni* are the main taxa to withstand anthropogenic eutrophication as seen in the studied archaeological excavation sites. In contrast to modern day distribution *Miliammina fusca* is rarely found in our subfossil samples. We suppose this is a taphonomical effect as well as due to the dissolution of calcareous tests in many samples.

Despite common taphonomical problems by destruction of tests, we can obtain data on changes of foraminiferal association in the history of the southern Baltic Sea by studying sediment cores and outcrops. All species found in Holocene sediments still occur in the Baltic Sea today, however many species are restricted to more westerly situated areas or to water below the halocline where the salinity is higher. Salinity is the main driving factor for

changes in foraminiferal associations. The foraminifers give us information on salinity, temperature, water stratification and habitat structure and are therefore valuable tools for palaeoenvironmental reconstructions in the Holocene of the southern Baltic Sea.

The effects of rising pCO_2 on coccolithophore calcification

Markus Geisen (1), Gerald Langer (1), Ulf Riebesell (2), Ian Probert (3) & Jeremy Young (4)
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The growth of coccolithophores and their subsequent sinking to depth contribute to two different processes by which carbon is transported to the deep sea: the organic carbon pump transports photosynthetically fixed carbon (POC) and the carbonate pump transports particulate inorganic carbon (PIC) - biomineralised calcite in the coccoliths. While photosynthesis removes CO_2 from the surface water thus forming a sink in ocean-atmosphere CO_2 exchange, calcification causes a shift in the carbonate system towards higher p CO_2 thereby providing a potential source of CO_2. According to the IPCC (Intergovernmental Panel on Climate Change) report anthropogenic CO_2 emissions will double atmospheric p CO_2 over the next 100 years. Previous studies have shown that two closely related coccolithophore species, *Emiliania huxleyi* and *Gephyrocapsa oceanica*, decrease their PIC/POC ratio due to increasing p CO_2. In order to test whether this is a common phenomenon we have conducted similar experiments with two other important producers of coccolithophore calcite, *Calcidiscus leptoporus* and *Coccolithus pelagicus*. These two species are the dominant calcite producers in the northern part of the Atlantic Ocean and contain considerably more calcite than *E. huxleyi* (roughly 50 and 100 fold, respectively).

New data on an expanded K/T boundary section, Stevns Klint, Denmark

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The Cretaceous/Tertiary boundary sections of Stevns Klint (Denmark) famously record the transition from the white coccolith chalks of the Maastrichtian through to the bryozoan-rich mounds of the Lower Danian. Located at the boundary is the thin, organic-rich clay known as the Fish Clay. This clay contains, in its lowermost levels, the iridium concentration that is now accepted as the signature of the K/T "event" in successions from around the globe. The majority of workers have concentrated their efforts on one succession, immediately below the old church at Højerup, which is located in the middle of the 12 Km long cliff section. At this location the Fish Clay varies from 0 – 7 cm. in thickness, being preserved in a number of small troughs formed by a series of mounds in the uppermost Maastrichtian chalks. We have, over a period of 27 years, visited all parts of the succession from Rødvig (in the south) to Bøgeskov (in the north) and sampled the boundary extensively at three locations: Højerup, Rødvig and Kulstirenden. At the latter location, an expanded Fish Clay succession attains a maximum development of almost 40 cm. and has been sampled at ~1 cm. intervals. As part of our work we have studied the sedimentology, benthonic and planktonic foraminifera and the stable isotopes ($\delta^{13}C$ and δ^{18}). The benthonic foraminifera are only marginally affected by the extinction "event" at the K/T boundary, although there are subtle changes in the distribution/dominance of key taxa. The isotopic analysis (based on bulk carbonate and selected genera of benthonic foraminifera) shows the typical Maastrichtian pattern, followed by the pronounced negative $\delta^{13}C$ excursion within the lowest part of the Fish Clay. Within the expanded Fish Clay succession at Kulstirenden there are some significant variations in the $\delta^{13}C$ record and a number of 'cycles' are recorded within the organic-rich part of the succession. In other comparable K/T boundary successions, including those in other parts of Stevns Klint, only one pronounced negative excursion is recorded within the reduced thickness of the Fish Clay. The precise stratigraphy of the expanded Fish Clay is being investigated using the planktonic foraminifera, although most taxa in the more organic-rich part of the clay have suffered varying degrees of dissolution. Only the more robust benthonic taxa are preserved in this part of the succession and, again, this is almost certainly the result of dissolution either on the substrate or within the upper part of the sediment column. Using our microfaunal and sedimentological evidence a sequence stratigraphical

model for the K/T boundary is proposed for the boundary interval which attempts to explain the "mounds" in the uppermost Maastrichtian and the variations within the Fish Clay.

Coccolith Polysaccharides: Influence on Genesis and Diagenesis

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Coccoliths are composed of tiny but intricate crystals, with morphologies far removed from those characterising calcite grown in inorganic systems. Their genesis is known to involve complex organic molecules called coccolith associated polysaccharides (CAPs), that are present during crystal growth and form an organic cover on complete coccoliths. Using atomic force microscopy (AFM), we have investigated the influence of CAP on dissolution and growth of calcite. Our results show that the CAP coating protects the coccolith crystal faces against dissolution, therefore impacting diagenetic behaviour. For the species *Emiliania huxleyi*, we have shown how CAP can regulate crystal morphology to enhance precipitation of specific faces; a crucial aspect of coccolith genesis. *E. huxleyi* CAP preferentially interacts with acute surface sites, blocking them during dissolution and growth. Therefore, CAP makes the energetically most stable calcite face, {10$\bar{1}$4}, extend preferentially on the obtuse edges, promoting development of faces with lower angles to the **c**-axis, such as the {2134} scalenohedral and {1210} prismatic faces. AFM images of *E. huxleyi* at micrometer- and atomic scale established that these are precisely the type of faces that define the morphology of the coccolith crystals. Therefore, we interpret that crystal shape regulation by CAP is a fundamental aspect of coccolith biomineralisation.

Microfossil and nannofossil analyses of ditch cutting samples from two wells from within the Silverpit Crater, British Sector, North Sea: evidence towards confirming the age and origin of the structure.

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The Silverpit structure, which lies in the Anglo Dutch Basin in the British Sector of the North Sea, was identified during 3D seismic studies for hydrocarbon exploration by Stewart and Allen in 2002. The 20 kilometre diameter ring structure was interpreted by the authors as a meteorite impact, and although other possible methods of its formation have been proposed, the impact theory has been accepted for this presentation. From their data, Stewart and Allen suggested that the age of the impact was probably around the K/T boundary which would make it especially interesting in the light of the recent controversy over the status of the Chicxulub Crater, and with the suggestion that the end-Cretaceous extinctions were partially caused by multiple impacts. Both microfaunal and nannofossil analyses of the ditch cutting samples from two wells (43/24-3 and 43/25-1, both within the structure) have been used to attempt to define the exact age of the impact and to find any evidence that might support any of the proposed theories for its origin. The results obtained so far partially answer both problems.

Morphological variation and taxonomy of modern high-latitude *Neogloboquadrina* (planktonic foraminifera)

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Until recently, polar and subpolar surface waters of the modern oceans were assumed to be inhabited by low-diversity assemblages of planktonic foraminifera, dominated by a single morphospecies, *Neogloboquadrina*

pachyderma. Whilst it was acknowledged in practice that this morphospecies includes two distinct types, differentiated on the basis of their opposite coiling directions, this distinction has never been satisfactorily formalised. Recent genetic data have shown that there are indeed two distinct types of the high-latitude neogloboquadrinids and that these broadly correspond to the two coiling types. However, coiling direction is not an absolute discriminator between these types, making the traditional sinistral *versus* dextral informal nomenclature unsustainable. We have examined type material of a number of species and subspecies attributable to high-latitude neogloboquadrininds and we conclude that in the North Atlantic, *N. pachyderma* (Ehrenberg) appears to be the most appropriate name for the polar, mostly left-coiling type, whereas *N. incompta* (Cifelli) appears to be the appropriate name for the sub-polar mostly right-coiling type found in both hemispheres. The situation is more complicated in the Southern Hemisphere, where there are several genetically distinct left-coiling types, all of which are different from those found in the North Atlantic. We have examined their geographical distribution, shell morphology and microstructure, including logarithmic spire characteristics extracted from X-ray images, in an effort to find morphological traits specific to individual genetic types. Based on these analyses, we will present several alternative suggestions on how to treat the Southern Hemisphere group.

A comparison between morphometric and unsupervised, artificial, neural-net approaches to automated species identification in Foraminifera

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One way of addressing long-standing concerns associated with low reproducibility of foraminiferal taxonomic results, and coping with the looming taxonomic impediment, is through development of automated species-identification systems. Two generalised approaches are considered relevant in this context, morphometric systems based on some form of linear discriminant analysis (LDA), and artificial neural networks (ANN). In this investigation, digital images of 202 specimens representing seven modern planktonic foraminiferal species were used to compare and contrast these approaches in terms of system accuracy, generality, speed, and scalability. Results demonstrate that both approaches are capable of yielding systems whose models of morphological variation are over ninety per cent accurate for small datasets. Performance of distance and landmark-based LDA systems was enhanced substantially through application of least-squares superposition methods that normalise such data for variations in size and 2D orientation. The LDA approach was, however, found to be limited practically to the detailed analysis of small numbers of species by a variety of factors (e.g., the complexity of basis morphologies, speed of data acquisition, feature-space sample dependencies). An ANN variant based on the concept of a plastic self-organising map, combined with an *n*-tuple classifier, was found to be marginally less accurate than landmark-based LDA, but far more flexible, much faster, and robust to feature-space sample dependencies. Both approaches are considered valid within their own analytic domains, and both can benefit from various sorts of technology transfers. Taken as a whole, though, results indicate that fast and efficient, automated species-recognition systems can be constructed using available hardware and software technology and would be sufficiently accurate to be of great practical value in a very wide range of micropalaeontological contexts.

Stable isotopes in calcareous dinoflagellate cysts and their possible application in palaeoenvironmental reconstructions

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The ideal organism for stable oxygen and carbon isotopic palaeoclimatic studies should have a widespread geographic distribution, reach a sufficient abundance, be easily detectable and collectable, be resistant to dissolution, have no symbionts, live at a stable and restricted position in the water column, and continually produce calcareous tests throughout the year and in a relatively short time. Dinoflagellates producing calcareous cysts can fulfil most of these requirements, therefore they have recently been subject to preliminary stable isotopic studies.

Comparison of calcareous dinoflagellate and foraminifera stable oxygen isotopic data has been used to determine the relative depth habitat of Upper Cretaceous calcareous dinoflagellates, suggesting that calcareous dinoflagellates can probably be used in sea surface water temperature reconstructions.
More detailed investigations are possible on modern calcareous dinoflagellates. In a pilot study, it was suggested that *Thoracosphaera heimii*, the single most common species worldwide, can be used in temperature reconstructions. This species can be found in highest abundance in the upper part of the thermocline, and their $\delta^{18}O$ values seem to reflect the mean annual thermocline temperatures. However, the calculations are based on the assumption that *T. heimii* has no vital effect, i.e. that the stable oxygen ratio in its tests reflects the ratio in the surrounding sea water. In fact, T. heimii has a relatively strong vital effect in respect of $\delta^{18}O$ of about –2.5‰ (Dudley et al., 1980). Therefore, the temperatures calculated by Zonneveld (2004) are more than 10°C too high, and the general applicability of *T. heimii* for thermocline temperature reconstruction is strongly called into question.
However, by taking into account culturing experiments and field observations it can be shown that factors such as growth rates, size of the calcareous tests and seasonality in production might give an explanation for the discrepancy between the observed depth habitat and the stable oxygen signal of *T. heimii*.

Calcareous nannofossils and planktic foraminifera in the Cretaceous: an integrated approach for understanding palaeoecological changes in a Greenhouse world

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The Early Cretaceous of the Boreal Realm is characterised by different distribution and evolution patterns of calcareous nannofossils and planktic foraminifera. Calcareous nannofossils are present throughout all periods represented by marine sediments, covering the Berriasian – Albian. Planktic foraminifera, common in the Late Jurassic and Early Cretaceous of the Tethys, are, however, absent in the earliest Cretaceous of the Boreal Realm. They have their first occurrence in the late Barremian,, becoming a common component of the plankton assemblages in the Aptian. The calcareous plankton thus allows a two fold separation of the Early Cretaceous: 1. The Berriasian - Barremian interval without or with rare planktic forams, and 2. the mid Cretaceous (Aptian – younger) period with common planktic forams.
The calcareous nannofossils of the Berriasian – Barremian interval show in the Boreal Realm high rates of endemism, clearly reflecting geographic isolation of the Boreal Realm. The common occurrence of cosmopolitan taxa, and during certain intervals of Tethyan elements on the other hand indicates the presence of sea-ways throughout this period. Further parameters controlling nannofossil distribution are temperature and nutrients**.**
The Aptian (and younger intervals) are marked by a homogenisation of calcareous nannofossil floras showing more cosmopolitan affinities. Endemic taxa are rare or absent. The Aptian onset of planktic forams in the Boreal Realm shows taxa of Tethyan affinities settling in the North Sea and adjoining areas. There are no foram taxa endemic to the North Sea. This spread and homogenisation of marine floras and faunas is obviously linked to a major sea-level rise, establishment of new sea-ways (via the Proto-Channel) and a general change of the palaeoceanographic situation (increased MORB production). The different migration pathways for calcareous nannofossils and planktic foraminifera still need explanation by a) different nutrient/temperature affinities, b) different methods of the metabolistic test calcification, or c) palaeoceanographic reasons (e.g. barriers).

A new species of the genus *Orbulina* (Foraminifera) from the Serravalian (Middle Miocene): its occurrence and phylogenetic relation to *O. universa* (d´Orbigny 1839).

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The genus *Orbulina universa* was introduced by d´Orbigny in 1839. Since then this species has been given much attention regarding its origin and evolution and at present no consensus regarding the evolution and the

number of species, which should be classified as *Orbulina* exist. Many workers accept that the modern species of *Orbulina* evolved from *Globigerinoides triloba*. However, the presence of triangular spines and molecular data suggest that the modern species of Orbulina are closer related to the genera *Hastigerina* or *Globigerinella*. The general consensus today is that Orbulina comprises three living species *O. bilobata*, *O. suturalis* and *O. universa*. However, laboratory studies of *O. universa* indicate that a smaller proportion of the population when subjected to changing environmental parameters, develop into morphologically similar forms as *O. suturalis* or *O. bilobata*, indicating that only one species of *Orbulina* exists today. Contrary to this, studies of rDNA sequences from cells of *O. universa* shows that the modern Atlantic population can be separated into three different cryptic species *of O. universa.*
In this study, we have investigated more than 1100 modern and fossil samples containing large numbers of *Orbulinas*, in regard to the morphology of the adult test. All modern specimens of *O. universa* investigated show little variation in test morphology. The occurrence of *O. bilobata* and *O. suturalis* is extremely rare in the modern samples, suggesting that these species are typical of only extreme marine settings. The large morphological variation that was observed in the adult test of Plio/Pleistocene specimens of *O. universa* indicates that a revision of the genus *Orbulina* may needed.
During an investigation of material from Middle Miocene (Serravallian) material from southern Spain (Alicante Province) a large number of unknown specimens of *Orbulina* was observed. The typical test surface of these specimens requires the description of at least one new species of *Orbulina*.

The Caribbean Salt Kitchen monitored by *Globigerinoides sacculifer* and *Globigerinoides ruber* during the last 50,000 years.

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The Caribbean is a marginal sea of the subtropical Atlantic Ocean. Driven by trade winds, Atlantic surface water masses enter the Caribbean through the Antilles Island Arc. The surface waters pass the Yucatan channel, flow through the Gulf of Mexico and are funnelled in the Florida Straits. This Florida Stream constitutes the central core of the Gulf Stream that flows further northwards into the western Atlantic. The Gulf Stream transports salt and heat to the northern hemisphere and controls to a large extent the recent climate in Europe. The strength of North Atlantic Deep-Water formation also depends on the supply of warm, salty water. After losing heat to the atmosphere, the former tropical surface water produces the dense water masses that sink to great depths. For palaeoclimatic studies, it is therefore crucial to understand the pre-conditioning of surface waters in the Caribbean Sea.
Today, the surface mixed layer of Caribbean Water (50 to 80 m) is relatively low in salinity (<35.5) due to the Amazon and Orinoco River outflow and enhanced summer precipitation in the southern Caribbean. The mixed layer is underlain by highly saline (>36.5) Subtropical Underwater (80 to 200 m) that is formed in the central tropical Atlantic. Between 200 and 400 m, the Sargasso Sea Water prevails followed by the underlying Tropical Atlantic Central Water and the Antarctic Intermediate Water with a marked salinity minimum of ~35.0 between 600 and 1000 m. The salinity of the surface mixed layer increases and the vertical structure assimilates on the way from the southern Caribbean to the Gulf of Mexico and Florida Straits.
The magnesium content and oxygen isotopic composition of calcite precipitated by planktonic organisms record temperature and salinity of ambient seawater. *Globigerinoides ruber* dominates the living planktonic foraminiferal assemblage in near-surface waters. This species prevails with high standing stocks in lenses of low-salinity water (~34.0) with enhanced nutrient content due to freshwater input from the Orinoco River during the Autumn. *Globigerinoides sacculifer* is also frequent. It is not well adapted to large seasonal salinity changes and turbid surface waters, and hence is considered to rather reflect the conditions throughout the year. Paired Mg/Ca and oxygen isotope measurements of *G. sacculifer* and *G. ruber* from 20 surface sediment samples were compared with surface water salinities and sea water oxygen isotope measurements from the World Ocean Atlas 1994 and Global Seawater Oxygen-18 Database. The measured oxygen isotope values of *G. ruber* did not correlate with equilibrium calcite, but those of *G. sacculifer.* The best correlation was achieved for annual average temperatures and salinities from 30 to 50 m water depth which corresponds to the average living depth (40 m) of this species. Surface water salinities can be estimated with an accuracy of ±0.5 from Mg/Ca and oxygen isotope measurements of *G. sacculifer* from recent sediments by using the modern

Caribbean O-18 surface water - salinity relationship, a 0.5 permil offset to account for secondary, gammatogenetic calcite overgrowth, and the empirical O-18 - temperature relation for *G. sacculifer* from plankton catchments. The seasonal variability may also induce an uncertainty of ±0.5, in particular at low salinities.
Palaeo- salinities were calculated from three sediment cores from the western equatorial Atlantic, central Caribbean, and Florida Straits depicting the Caribbean surface water throughflow over the last 50,000 years. In the Caribbean and Florida Straits, the salinities were higher by one unit during Marine Oxygen Isotope Stage (MIS) 3 and two units during MIS2 beyond the influence of ice volume. This pattern may be attributed to stronger trade winds and higher evaporation during the last Glacial. The equatorial Atlantic, situated close to the Orinoco River debouchment stayed at the present, low-salinity level. A pronounced double maximum is recognized during the last deglaciation with salinity peaks during the Heinrich-Event H1 and Younger Dryas in all cores. These salinity maxima correspond to periods of low precipitation in the southern Caribbean region and Amazon Orinoco catchment areas. A return to wetter conditions during the intermittent Bølling/Allerød period is only visible in the Atlantic core reflecting a short-term re-initiation of river discharge from the southern American hinterland as it has been previously suggested for the Cariaco and western Caribbean Colombian basins.
A comparison of the Caribbean records with a core from the eastern subtropical Atlantic reveals a marked similarity in surface water salinity during the Holocene, Allerød, and Interstadial 2. The Caribbean salinity was higher by 1 to 2 units than in the eastern Atlantic during the cold and dry periods, however. This warm, salt-rich water flushed to the northern Atlantic and promoted the reinvigoration of thermohaline circulation in the subsequent warm climatic intervals.

Foraminifera and nannofossils in the Western Interior Sea, Canada: reconstruction of Cretaceous sea-level history

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The Canadian Western Sedimentary Basin documents a complex paleoenvironmental Mesozoic history linked to tectonism and global and relative sea-level changes. Cretaceous strata record the history of the Western Interior Sea, a marine basin under variable palaeoceanographic restriction. In unravelling its depositional history a multidisciplinary approach (in which foraminiferal and nannofossil studies play integral parts) has been proven as most successful.
Cretaceous sea-level history in the Western Interior Sea is recognised in ten global transgressive/regressive cycles. Highest sea levels are recorded during the Albian to Santonian, when the shale dominated Colorado Group was deposited in the Western Canada Sedimentary Basin. A seaway developed during times of highest sea levels connecting the Tethyan and Boreal seas and creating a complex watermass stratification pattern. Several anoxic to dysoxic events are documented that have influenced different basin areas with varying intensity.
When the basin was connected to the northern Boreal Sea, but enclosed to the south, agglutinated foraminifera dominated benthic environments. Salinities were reduced and at times sediment input into the basin was high. During phases of sea-level highstand normal marine conditions prevailed and southerly derived planktic foraminifera and nannofossils become important biostratigraphic markers. At the same time anoxic bottom-water conditions resulted in finely-laminated, organic-rich black shale sequences, barren of benthic foraminifera.
It is difficult to divide large mudstone and shale-dominated sequences, indicating deposition in distal basin settings, based purely on lithology. Faunal assemblages, however, respond to subtle basin processes and their changes can be correlated with regional log markers. Disconformities, hidden within shale sequences without pebble beds or bioclastic conglomerates, can only be detected by missing faunal and floral zones. Therefore micro- and nannofossils are a vital part of sequence stratigraphic analyses. They distinguish flooding surfaces from maximum flooding surfaces and determine unconformities.
Tracefossils have also become a reliable component of sequence stratigraphic analysis. In the Cretaceous Canadian Basin, in once soft, muddy offshore sediments with little lithological contrasts to enhance

ichnofossils, the additional use of foraminifera supports paleoecological interpretations. In shallow marine settings, lagoonal sediments can resemble finer-grained, low-energy, fully marine shoreface settings in lithology and log signature. In these complex environments micropaleontology has been successful in paleoenvironmental analysis by showing distinct biofacies.

Adaptation without differentiation: Morphological homogeneity between 'pseudo-Cryptic' forms of *Globigerinoides rube*r d'Orbigny

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Globigerinoides ruber is a widespread and often dominant component of sub-tropical and tropical assemblages of planktic foraminifera, and consequently is often used as a vector for geochemical palaeoproxies. Unusually for planktic foraminifera, the traditional morphospecies concept is habitually divided into two informally recognised sub-types (*Gs. ruber* 'pink' and 'white') based on test pigmentation. These two types are genetically dissimilar and have differing biogeographic and stratigraphic distributions, indicating that they are almost certainly reproductively isolated populations with different environmental preferences. Previous workers have also identified morphological features that could be used to distinguish the two types. If this is the case, then the variants can be separated independently of test colour- a potentially important finding, since there is circumstantial evidence that diagenesis may be altering the unstable pink pigment and artificially truncating the range of *Gs. ruber* 'pink' (currently thought to have first occurred at ~ 0.7 Ma). Extending the time of divergence between 'pink' and 'white' would also accord more closely with some molecular clock estimates, which seem to suggest a time of divergence that is considerably discordant with the stratigraphic record.
We have conducted a multivariate morphometric analysis based on material from ODP Site 926A (Ceara Rise), measuring 13 continuous metric characters based on two views of oriented, mature shells of *Gs. ruber*. Preliminary analysis suggests that the two types are indeed morphometrically indistinguishable. Unfortunately, this implies that morphology cannot provide an independent appraisal of the evolutionary history of *Gs. ruber*, and hence that the molecular clock hypothesis cannot be tested using morphometrics. This is a result of more than academic interest; if the deep divergence model suggested by the molecular clock is correct, then geochemical analyses based on tests harvested from material older than 0.7 Ma are effectively pooling two species, and may therefore be inducing significant noise. We are currently exploring the potential for other characteristics (such as test ultrastructure) and microscopy techniques (such as illumination with UV light) to accurately delineate the two types, but it is likely that *Gs. ruber* represents a true case of long-term morphological stasis- 'cryptic' speciation in its truest sense.

Calcareous nannofossils in extreme environments: The Messinian Salinity Crisis, Cyprus

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The rapidly changing and extreme environmental conditions of the early Messinian Salinity Crisis are reflected in abrupt variations in nannofossil assemblages within the Messinian units (Kalavasos Formation) from the Polemi Basin, Cyprus. During the Messinian, the Polemi Basin was a semi-enclosed, neritic to littoral environment, subject to repeated influxes of marine and freshwater. Nannofossil diversity (3 to 11 species) is greatly reduced in comparison to the open ocean and assemblages are highly uneven with high dominance. One of five nannoplankton species were observed to dominate any of the assemblages, these were *Reticulofenestra minuta*, *Dictyococcites antarcticus*, *Helicosphaera carteri*, *Umbilicosphaera jafari* and *Sphenolithus abies*. The associated diatom and sedimentological evidence from the Polemi Basin are used to indicate the palaeoecology of key nannofossil taxa. *D. antarcticus* predominated in normal salinity, mesotrophic, shallow water environments; *H. carteri* in shallow, hyper-eutrophic environments with enhanced salinity; *U. jafari* hypersaline conditions; *R. minuta* in hyper-eutrophic conditions with an abnormal salinity from brackish to hypersaline; *S.*

abies in mesotrophic, deeper and normal salinity environments. These species are indicated to be opportunistic taxa, adapted to unstable environments. Fluctuations in nutrient levels and salinity are interpreted as the primary factors controlling the overall nature of the nannoplankton assemblages and the species which dominate at any one level.

Comparison of Quaternary upper-ocean water changes between the Southern and Northern South China Sea: A Seesaw Pattern

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Palaeoceanographic multi-proxies on sea surface temperature (SST), depth of thermocline (DOT) and palaeoproductivity from ODP Site 1143 (9º21.72'N, 113º17.11'E, water depth 2,772 m) were analysed to study the response of upper-ocean water changes to glacial cycles in the southern South China Sea (SCS) during the past 2,100 kyr, with ~2 ka resolution, and were further compared with those from the northern SCS.
At ODP Site 1143, warm water species (*Globigerinoides ruber*, *Globigerinoides sacculifer*, *Globorotalia menardii* and *Pulleniatina obliquiloculata*) and results from transfer functions (FP-12E and SIMMAX-28) based on census data both show that SST has no clear glacial-interglacial cycles in the southern SCS over the whole time interval. DOT inferred from surface-water species (*G. ruber*, *G. sacculifer* and *Globigerinita glutinata*), thermocline species (*Neogloboquadrina* group and *G. menardii*), $\delta^{18}O_{(P.\ obliquiloculata\text{-}G.\ ruber)}$ and results derived from the faunal transfer function, however, displays faithful variations according to oxygen isotope cyclicities; deeper during glacials and shallower during interglacials. Amongst various palaeoproductivity indices, opal percent and opal accumulation rate indicate high productivity during interglacials since 1,600 ka (Wang and Li, 2003), whereas other indices such as percentages of *Neogloboquadrina dutertrei*, *Globigerina bulloides* and *G. glutinata*, percentage of nannoplankton *Florisphaera profunda*, and the $\delta^{13}C$ difference between *P. obliquiloculata* and *G. ruber* show vague variations against glacial cycles.
Comparing these results with records from ODP Site 1146 (19º27.40'N, 116º16.37'E, water depth 2,091 m, ~10 ka resolution) from the northern SCS, SST and DOT indices and predominant species all indicate that upper-ocean waters between the southern and northern SCS underwent profound divergence around 1,000 ka. SST in the northern SCS have decreased dramatically since 1,000 ka; high in interglacials and low in glacials, compared with those in the southern part. DOT gradient between the south and the north, represented by $DOT_{(1143\text{-}1146)}$, have increased conspicuously during glacial intervals in the past 1,000 kyr. In addition, it has been documented that paleoproductivity indicated by opal percent and opal accumulation rate from ODP Site 1144 (20º3.18'N, 117º25.14'E, water depth 2,037 m), close to ODP Site 1146 in the northern SCS, is high in glacials and low in interglacials since 1,050 ka, the reverse of results from ODP Site 1143.
It is suggested that the strong SST gradient between the south and north and the geographical enclosure of the basin to south during glacials in the past 1,000 kyr should be responsible for the development of the seesaw-like pattern of upper-ocean water changes within SCS. Strengthening of the winter monsoon during glacials in the north, and summer monsoon during interglacials in the south may play a direct role.

Holococcolith biomineralisation

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Recent work from the CODENET research network (Coccolithophorid evolutionary biodiversity and ecology network) project has proven the hypothesis that the typical coccolithophore life-cycle is haplo-diploid with very different calcification modes in the haploid and diploid phases. Available evidence suggests that calcification evolved in the diploid phase and that diploid phase calcification results in formation of heterococcoliths. Calcification appears to have been adopted secondarily in the haploid phase several times resulting in different

biomineralisation modes, including at least holococcoliths, ceratolith nannolith and "Polycrater" nannoliths. Of these holococcoliths are much the most widespread so critical reassessment of the nature of holococcolith biomineralisation is timely. A satisfying model of holococcolith biomineralisation cannot yet be produced, but the salient features of holococcolith formation which such a model needs to address can be outlined.

Poster Abstracts

Removing assemblage-size bias from planktonic foraminifer biodiversity estimates

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The excellent fossil record of planktonic foraminifera provides a unique opportunity to study past and present diversity patterns of this important group of oceanic zooplankton. Spatial and temporal analysis of species diversity of entire planktonic foraminiferal assemblages has the potential to provide insight into long-term biodiversity processes and their relationship with environmental change. However, for various methodological reasons, representative and consistent records of planktonic foraminifer biodiversity are lacking.
In the modern ocean, planktonic foraminifer size distribution is largely attributed to temperature and nutrient effects. On geological timescales, planktonic foraminifera have undergone several periods of diversification, each of which is thought to have involved a general increase in test size. In addition, recent quantitative analyses have identified large changes in the size of assemblages of planktonic foraminifera throughout the Cenozoic that can be attributed to long-term changes in vertical stratification of the surface ocean. Despite these large changes in size, analysis of planktonic foraminiferal assemblages is typically carried out using a uniform mesh size. This constitutes a major problem for consistent estimates of diversity of planktonic foraminifera.
To overcome this methodological problem, we have attempted to devise a technique that will produce a quantitative biodiversity estimate, independent of assemblage size distribution in the analysed sample. To achieve this, multiple splits of a single modern assemblage was first carried out, and the number of species counted and recorded. Data was then processed using PAST (PAlaeontological STatistics) v1.20, and a minimum number of specimens required to be counted, in order to obtain a representative species diversity estimate of the entire assemblage was established. We then analysed diversity in different sieve size fractions in several modern core-top samples and compared these diversity estimates with size distribution of foraminifera in these samples.

Calibrating the Neogene microfossil biostratigraphy of the North Sea region

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The search for a viable means of disposal has led many countries in the circum-North Sea region to investigate the potential for gas disposal in saline aquifers of Neogene age. Until recently the petroleum industry has had little need for a high-resolution Neogene stratigraphy due to the lack of natural hydrocarbon accumulations in Neogene strata.
Previous biostratigraphic studies of the Neogene of the North Sea have resulted in often poorly calibrated and isolated assemblage sequences providing weakly constrained ages. While the Ocean Drilling Project has produced well calibrated Neogene zonations for the northern North Atlantic and for the Vøring Basin, the existing North Sea zonations have been calibrated most often by second and third order correlations. Until now the general zonations of King (1989) and Gradstein & Bäckström (1996) have proved useful in routine petroleum exploration where only ditch-cuttings are present, however, there is great potential for a much higher resolution and much better constrained zonal ages.
This study will have as its main aim the creation of a calibrated Neogene zonation scheme for the North Sea, incorporating a diverse range of microfossil data. Quantitative statistical treatment of a large Norwegian dataset will be used to determine the reliability of existing marker events. Robust events will then, through combined analysis of onshore and offshore well-cores and supplemented by outcrop observations, be calibrated to the new standard geological time scale of Gradstein *et al.* (in press). Limited first-order chronostratigraphic dating may be achieved using selected planktonic forminifers and dinoflagellate cysts. Calibration will also be achieved

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through radiometric strontium (Sr) isotope dating of principally benthic foraminiferal tests, supplemented partially by magnetostratigraphic control. Key biohorizons will be tied to the regional seismic and sequence stratigraphic framework.
Industrial implications are the creation of a high-resolution tool for Neogene stratigraphy in the North Sea and circum-North Sea region. It will be applicable in various depositional environments due to the integration of a broad fossil dataset, and incorporation into the regional stratigraphic framework. Secondary aims include assessing the reliability of *Bolboforma* (Chrysophyta) microfossils as North Sea Miocene markers, evaluating the usefulness of Sr-isotope stratigraphy for the last 15 ma, where Sr-dating precision is theoretically highest for the Neogene, and to produce a palaeobathymetric model of the depth evolution of the region based on fossil findings. Ultimately, this study will create a much needed chronostratigraphic link between the classical Neogene biostratigraphy of the Mediterranean, and the poorly calibrated Neogene biostratigraphy of the North Sea region.

The Valanginian "Weissert" Event in the western Atlantic (DSDP Sites 534A and 603B): results from calcareous nannofossils and carbon isotopes

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The mid Valanginian "Weissert Event" is characterised by a positive carbon isotope excursion (CIE), which has been observed on a supraregional scale. The CIE coincides with a sea level rise and increased volcanic activity (Paraná-Etendeka volcanism), which may have caused elevated atmospheric pCO_2 levels. A greenhouse climate and accelerated hydrologic cycling are thought to have intensified the weathering processes. This may have caused an elevated nutrient transfer from the continents into the oceans.
In the western Atlantic Ocean (DSDP Sites 534A and 603B) enhanced surface-water fertility is indicated by an increase in abundance of nannofossil species which are believed to indicate more eutrophic conditions. This increase coincides with the turning point of the carbon isotope record at the magnetostratigraphic M15/M14 boundary and therefore predates the CIE. Enhanced surface-water productivity is also presumably reflected by an increase in bulk-rock Sr/Ca-ratios reported from the same sites, and by the occurrence of TOC-rich marlstones. We assume that enhanced surface water productivity may have contributed to the shift in the carbon isotopic composition of the carbonates.
In the western Tethys the mid Valanginian is also marked by a sharp decrease in the abundance of rockforming nannoconids ('the nannoconid crisis'). This event is much less pronounced in the western Atlantic (this study) and the Pacific due to a general scarcity of these nannoliths in open oceanic settings, but nevertheless a decline in the carbonate accumulation and a dominance of less calcified nannofossil species were observed. We assume that the interval of the so-called 'nannoconid crisis' was characterised by generally lower rates of carbonate accumulation reflecting a crisis in the biogenic carbonate production.
The decrease in the biogenic carbonate production may have been caused by enhanced surface-water nutrification, by a pH drop of seawater due to enhanced volcanic CO_2 outgassing and/or by the release of trace elements, which limit or inhibit calcification, during volcanism.

Morphological variation in Recent *Globorotalia menardii*

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Globorotalia menardii is a prominent Neogene sub-tropical to tropical planktonic foraminiferal species. It has a distinctive lenticular keeled morphology. However there is a range of morphotypes, from more robust, heavily keeled types to the more delicately walled finer keeled forms. This work attempts to geographically map out the various Recent morphotypes, identify end members and determine if this morphological variation can be linked to environmental conditions, and or geographical areas.
The initial findings indicate a geographic variation in the spiral height of the '*menardii* form' globorotalids; the highest spired specimens being found in samples form the higher latitudes, and lowest values of spiral height are found in lower latitude samples. There is an apparent trend towards flatter, plate-like tests in '*menardii*

form' globorotalids found in the northern subtropical Atlantic and Caribbean regions. It is possible that the distinctive morphotypes identified represent end members of more than one sub-group, but overlap in the geographical areas hides the trend of decreasing spiral height, making visual recognition of the trend difficult.

Extensive phenotypic and structural variability in very small and small Lower Pliocene reticulofenestrid coccoliths (South Caribbean Sea): evolutionary and paleoecological implications

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Modern reticulofenestrid coccolithophores (*Emiliania huxleyi*, *Gephyrocapsa, Reticulofenestra*) show a very wide range of morphological variability and many species and varieties have been described. By contrast, the fossil record of reticulofenestrids is conventionally represented by a limited set of species that evolve geologically instantaneously and remain morphologically stable over millions of years. In particular, there is minimal documentation of morphological differentiation within the very small and small (<3µm and 3-5µm) reticulofenestrid groups, even though these frequently dominate assemblages. Due to their small size these are usually assigned to broad size-defined groups.
Exceptionally preserved sediments from the South Caribbean basin (ODP Site 1000A Leg 165, Lower Pliocene) have offered a unique opportunity to carry out detailed scanning electron microscope observations on morphological variability of the small reticulofenestrid populations and analyse the primary composition of these assemblages. A range of peculiar morphotypes have been observed. Morphological variability mainly consists of differential development of distally directed extensions of the inner tube elements, with variable contribution of the outer tube elements. These morphotypes have been quantified in terms of absolute abundance and relative abundance and compared with morphological variation patterns seen in extant small *Gephyrocapsa* coccoliths.
Phenotypic characters that allowed separation of a set of very small morphotypes appear to be fairly stable morphologies and, in conjunction with the presence of intermediate forms, suggests that these represent in fact (eco)phenotypes of small *Gephyrocapsa* rather then separate species.
By comparison, morphological variation displayed amongst a second set of very small reticulofenestrids (*R. minuta* s.l.), which consists of the development of tube elements at the coccolith's side, is also thought to be ecologically driven. A "malformed" coccolith with slitted distal shield elements very similar to those of *Emiliania huxleyi*, but clearly separable from this species and from the *Pseudoemiliania* group, possibly represents a precursor response to similar ecological pressures which subsequently resulted in stable adoption of this morphology. A distinct coccolith, *Reticulofenestra calicis* n. sp., appears in the fossil record shortly after the first common occurrence of small *Gephyrocapsa,* when the previously discussed morphotypes become much less common. The affinity of this coccolith, present for a relatively short interval, is still unclear. The opposite absolute abundance (n. /g dry sediment) pattern of *R. calicis* with respect to small *Gephyrocapsa* coccoliths suggests different ecology. A similarly opposite abundance trend (with respect to small *Gephyrocapsa* population) is showed by forms of the *R. minuta* s.l. group. This possibly suggests that *R. calicis* evolved from this group of coccoliths to fill up slightly different ecological niches.It possibly represents the final evolution of the "malformed" coccoliths group.
The evolutionary dynamics of the population is currently under investigation, but it is clear from our results to date that the small reticulofenestrid coccoliths are much more morphologically variable than previously thought. It is possible that at this Caribbean site peculiar ecological conditions occurred resulting in the previously unreported diversity, alternatively the diversity may be universal but as yet has not been reported due to an absence of detailed studies of co-eval assemblages; this requires testing.

Cryptic genetic diversity in the planktonic foraminifer *Neogloboquadrina pachyderma*

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Morphological distinction provides the main basis for foraminiferal counts and derived palaeoceanographic reconstructions. *Neogloboquadrina pachyderma* is the dominant morphospecies today in the high latitudes and has played a pivotal role in the reconstruction of past climate in these regions. Although known to exhibit a degree of morphological plasticity, coiling direction is currently the sole criterion used in its application as a palaeoceanographic proxy. Molecular analyses of living *Neogloboquadrina pachyderma* assemblages have now revealed a previously unrecognised high degree of genetic diversity which is particularly manifest in the left coiling morphotype. Several genetic variants are associated with different regions of the global ocean and some exhibit specific adaptations. Coiling direction is not a sufficient guide to genetic type or their adaptation and in some cases can be positively misleading. It has now become imperative to rationalise nomenclature and investigate the morphologies of the different genetic types of *Neogloboquadrina pachyderma* to provide guidance for their use as paleoproxies.

Isotopic and foraminiferal analysis of the Cenomanian-Turonian Boundary event in the Indian Ocean
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The Cenomanian/Turonian boundary event occurred some 93 million years ago and is one of the most distinctive events in mid-Cretaceous stratigraphy. It can be detected as a faunal, chemical, isotope and sedimentological event on all continents and is, genuinely, a global event. Samples from ODP sites on the Exmouth Plateau (Indian Ocean) have been analysed for both foraminiferal stratigraphy and stable isotopes. The data from these successions are part of a wider study of Cenomanian/Turonian boundary successions in various parts of the world, including Australia, Europe, Crimea and South America. In the successions from the Indian Ocean and the Crimea there is a degree of diagenetic overprinting that makes comparisons to other successions slightly more difficult than might otherwise be the case. Recognition of these diagenetic overprints is very important.

Biostratigraphy and palaeoecological interpretation of planktonic foraminifera from the Cenomanian to Coniacian Nkalagu Formation, southern Nigeria
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Planktonic foraminifera form the base of many marine biostratigraphic zonations in the Cretaceous and Tertiary intervals. However, long ranging shallow water associations dominate in most marine Cretaceous deposits of the Benue Trough and keeled deep-water forms are restricted to the Nigerian coastal basins. Only the Turonian to Coniacian of the Lower Benue Trough (Nkalagu Fm) yielded forms which are important for biostratigraphy and worldwide correlation of strata. Due to their relatively rare occurrence in Nigeria, a biostratigraphic zonation based on planktonic foraminifera for the Late Cretaceous was never attempted. Due to the higher concentration of foraminiferal tests from keeled species with the dry sieving of the studied samples, it was possible to gain sufficient material for a zonation of the ?middle Turonian to Coniacian strata of the Lower Benue Trough. In addition to the biostratigraphic study, the planktonic foraminiferal associations were analysed statistically and interpreted palaeoecologically. The three investigated sections are situated on the north-western flank of the Abakaliki Anticline, a major tectonic structure in the Lower Benue Trough.
Four biostratigraphic zones are proposed for the (?)middle Turonian to Coniacian interval in southern Nigeria: (1) *Praeglobotruncana* cf. *stephani* Zone (middle? Turonian); (2) *Marginotruncana sigali* Zone (late Turonian); (3) *Dicarinella primitiva* Zone (latest Turonian); and (4) *Dicarinella concavata* Zone (Coniacian). Based on planktonic/benthonic foraminiferal ratios and environmental index forms, a general deepening of depositional environments is indicated from late Cenomanian to Turonian and Coniacian ages. Upper Cenomanian sediments were deposited in an inner shelf environment (0-70 m, 0-20% planktonic foraminifera; only one *Heterohelix* species occurs). During the (?)middle to early late Turonian, an upper bathyal environment of about 600 m water-depth is indicated (46-94 % planktonic foraminifera, with heterohelicids dominating and a relatively large

number of keeled specimens). The middle late to latest Turonian interval is characterized by 20-71 % planktonic foraminifera with heterohelicids dominating and very rare keeled specimens, pointing to an upper bathyal depositional environment (c. 250 m water-depth). A (deeper) upper bathyal environment (c. 600 m water-depth), dominated by heterohelicids but with up to 30% hedbergellids during the Coniacian, is indicated by 63-93% planktonic foraminifera with a relatively large number of keeled specimens. In general, an open marine deep-water environment (upper bathyal) is indicated by the (?)middle Turonian to Coniacian planktonic foraminiferal faunas, further influenced by periods of eutrophication or (weak) salinity fluctuations. The (?)middle Turonian and latest late Turonian were time intervals of highest surface productivity in southern Nigeria.

Basal Danian Cerithium Limestone at Stevns Klint, Denmark – diachronous and unusual

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The lenticular, discontinuous nature of the basal Danian Cerithium Limestone at Stevns Klint was first recognised by Rosenkrantz in 1924, but its true significance became apparent only when the Mesozoic-Cenozoic boundary was formally placed below the Danian. However, due to pervasive cementation biostratigraphic resolution within the Cerithium Limestone has so far been exceedingly poor.
Improved preparation techniques have provided thousands of specimens of planktic foraminiferids and have now remedied this situation, and as a result a detailed biostratigraphy has been established, revealing pronounced diachronism in the deposition of this crucial unit. Thus, in the southernmost part of the cliff most, or possibly all, of the Cerithium Limestone belongs to the *Parvularugoglobigerina eugubina* Zone (P?), indicating that in this part of the cliff the Fish Clay – Cerithium Limestone transition is essentially continuous. Farther to the north the *P. eugubina* Zone gradually thins and is superseded by the *P. pseudobulloides* Subzone (P1a), while still farther north, at Holtug, only the *P. pseudobulloides* Subzone is found.
In contrast to the diachronous nature of the Cerithium Limestone at Stevns Klint, the lateral equivalents of this unit exhibit continuous and uninterrupted accumulation in the deeper part of the Danish Basin as exposed in e.g. Nye Kløv. Cross-basin correlation is supported by both micro- and nanno-fossils, but in detail it is based on parallel developments in the ratio between biserial and spirally coiled planktic foraminiferids, reflecting a common evolutionary signal of recovery, apparent in spite of pronounced differences in facies and accumulation patterns.
The recovery patterns of the mollusc fauna at Stevns Klint, revealed through exceptional preservation due to early cementation of the Cerithium Limestone lend further support to the diachroneity of this unit.

Pele's Tears and various misconcepts

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Pele's Tears are quenched droplets from basaltic magma fountains found i.e. on Hawaii, USA. They are mainly composed of gas bubbles separated by thin, glassy walls. They are characterised by their low density, and they can float on seawater. This explains their wide marine distribution.
When the magma erupts, it passes the temperature interval of 1000 to 600EC and here the Boudouard reaction takes place. At 1000 degrees C and a pressure of 1 atmosphere the carbon gas is CO only. The Boudouard reaction prescribes, that the CO splits into free carbon and CO_2 (i.e. $2CO = C$ and CO_2). This leads to the formation of graphite spheres in the vesicles forming a coating of the vesicle walls. Thus it results in formation of hollow, graphite spheres. By dissolution of basaltic glass, one observes in the residue, hollow graphite spheres in the size range of sub-micron to 15 microns in diameter.
A side effect of a meteoritic impact is the formation of tektites. They consist of melted drops of the impacted rock. A tektite is a drop of melted rock, which passes through the atmosphere where the oxygen content is high, and thereby, the material becomes well oxidised. Thus, one is not expected to find graphite in tektites.

Dissolution of specimens of tektites present in the collection of the Geological Museum in Copenhagen showed no residual carbon at all. (The dissolved tektites are: Ivory Coast, Australites, Moldavites and Indochinites). They are all made of massive, glassy, non-vesicular material with pitted surfaces.
It has for years been claimed by "meteorists", that the presence of spherules (so-called "altered micro-tektites") at marine K/T boundaries is related to an impact. However, these spheres all seem to have formed inside the skeletons of prasinophyte algae. How each of the impact drops managed to strike an algal skeleton and slip inside remains unexplained.
At Caravaca and Gubbio the filled algae are sometimes overgrown by later-formed sanidine. Sanidine is a high-temperature K-feldspar. However, sanidine is known also to form in submarine tuffs. Sanidine dated by Ar/Ar resulted in 49.4 Ma ± 0.98 for Caravaca and 59.3 Ma ± 1.18 for Gubbio.
At the terrestrial K/T boundaries, no such spherules are found. The spheres claimed to be of K/T age, have turned out to occur too late, and besides, they are known in various volcanic ash layers of different ages. They are composed of minerals such as kaolinite or of minerals of the Crandallite group (phosphates such as Goyazite etc.).
Real tektites are massive glassy droplets of melt-rock from the impact site. They do not contain graphite. Therefore, the spherules from Haiti and other localities around the Mexican Gulf may safely be characterized as Pele's Tears due to their content of graphite and bubbly inner structure. The Haiti spherules are variously diagenetised ranging from specimens with a content of unaltered volcanic glass to pure smectite spheres. Their colour ranges from white to almost black depending on the degree of leaching. They are unrelated to impacts. The Lower Eocene spherules from the Danish North Sea show spherical cavities (like the gas bubbles from true Pele's Tears) and definitely have nothing to do with tektites. Other North Sea spherules even contain fossils!

New data on the Late Cenomanian Extinction Event

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The Late Cenomanian extinction event is one of those initially identified by Raup & Sepkoski in 1982. The 'event' has long been recognised as one of the major features of the Cretaceous succession on all continents and, in many localities, is associated with dark/black mudstones. The Bonarelli Event, as it is known in some parts of Europe (or CTBE in other areas) records a moderate turnover of both macrofauna and microfauna/flora. Associated with these extinctions and biodiversification events are a number of geochemical signals, including REEs and the presence of iridium. The sedimentary, isotopic, chemical, floral and faunal changes can be matched across continents and a detailed event stratigraphy generated. The mechanisms controlling this event are still debated and range from impacts to sea level rise (or fall) and productivity changes.

Henry Buckley: an unknown planktonic foraminiferal pioneer

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Henry Buckley (who died in 2001) was a curator at The Natural History Museum, London, in the Mineralogy Department. He spent most of his career working with ocean-bottom sediments and managed the vast collections at the NHM. He was first directed to the study of modern planktonic foraminifera through working with Dr J. Wiseman, the oceanographer and his manager at the time, and this became a passion for the rest of his life. Due to his sitation, however, and being in a non-Palaeontological department, the Museum subsequently officially discouraged Henry from this work. As a result, he was to publish little on the planktonic foraminifera (a notable exeption was a paper in *Nature* in 1973) and in consequence is almost unknown within the foraminiferal community. This is a great pity because Henry Buckley was one of the first scientists to use the SEM (in the late 1960's) to examine wall texture and to appreciate it had an important bearing on the systematics of planktonic foraminifera. Henry had hoped to prepare an Atlas of Planktonic Foraminifera, using state-of-the-art SEM's, but he was never allowed to proceed with its publication.
Recently, a transfer has been arranged between the Mineralogy and Palaeontology departments at The Natural History Museum which has enabled us to acquire the entire collection of Henry Buckley, including over 2,500 foraminiferal slides and 10,000 SEM micrographs. The collection represents an extremely important resource for the study of Recent planktonic foraminifera as it encompasses material from ocean bottom sediments from

all over the globe. The collection is currently being databased with an aim to promote its contents and the research of Henry Buckley to the foraminiferal community. It is fitting that this collection should now, at last, receive the attention that it deserves - the legacy of Henry Buckley, an almost unknown pioneer of planktonic foraminifera.

The Foraminiferal Response to the Early Toarcian Extinction Event

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In their initial investigation of periodic extinctions Raup & Sepkowski (1982) identified an important faunal turnover at, or about, the Pliensbachian/Toarcian boundary. Subsequent work on the palaeontology of the lower Jurassic successions in Europe, South America and Asia has shown that the most important faunal turnover was in the early Toarcian. By comparison to some other events (Permo-Triassic boundary, K/T boundary, etc.) the early Toarcian is clearly of less importance and appears to be both regional (?) and at the species (rather than genus or family) level. As part of our on-going research on Jurassic foraminiferal assemblages the early Toarcian extinction event has been studies at a number of locations in the UK, Germany and France. In N.W.Europe the main extinction 'level' appears to be coincident with a sharp negative $\delta^{13}C$ excursion (possibly caused by a major methane escape) at a time of sea level highstand.

Integrated biozonation scheme for the Late Cretaceous to Tertiary of North Africa

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The application of sequence stratigraphic techniques for basinal modelling in oil exploration is playing an increasingly important role. Biostratigraphic input for definition of sedimentary sequences is crucial for the determination of precise tectonic and sedimentary histories of basins and their accurate modelling. The thick Late Cretaceous – Tertiary sequences preserved in North African basins have yielded abundant and diverse microfaunal and microfloral assemblages. An evaluation of the main biostratigraphic index fossils has been undertaken by reviewing published data across North Africa from Egypt to Morocco. Range charts of stratigraphically diagnostic dinoflagellate cysts, foraminifera, nannoplankton, ostracods and sporomorph species are presented. These range charts are based on, or modified from the currently available published data. The charts cover the Cenomanian to Pliocene intervals. Presentation of the various microfossil groups permits age-dating of both the carbonate and clastic sedimentary sequences. An integrated biozonation scheme is presented which is tied to the sea level curve of Haq *et al*. 1987. The proposed integrated scheme will permit for the first time, inter- and intra-basinal biostratigraphic correlation of the sedimentary sequences across North Africa.

Microevolution in planktonic foraminifera: a morphometric case study applied to the *Globorotalia menardii* plexus and *G. tumida* lineage

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Never before has evolutionary research been so controversial than today: while the study of various groups of oceanic pelagic microfossils have provided the basis for morphology oriented taxonomy, results from molecular studies seem sometimes to question the findings of traditional micropaleontologists. A particular problem is the distinction between morphologically closely related species or subspecies, especially if their morphological expression has been influenced by present or past environmental regimes. There is evidence from stable isotope or genetic work, that morphological species do not always match with molecular taxonomy, indicating the occurrence of cryptic speciation. A detailed documentation of microevolutionary patterns through time and geography is therefore of great help to better understand fundamental processes of speciation, phylogenies, and

finally to arrive at more stable species concepts.
In this context we investigate the morphological evolution of two Neogene planktonic foraminifers, which are thought to be phylogenetically connected, the *Globorotalia menardii* plexus and the group of *Globorotalia tumida* and its ancestors, across the ancient Central American Seaway, from 8 Ma (Upper Miocene) to Recent times. The Isthmus of Panama permanently disconnected the Atlantic from the Pacific Ocean about 3.2-2.5 Ma ago, and so provides an ideal natural laboratory for investigating speciation.
The coordinates of test outlines of these protists were acquired with digital imagery from isochroneous levels at DSDP Sites 502A (Caribbean Sea) and 503A (Eastern Equatorial Pacific). In a parallel, still ongoing PhD study we investigate the morphological variation of Holocene representatives of *G. menardii* and *G. tumida* across environmental gradients within the global 'menardine' biogeography, in order to recognise modern end-members.
Here, results of the morphological study through time at Sites 502 and 503 are presented: In *G. menardii* and *G. tumida* a distinct size increase during the past 8 million years was observed, while shape changes (flattening of tests) were mostly observed during the youngest interval of our study. During the upper Miocene to lower Pliocene small *G. menardii* increased gradually into larger morphotypes along a single regression line in the morphospace of test diameter versus test height. This trend can be seen at both sides of the Isthmus of Panama. In samples younger than 4 Ma, this trend diverged into two separate directions of larger specimens, eventually indicating a cladogenetic speciation event: one branch evolved into forms similar to *G. menardii menardii*, while the other into forms similar to *G. menardii cultrata*. An unresolved problem is the interpretation of juvenile specimens in our material: The juvenile portion of dissected adult menardines showed morphological similarities to small forms often recognised for example as *G. ungulata*. More ontogenetic studies are needed to clarify these relationships.
In the case of the *G. merotumida-plesiotumida-tumida tumida* lineage a different evolutionary pattern has appeared from the morphometric measurements: test size increased with a major transition between 5.5 and 4.5 Ma on both sides of the Isthmus, when *G. plesiotumida* evolved into *G. tumida tumida*. In contrast to *G. menardii*, however, no splitting event could be observed from test inflation, and the data show a continous time-progressive morphological trend. Size-based discrimination between *G. merotumida*, *G. plesiotumida* and early *G. tumida tumida* is difficult because of the continuous transition; extra characters are needed for species recognition. Our measurements of *G. tumida* from DSDP Site 503A (Pacific) match very well with earlier morphometric observations at Southern Indian Ocean DSDP Site 214, which is very interesting when we consider the large distance between the two study areas.

Planktonic Foraminifera at the Coniacian – Santonian boundary at Olazagutía, northern Spain
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The Olazagutía section (Navarra province, northern Spain) was chosen during the second Symposium on Cretaceous Stage Boundaries in Brussels, 1995, as one of the three potential candidates for the Global Standard stratotype Section and Point (GSSP) for the Coniacian-Santonian boundary. In September 2002 during the meeting on the Coniacian/Santonian Boundary in Bilbao, organized by the Subcomission on Cretaceous Stratigraphy, the participants – members of the Santonian Working Group – agreed that the Olazagutía section should be chosen as the Coniacian-Santonian boundary stratotype.
The studied part of the section at Olazagutia represents a sequence across the Coniacian-Santonian boundary in a carbonate facies which is composed generally of two complexes: marlier (20m thick) in the lower part and more calcareous (25m thick) in the upper part.
More than thirty planktonic foraminiferal species were recorded. In the interval studied the following sequence of bioevents is recorded from bottom to top (a) FO of *Sigalia carpatica*; (b) FO of *Costellagerina pilula*; (c) FO of typical "pill-box" like morphotypes of *Globotruncana linneiana*. The planktonic foraminifera allow the subdivision of the studied section into two heterohelicid zones: *Pseudotextularia nuttalli* and S*igalia carpatica* and the correlation of the zonal boundary with the inoceramid scheme. The Coniacian – Santonian boundary, as defined by the first occurrence of *Platyceramus undulatoplicatus* (Roemer), falls in the lower part of the *Sigalia*

carpatica Zone. FOs of *Costellagerina pilula* and typical "pill-box" like morphotypes of *Globotruncana linneiana* are a good proxy for the stage boundary.

Late Glacial and Holocene calcareous nannoplankton variations in the Northern Red Sea

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We present a high-resolution calcareous nannoplankton record from the northern Red Sea (GeoB 5844-2). Absolute abundances and numerical variations between selected species were used to reconstruct the palaeoceanography during the last 22 ka and are compared with geochemical data. The present work was carried out in order to improve our understanding of short-term variations of the calcareous nannoplankton assemblages and their relation to the terrestrial climate history.
The Red Sea is a key area for studying climatic changes in the late Quaternary. The oceanographic conditions are controlled by the regional climate and the restricted exchange of water masses with the Indian Ocean via the shallow Strait of Bab el Mandeb. Due to this fact, the salinity is particularly sensitive to changes in the global sea level. Variations of the sea level driven exchange during glacial-interglacial cycles are well documented in an enhanced amplification of palaeoclimatic signals such as oxygen isotope ratios and microfossil compositions.
Extreme conditions with highest salinities during the late glacial result in the northern Red Sea in the total disappearance of planktic foraminifers („aplanktic zone"), caused by low abundances of the calcareous nannoplankton. However, it is proven that sea-surface salinity is not the controlling factor of variations within calcareous nannoplankton since the Heinrich event 1 (H1). Different assemblage compositions and absolute coccolith numbers throughout the H1 indicate fluctuations in productivity and surface water conditions. For example: the assemblages during the Bølling/Allerød warm period and especially the Red Sea humid period are dominated by *Emiliania huxleyi* suggesting more eutrophic and humid conditions. The period of the Younger Dryas is characterised by increased abundances of *Gephyrocapsa oceanica* indicating significant changes in the stratification and productivity. The palaeoceanographic implication of the calcareous nannoplankton composition is also documented by different geochemical proxies, providing the hypothesis of a strong coupling between the environmental changes in the northern Red Sea and the climate of the Northern Hemisphere high latitudes.

Palaeomagnetic and Planktonic foraminiferal biostratigraphy of a Plio-Pleistocene section, Rhodes (Greece)

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The Island of Rhodes makes up the easternmost part of the Aegean Arch, located near the Turkish mainland, in the Eastern Mediterranean Sea.
The Tsambika profile is located on the road to Tsambika Beach, approximately 25 km from the centre of Rhodes City at the south-eastern coast of the Island. The basement in this area is composed of metamorphic limestone of Mesozoic age. The basement reaches an elevation of 300-400 m above sea level just beside the profile (Tsambika Mountain). The investigated section consists of 40m of marine sediment (limestone, silt/clay), that rests unconformably on the basement. The sections can be separated into two lithofacies. The first is a limestone facies occurring between 0-4 meters in the lower part of the section. The limestone is replaced by a silt/clay facies occurring throughout the rest of the section. The foraminiferal assemblage suggests that the limestone unit is not an in-situ sediment and has been deposited by several gravity flows during a transgression. During the transgression the carbonate environment was drowned and replaced by the silt/clay facies, representing a deep-sea environment (> 400 m). Both the foraminiferal and palaeomagnetic data suggest that the section is of Late Plio-Pleistocene age. The limestone facies is assigned to the Kolimbia limestone Formation, while the silt/clay facies is assigned to the Lindos Bay Clay Formation.
The marine deposits have a very diverse planktonic foraminifera fauna. A total of 6o species have been recorded. More than ten of those species have not been previously recorded in the Mediterranean Plio-

Pleiostocene. Further, at least two unknown planktonic species has been observed.
The biostratigraphic correlation between the Tsambika section and the Plio-Pleistocene boundary stratotype at Vrica, Southern Italy, shows that most of the foraminiferal events are diachronous. The only possible exception is the FAD of *G. crassaformis*. Also the benthic foraminifera *Hyalina baltica* has been recorded but the FAD of this species predates the Plio-Pleistocene boundary in the Tsambika section as indicated by the paleomagnetic data. It is concluded that it is not possible to correlate between the Tsambika and the Vrica sections based on foraminiferal biostratigraphy.

The Maastrichtian - Danian boundary of the TUBA-13 drill core, central Copenhagen, Denmark
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The TUBA-13 drill core has been re-investigated with the aim of shedding new light on the biostratigraphic resolution around the Cretaceous - Palaeogene (K-P) boundary. Both the Maastrichtian chalk and the overlying Danian limestone contain rich and well-preserved microfaunas and nannofloras. The uppermost Maastrichtian strata contain e.g. the planktic foraminiferid species *Pseudotextularia elegans*, *Planoglobulina acervulinoides*, *Heterohelix globulosa*, *Guembelitria cretacea*, *Globigerinelloides multispina* and *Rugoglobigerina rugosa* together with the benthic *Brizalina incrassata* and *Stensioeina pommerana*. Characteristic nannofossil species of this level are *Cribrosphaerella daniae*, *Nephrolithus frequens*, and large (14mm) *Arkhangelskiella cymbiformis*. These biota demonstrate that the uppermost Maastrichtian strata correlate with the *P. elegans* foraminiferid Zone (FCS 23) and the UC20d nannofloral Zone.
The lowermost Danian samples contain e.g. the planktic foraminiferids *Globoconusa daubjergensis*, *Eoglobigerina eobulloides* and *Parasubbotina pseudobulloides*, while *Subbotina triloculinoides* and *Globanomalina compressa* appear further upward in the succession. The lowermost Danian sample contained only very rare, non-diagnostic nannofossils. The overlying sample contained *Coccolithus pelagicus*, *Placozygus sigmoides* and *Markalius inversus*, whereas *Prinsius dimorphosus* and *Cruciplacolithus asymmetricus* first appear in samples situated slightly higher up-section. Accordingly, the fossil assemblages indicate that the lowermost Danian strata correlate with the P1a foraminiferid Zone and the NNTp2C nannofossil Zone. In conclusion, it is suggested that the P0 and Pa foraminiferid zones and the NNTp1A-2B nannofossil subzones do not occur in the TUBA-13, central Copenhagen.

Calcareous plankton of the Cretaceous North Sea Basin: an integrated study of planktonic foraminifera and calcareous nannofossils
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In order to establish an integrated stratigraphic scheme for the Barremian to Albian interval in the Boreal Realm as well as gaining palaeoceanographic information, the BGS Borehole 81/40, which is located in the western part of the Central North Sea Basin, has been studied. A stratigraphy based on ammonites and ostracods published by Lott et al. in 1985 shows a complete succession of middle Barremian to Albian sediments. Based on planktonic foraminifera, calcareous nannofossils and stable isotopes a revised stratigraphy was developed which reveals a hiatus covering the lower Aptian.
While the planktonic foraminiferal assemblage indicates a more isolated position for the North Sea Basin during Barremian times with low abundances and specimen numbers, the upper Aptian is characterised by high abundances and specimen numbers which suggest more open oceanic conditions. The assemblages are dominated by small trochospiral and opportunistic hedbergellids; the episodical occurrence of planispiral specimens of *Globigerinelloides*, *Leupoldina* and *Ticinella* let us assume that different phases of water mass exchange between the Tethys and Boreal Realm took place during the Barremian to Albian interval.
A semi-quantitative analysis of calcareous nannofossils suggests warmer conditions during the middle Barremian which favoured high abundances of nannoconids. The representatives of the genus *Nannoconus* are mainly species restricted to the Boreal Realm such as *Nannoconus abundans*, *N. borealis* and *N. inornatus*.

Whereas the upper Aptian is characterised by cooler conditions as indicated by high abundances of cool water taxa (*Repagulum parvidentatum*, *Crucibiscutum* spp.).
A semi-quantitative analysis of benthic foraminifera based on the agglutinated/calcareous-ratio suggests warmer bottom-water conditions during Barremian and lowermost upper Aptian times. For the upper Aptian a cooling trend which is indicated by a dominance of agglutinated specimens can be observed.

High resolution biostratigraphy in Neogene sediments of two wells in the western Gulf of Mexico
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High-resolution biostratigraphy was carried out using calcareous nannofossils, planktic and benthic foraminifera, and palynomorphs from two wells in the western Gulf of Mexico. The age of the sediments is early Pleistocene to middle Miocene.

The early Pleistocene is represented by nannoflora and microfauna of biozones NN19 and N22 (the *G. truncatulinoides truncatulinoides* Biozone) respectively, and by the dinocyst species: *S. delicates, S. membranaceous, M. quanta* and *H. rigaudiae*. These sediments were deposited in an inner neritic to middle neritic environment.
The Pliocene is characterised by biozones NN18, NN17, NN16, NN15, and NN14 to NN12, the *G. miocenica-G. tosaensis tosaensis* (N21-N20) biozones, the *Globorotalia margaritae* (N19-N18) biozones, and by the species of dinoflagellates *P. zoharyi, L. machaerophorum, M. choanophorum* and *O. crassum*. The palaeobathymetry corresponds to inner neritic to upper bathyal environments.
The late Miocene sediments comprise microfossils from the NN11, NN10, and NN9 biozones and the *G. humerosa* and *G. acostaensis* (N17 and N16) biozones. The dinocysts present in these sediments are: *S. mirabilis, D. pastielsii, S. hipidum*, and *Achomosphaera andalusiensis* among others. The palaeobathymetry of the sediments corresponds to an outer neritic to upper bathyal environment.
The middle Miocene strata are represented by the calcareous nannofossil biozones NN9, NN8, NN6 and NN5; the *G. mayeri*, *G. fohsi lobata - G. ruber* and *G. fohsi fohsi* (N14, N11-N13 and N10 biozones); and probably by part of the *G. fohsi peripheroronda* (N9) Biozone. These strata were deposited mainly in an outer neritic to upper bathyal environment.
The diversity and abundance of nannofossils presented notable variations throughout the two wells. In Well A, a strong predominance of calcareous nannofossils and marine palynomorphs from an outer neritic environment are observed, while planktic foraminifera from an upper bathyal environment increase in this well. In Well B an abundance of continental palynomorphs are noted from an inner neritic to middle neritic environment. One reduction is detected, indicating the outer neritic to upper bathyal.

Late Quaternary stratigraphy and foraminiferal response on the northern New South Wales continental shelf, Australia: a mixed siliclastic-carbonate setting
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The narrow continental shelf of northern New South Wales, Eastern Australia is covered by mixed siliclastic and temperate carbonate sediments. The strong, warm East Australian Current flows south sweeping mid and outer shelf biogenic sands and gravels. Inner and mid shelf clastic sediments are reworked by year-round, high-energy waves causing northward longshore currents or waning storm flows. This margin has low accommodation, and is dominated by wave and oceanic currents that have produced mixed siliclastic-carbonate facies. Ten cores are studied to establish benthic foraminiferal response to changes in lithofacies and Late Quaternary sea-level history. These cores cover two transects, from inner shelf to upper slope at Tweed Heads near the border to Queensland and from inner to outer shelf near the Clarence River at Yamba. Whereas the

East Australian Current prevents fine-grained sediments from being deposited in less than 35m water depth on the shelf, coastal headlands and the relatively large sediment input of the Clarence River allows for some mud to settle near Yamba.
A total of five facies associations were identified in the cores including inner shelf siliclastic sands, mid shelf clastic sands, outer shelf and upper slope temperate carbonate sands and gravels, and estuarine sediments. Foraminifera clearly increase in abundance and diversity with greater distance from shore and decrease in siliclastic influence. Palaeoestuaries that developed during the last interglacial and subsequently filled during early transgression were recovered on the inner to mid shelf. Faunal content in various estuarine facies varies, resembling the faunal response to complex ecological conditions of modern estuaries in the same region. Estuarine fill on the modern shelf is thin suggesting only shallow incision into the continental shelf during lowstand and/or erosion of earlier estuarine deposits through wave ravinement. The inner shelf facies at Tweed Heads comprise fine to medium sands with a poorly preserved low diversity benthic fauna indicating some reworking. At Clarence River a higher mud portion is preserved in the inner to mid shelf facies, foraminiferal abundance and diversity increases and the spiny species *Parrellina imperatrix* becomes common. Quaternary carbonate outer shelf sediments form uniform and graded beds resulting from the East Australian Current and less frequent storm energy. Foraminiferal assemblages are rich in abundance and diversity including numerous taxa of large test size. Calcareous species widely dominate the outer shelf and upper slope assemblage with a slight increase in agglutinated species on the upper slope. These transgressive and highstand outer shelf and upper slope sediments comprise temperate water carbonates. This project is part of a larger multidisciplinary study of Quaternary coastal valley evolution in New South Wales, Australia.

An improved Upper Cretaceous foraminiferal biozonation and well log correlation for the Pompeckj Block - Preliminary results

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The objective of this study is to reconstruct - chronologically and spatially - the distribution patterns of the Upper Cretaceous sediments (Albian to Maastrichtian) and finally the inversion history of a part of the Northwest German Basin (NWGB), namely the Pompeckj Block (PB) on a high resolution scale. Therefore an improved stratigraphic zonation scheme is desirable.
The Cretaceous NWGB is likely defined as a structure which consists of three tectonic elements:
a. Münsterland Block (MB)
b. Lower Saxony Basin (LSB)
c. Pompeckj Block (PB)
Its structural and sedimentary development can be generalised as follows:
1.) Large thicknesses of Upper Jurassic to Early Cretaceous sediments within the LSB. Deposits of this age are absent further south on the MB and in the north on the PB.
2.) An quiet phase (Aptian to Cenomanian) is characterised by a widespread transgressive onlap of marine sediments.
3.) The legitimate inversion took place most presumably from the Turonian to the Campanian, indicated by a spatial shift of the major depositional centre. The LSB was uplifted and eroded. Simultaneously sediments were accumulated on the subsiding MB and PB; the regions of former highs.
4.) The inversion supposedly terminates with a stable phase (Upper Maastrichtian to Palaeogene).
Furthermore, it remains unclear where and at what time precisely, if repeated in multiple steps for instance, how intensely the MB and PB subsided during the phase of legitimate inversion. Thus the exact driving mechanism for this inversion within the varying stress conditions of the Central European Basin System (CEBS) is not known in detail.
Data sets and original material of relevant wells penetrating the Upper Cretaceous of the PB have been re-examined to refine the existing (bio-)zonation and to reassess calibration for SP well log correlation. To achieve an improved comprehensive biostratigraphic concept recent work dealing with distinct time slices of the Upper Cretaceous NWGB have been implemented. Additionally zonation schemes developed for the North Sea, Offshore Norway and the MB were estimated and checked for applicability.

The most complete and thick Upper Cretaceous sequence of the Offenseth 1 well (OFFS 1) serves as the reference section. Special attention is paid to first downhole appearances (FDA) of index foraminifera to minimise erroneous dating due to reworking and caving. Nevertheless taphonomical inquiry also allows the use of last downhole appearances (LDA) datum markers .
This improved zonation scheme based on benthic and planktic foraminifera allows biostratigraphic calibration of parts of the drilled Upper Cretaceous sequences with a resolution of less than 1Ma. It will be further refined and seconded in combination with well log peak stratigraphy and then used for correlation of wells penetrating the Late Cretaceous of the Pompeckj Block.

Joint Silicofossil and Palynology Group Meeting, Cardiff June 9^{th} –10^{th} 2004

Talk Abstracts

Fossil evidence for the spread of toxic algal species
Andrew McMinn
Institute of Antarctic and Southern Ocean Studies, University of Tasmania.
No abstract

Diatom $\delta^{18}O$ evidence for the development of the modern halocline system in the subarctic North West Pacific across the ONHG boundary
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Establishing a time frame for the development of the modern thermocline and stratified water column in the subarctic Pacific has significant palaeoclimate implications. Here we present a $\delta^{18}O_{(diatom)}$ record consisting of only two species that represent autumnal/winter conditions in the region across the Onset of Northern Hemisphere Glaciation boundary. At c.2.73 Ma BP, a 4.6-6.0‰ depletion is observed in $\delta^{18}O_{(diatom)}$ whereas previously published $\delta^{18}O_{(foram)}$ results show a 2.6‰ enrichment. $\delta^{18}O_{(diatom)}$, together with U^{K}_{37} SST reconstructions, are consistent with the development of the modern halocline with year-round stratification of the water column and a summer/autumnal temperature inversion at the ONHG. In contrast, the foraminifera $\delta^{18}O$ signal is likely to be indicative of conditions beneath the mesothermal structure and/or spring conditions when the thermocline and warm SST are not present. With a $\delta^{18}O_{(diatom)}$ fractionation temperature coefficient of 0.4‰ to 0.5‰ per ^{0}C, the inference here of a warm pool of surface water from c.2.73 Ma BP provides a potential source for the extra moisture needed to supply the growing North American ice-sheets.

Does fluorescence tell us about heterotrophy in fossil dinoflagellates?
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Recent studies have shown that the organic cysts of some extant heterotrophic peridinioid dinoflagellates, in contrast to phototrophic dinoflagellates, do not show autofluorescence. This lead to the hypothesis, that autofluorescence of the organic walls of cysts is related to photosynthesis in the motile cells, in that metabolic products of photosynthesis are incorporated into the organic cyst wall. Also in fossil material, it has been shown that most dinoflagellate cysts show autofluorescence, whereas others having suffered the same post-depositional processes do not. It is therefore assumed, that we can use autofluorescence in fossil cysts as an indicator for phototrophy, and that those non-fluorescing cysts were formed by heterotrophic motile cells.
Dinoflagellate cysts assemblages from selected time slices from the Triassic to the Tertiary have been examined using Confocal Laser Scanning Microscopy (CLSM) for analysing their fluorescence properties. In addition to

the qualitative assessment of the presence or absence of autofluorescence, CLSM was used to obtain quantitative fluorescence spectra of these fossil cysts, with the objective to reveal different wall materials in different taxonomic groups of fossil dinoflagellate cysts. This study is the first systematic survey of detailed fluorescence properties of fossil dinoflagellate cysts and will build a sound baseline of data for further studies. In the present contribution we will explain the methods used and report on the first results on the discrimination of trophic groups and on the relationship of trophic strategies to phylogeny and taxonomy.

Understanding the origin of diatoms in Lake Baikal: Interpreting the Recent and fossil specimens
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The diversity of the benthic diatom flora in Lake Baikal has been little studied in the last 50 years and remains largely unknown. A recent (1997-9) Darwin Initiative allowed a complete survey of the lake perimeter and a general assessment of its current diversity. Preliminary assessments indicate that the flora is large (in excess of 500 species) and that it includes a rather large number of endemic species, roughly a third. The relationships of the endemic species are under study with the aim to understand their origin in the lake. More recently examination of a long core has allowed a palaeontological dimension to be obtained so that the extinct diversity can be related to the current flora as well as the global distribution of certain species. In this presentation I will give several examples of the interrelationships among certain groups of diatoms in both their spatial and temporal contexts with an examination of the roles both recent and fossil distributions play in understanding the origins of Lake Baikal's diversity.

Opal export and burial in the Southern Ocean: Fragilariopsis kerguelensis versus large diatoms
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Based on the correlation of *Fragilariopsis kerguelensis* and opal downcore and the fact that this numerically dominant diatom is strongly silicified, it has been suggested that *F. kerguelensis* is the most important diatom species in opal export from the surface waters and subsequent burial into the sediments of the Southern Ocean. Numerical dominance, however, does not take into account the vast difference in cellular and frustule volume between the most widespread Antarctic diatom, and less abundant but larger species. In this study we show that the species *Thalassiothrix antarctica* and *Thalassiosira lentiginosa* can match and exceed the frustule volume of *Fragilariopsis kerguelensis*. The trend is observed not only in water column samples but core tops and downcore. Despite their lower abundance in standard micropaleontological counts, *T. antarctica* is likely to be just as important for opal export and burial as *F. kerguelensis*. Such vast differences in size and abundance will have to be considered in the bulk geochemical analysis of Southern Ocean sediments as there is evidence to suggest that the two diatoms may grow at different depths.

Is the opening of the Tasmanian Gateway related to earliest Oligocene Antarctic cryospheric development?
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Tasmanian Gateway (TG) opening during the Eocene/Oligocene transition has long been invoked as the causal mechanism for the global climate shift from the "Hothouse" world of the early Cenozoic to the "Icehouse" world of the past 35 million years. ODP Leg 189 was designed to test the hypothesis that Antarctic cryospheric evolution resulted from the thermal isolation of Antarctica, caused by the opening of the TG. The proposed

mechanism specifically being investigated was the cessation of poleward penetration of the heat-transporting, warm East Australian Current (EAC), and concomitant Antarctic Circumpolar Current (ACC) development, as the cause of the climate cooling. Five sites (1168-1172) were drilled to document paleoceanographic and paleoclimatic changes associated with the opening of the TG as Australia moved northward from Antarctica during the early Cenozoic. Demonstrating that this climatic transformation occurred immediately following significant opening of the TG is one of the major results of ODP Leg 189 (Stickley et al., in press). To elucidate pre-TG paleo-ocean circulation in this critical region, Eocene phytoplankton records from Leg 189 and other published biotic records from the circum-Antarctic are here examined for biogeographic patterns. To test the TG hypothesis further we compare model fully coupled (ocean-atmosphere-sea ice-land) climate model results for Late Eocene conditions with proxy data and isotopic climate reconstructions. We demonstrate that (1) the EAC never extended far poleward, bending eastward around the northern edge of New Zealand instead, (2) even if this current had extended to Antarctica it is unlikely that turning the current off would have initiated glaciation, (3) that the proxy data agree with the paleocurrent predictions of the model, and (4) that the field data and model responses are not consistent with TG opening as being the control on earliest Oligocene Antarctic glaciation.

Deglacial ocean and climate seasonality in laminated diatom sediments, Mac.Robertson Shelf, Antarctica
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The East Antarctic Margin (EAM) has received less attention in palaeoceanographic studies than the Western Antarctic Margin, yet its role in deep ocean circulation and therefore the global ocean system is significant. During the USA NSF Polar Programs-funded cruise of the NVIB Nathaniel B. Palmer (NBP0101) in February-March 2001, laminated diatom-rich sediments from the last deglaciation, were recovered from the EAM, e.g. Mertz Drift (~66°S, 143°E), Svenner Channel (~69°S, 77°E) in Prydz Bay, Nielsen Basin (~67°S, 66°E) and Iceberg Alley (~67°S, 63°E). Here, we report on the microfabric of the deglacial, varved sediments from Iceberg Alley, Mac.Roberston Shelf. Our high-resolution palaeodata records diatom productivity associated with the retreat of permanent sea ice cover, and seasonal sea-ice changes along the EAM. This information is invaluable for assessing cryospheric-oceanographic variation, and therefore, climate change.
Jumbo piston core JPC43B (Iceberg Alley), comprises 23.96 m of intermittently laminated hemipelagic sediment with the deglacial varves found between 19.13-23.96 m. Couplets are composed of thickly laminated to thinly bedded orange/orange-brown diatom ooze (dominated by Hyalochaete Chaetoceros spp. resting spores, with abundant Corethron criophilum and Rhizosolenia antennata var. semispina in some laminae) and brown/blue-grey terrigenous angular quartz sand, silt and clays, bearing mixed diatoms. The thickness and frequency of these coupled laminations varies, becoming thinner upcore. Scanning electron microscope secondary electron imagery (SEI) of lamina 'bedding planes' and backscattered electron imagery (BSEI) of polished thin sections have been used to analyse the varves. The nature and temporal significance of the laminations are discussed in terms of seasonal deposition and cyclicity of diatom species, along the EAM in post-glacial times. With published West Antarctic studies of a similar nature, we report on how this rich archive can reveal clues about circum-Antarctic palaeoceanographic change during a time of both rapid climate change and high silica flux.

The Early Bajocian Carbon-isotope Shift - Radiolarian and Dinoflagellate Response
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A positive carbon-isotope excursion from 1.5 to 3 ‰ in $\delta^{13}C$ in late early Bajocian time has been documented

from several Tethyan sections. This peak is double-pronged: $\delta^{13}C$ values increase by about 1.5 ‰ during the discites and laeviscula Zones and first peak in the sauzei Zone. After a minimum in the lower humphriesianum Zone values peak again in the higher part of that zone, stay high in the niortense Zone and then gradually drop off during the rest of the late Bajocian and early Bathonian. In sensitive areas like the Umbria-Marche palaeogeographic zone of the Northern Apennines, the positive excursion correlates with more chert-rich lithologies, suggesting higher radiolarian and siliceous sponge productivity. In many Tethyan basinal sections, like those of the Lombardy Basin in the Southern Alps, lime-free radiolarites replace siliceous pelagic limestones from the sauzei or humphiesianum Zone upsection.
With the Unitary Association method we quantitatively compiled first (FAD) versus last (LAD) appearances of over 400 radiolarian taxa for 79 Unitary Associations through the Middle to Late Jurassic from Tethyan sections and found a characteristic response to this carbon isotope excursion: FADs dominate over LADs, suggesting diversification during the early Bajocian rise of carbon-isotope values. Then, during the second isotope peak (humphiesianum-niortense) this tendency is reversed and LADs dominate over FADs indicating abundant extinctions. A gradual increase in FADs then occurs during the late Bajocian-early Bathonian. The response of index species diversity is somewhat different: it is lowest during the isotopic rise and highest during the isotopic minimum during the late Bajocian-Bathonian. Thus, high silica productivity/preservation occurred during carbon isotopic highs and resulted in low radiolarian diversity, while low silica productivity occurred during isotopic lows and show high radiolarian diversity, where preservation is sufficient to reveal complete assemblages.
The dinoflagellate response seems to be almost contrary to the radiolarian response: peak diversification is observed in humphiesianum and niortense Zones, when carbon isotopes are maximal. This mid-Bajocian diversification event corresponds to the onset of the major dinoflagellate cyst radiation of the Mesozoic. This concerns especially one family, the Gonyaulacaceae, which is the most diverse dinoflagellate cyst family in the Mesozoic and Cainozoic. We conclude that thriving radiolarian and dinoflagellate productivity during the Middle Jurassic periods of high $\delta^{13}C$ are indicative of moderate eutrophication of Tethyan surface waters. When $\delta^{13}C$ is highest, radiolarian diversity drops drastically, while dinoflagellate diversity increases. This response suggests less tolerance of most radiolarian taxa to eutrophication as compared to dinoflagellates, which thrived during most eutrophic times. During the Cretaceous anoxic events, higher positive carbon excursions and the dropout of biogenic silica production during the peak of the events suggest more important eutrophication as compared to the Jurassic.

(Paleo)limnology and diatom assemblages of oligotrophic lakes in the Amery Oasis (East Antarctica)
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Antarctic freshwater ecosystems are characterized by persistent low temperatures, prolonged ice-cover, extremes in irradiance, short growing seasons, reduced bioproductivity and low biota diversity. Within the Australian research programme Palaeoenvironments of the Antarctic coast, from 50ºE to 120ºE, three lakes of the Amery Oasis, northern Prince Charles Mountains, East Antarctica, were analyzed on their limnology and diatom flora. The three investigated lakes, Terrasovoje Lake (31 m water depth) and Radok Lake (min. 357 m), both meltwater reservoirs, and Beaver Lake (> 400 m), an epishelf lake, show minor to moderate vertical changes in conductivity, pH, temperature and oxygen content. The lakes of the Amery Oasis are cold, ultra-oligotrophic lakes with moderate (Terrasovoje and Radok Lakes) to high (Beaver Lake) ion concentrations. Beaver Lake has a chemocline at 20-30 m water depth which separates warmer freshwater at the surface (~ 3500 µS cm^{-1}) from colder and denser deep water (~ 6500 µS cm^{-1}).
Planktonic diatoms were not present in any of the three lakes during austral summer 2001/2002. However, 34 benthic diatom taxa could be identified from sediments recovered in Terrasovoje and Radok Lakes whereas the sediments of Beaver Lake do not contain any diatoms. A 552 cm long sediment core recovered in Terrasovoje Lake reflects the late Pleistocene to Holocene environmental history of the Amery Oasis. The diatom assemblages in this sediment core together with changes of several geochemical indicators reveal distinct

relative changes of past temperature, productivity and bottom water conditions.

Synchronous Eocene/Oligocene high latitude cooling: ODP Site 913, Norwegian-Greenland Sea
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The Eocene-Oligocene interval was a critical phase in earth history, marking a major climatic transition from greenhouse conditions in the Cretaceous to icehouse conditions in the Cenozoic. Stable oxygen isotope data indicate that, after the late Palaeocene-early Eocene thermal maximum, a long-term cooling trend began at about 52 Ma which culminated in a permanent drop in oceanic bottom water temperatures at the Eocene-Oligocene (E/O) boundary. The climatic deterioration is manifested as a series of cooling episodes, partly reflected in the biotic realm by stepwise faunal and floral extinctions as temperature sensitive species were replaced by more tolerant taxa. Here we present a dinoflagellate cyst-based relative sea surface temperature curve (DTC) for the E/O section of ODP Hole 913B, drilled in the Norwegian-Greenland Sea. This first E/O SST curve for high Northern latitudes records cooling episodes that are synchronous with the Southern Ocean record for this period. Micropalaeontological and geochemical proxies indicate that the increased productivity represented by the biogenic sediments deposited during these cooling episodes, were the result of increases in nutrient supply due to enhanced atmospheric and oceanic circulation. Moreover, the identification of ice-rafted debris in Hole 913B, provides evidence for possible Northern Hemisphere glaciation, or at least the presence of seasonal sea-ice, during the latest Eocene cooling phase, which also corresponds with an intensification of the East Antarctic Ice Shelf at the Eocene-Oligocene boundary.

A new technique to compare transmitted light and scanning electron micrographs: Applied to low-latitude Palaeogene Radiolaria
Jackett, S-J. and Baumgartner, P.O.
Université de Lausanne, Institut de Géologie et Paléontologie, Lausanne, Switzerland

We propose a simple, time efficient technique to produce comparative composite focal depth TL and SEM images of single specimens of low-latitude Palaeogene radiolarians.
SEM precedes TL microscopy:
(1) A cover slip (12mm Ø) is prepared with clear nail varnish diluted in acetone to securely adhere the specimens. Once arranged on the cover slip, the varnish is softened with acetone fumes to fix the specimens. Nail varnish provides an even, smooth surface for background contrast. (2) Uncoated specimens are photographed in low vacuum (40-50 Pa) to avoid charging. The cover slip is fixed to a 25 mm Ø stub with beryllium levers allowing electrical earthing and removal of the cover slip. Decreased cover slip Ø to stub Ø ratio and a fine coating of antistatic spray further prevents charging (3) After SEM work the cover slip is removed, overturned and mounted on a glass slide for TL microscopy. Composite focal depth TL microscopy uses a series of images taken in focus throughout the thickness of a radiolarian specimen. An algorithm extracts the focused portions of each image to produce a composite image showing sharpness throughout the specimen. Advantages of this technique are: (1) it produces comparative TL and SEM illustrations that help clarify radiolarian taxonomy (2) there is minimal risk of damaging specimens during picking and mounting for SEM and TL illustration, (3) in comparison with published techniques to illustrate single specimens by TL and SEM our technique is more time efficient and materials used are less toxic.
This technique is used to study entire radiolarian faunal assemblages of the low-latitude Palaeocene - lower Eocene as: (1) the total number of radiolarian species in a sample at any given time is approximately 150 and a high proportion remain unclassified, plus there are radiolarian events that are not yet documented. Thus radiolarian faunal turnover is poorly known during significant global climate and ocean circulation changes across the P-E boundary and the LPTM interval, (2) presently zones RP1-RP5 of the earliest Palaeocene are only demonstrated in high latitudes, (3) DSDP/ODP topotypic material photographed using this technique aids identification of diagenetically altered specimens from land sections. We will construct assemblage zones based

on abundant and more robust taxa readily found in orogenic sections.

Palaeoceanography of the South Tasman Rise during MIS 10-12 from diatom and dinocyst analyses
Adam Young and Catherine Stickley
School of Earth, Ocean and Planetary Sciences, Cardiff University, UK.

Diatom analysis is used to help reconstruct palaeoceanographic conditions of the South Tasman Rise (STR) at Site 1171 of Ocean Drilling Program (ODP) Leg 189, during MIS 10-12 at a resolution of ~3 kyr. Emphasis is placed on Termination V (434-423 ka) and the Mid-Brunhes Event (MBE) at ~400 kyr. Site 1171 is located in lower bathyal water depths of ~2150 m on a gentle southwesterly slope on the southernmost STR, ~550 km south of Tasmania and 270 km southeast of Site 1170. At 48°S, it lies in subantarctic waters between the Subtropical Front to the north and the Subantarctic Front to the south. Four holes were drilled at Site 1171; this presentation primarily covers our initial findings of diatom analysis from Hole 1171A.
Four distinct diatom assemblages are defined by cluster analysis; the characteristic diatom species for each assemblage defined by correspondence analysis. Three of these assemblages indicate possible latitudinal movement of oceanographic fronts in the region during MIS 10-12, although data from nearby sites is required to confirm this. Diatom accumulation rate data are presented which indicate changing flux rates associated with oceanographic movement. Flux rates are greatest during early MIS 11, following Termination V which appears to have been a time of intense silica dissolution apparent by very poorly preserved, dissolved diatom valves. Dissolution may have been enhanced at this time by an increase in wind-blown dust to the STR.
An assessment is made on how widespread or localised our findings are by comparison with published work from ODP 177 (South Atlantic sector). This work represents the initial findings of diatom and analysis for MIS 11 times over the STR. Work is underway to complete the analysis for both diatoms and dinocysts for Site 1170 and 1171 in order to make a fuller assessment of palaeoenvironmental conditions for the STR.

The first substantial UK onshore occurrence of Middle Eocene diatoms: comparisons with published palynological data, and implications for palaeoceanographic change
Malcolm B. Hart (1) & Alexander G. Mitlehner (2)
(1) School of Earth, Ocean & Environmental Sciences, University of Plymouth, Drake Circus, Plymouth PL4 8AA, UK; (2) Department of Geography, Padworth International College, Reading RG7 4JD, UK

Sampling of the Bracklesham Group sediments of Whitecliff Bay, Isle of Wight, has led to the discovery of an assemblage of marine diatoms in a series of clays previously thought to be barren of microfossils. Although preserved as pyritised steinkerns, enough detail is present in most cases to allow identification to species level. They include several stratigraphically restricted taxa, including *Brightwellia hyperborea* and *Aulacodiscus subexcavatus*, which allow the assemblage to be placed within the *Triceratium kanayae* diatom zone of the Middle Eocene. This is equivalent to calcareous nannoplankton zone NP15, and confirms a Lutetian age.
The assemblage is dominated by the large centric diatom *Fenestrella antiqua* (previously *Coscinodiscus* sp. 1 of many industry workers), previously unknown in sediments later than earliest Eocene worldwide, and its occurrence in this sequence therefore extends the known range of this species into the Middle Eocene.
The diatoms recovered include both low-latitude planktic species and more cosmopolitan coastal and nearshore taxa, attesting to strong connections to both southerly, warmer waters as well as cooler waters to the north and east. Data include the presence of the larger foraminiferid *Nummulites laevigatus* from beds above and below the diatom-bearing level, further confirming warm conditions around the time of deposition, whilst palynological evidence shows the presence of peridinioid dinoflagellates in the diatom-bearing section. Diatom-rich sections in the late Cretaceous to mid Tertiary of the North West Europe continental shelf are known to coincide with abundances of peridinioid dinoflagellates belonging to the genera *Phthanoperidinium* and *Wetzelliella*, and their co-occurrence suggests the presence of eutrophic, nutrient-rich conditions in surface waters, attributable to episodes of water column stratification and reduced water circulation. The publication of industrial records showing this phenomenon is badly needed, as it will help to refine palaeonvironmental interpretations in offshore sections, as well as adding to knowledge of marine circulation changes in the later Mesozoic and Cenozoic worldwide.

The White Stone Band of the Kimmeridge Clay Formation, an integrated high-resolution approach to understanding environmental change

S.J. Pearson, J.E.A. Marshall, & A.E.S. Kemp
School of Ocean and Earth Science, University of Southampton, Southampton Oceanography Centre, European Way, Southampton, SO14 3ZH, UK

The Kimmeridge Clay is a Jurassic mudrock succession that shows Milankovitch Band climatic cyclicity. A key issue is to determine how the subtle changes that define this cyclicity result from climatic change. Using material from the Natural Environment Research Council Rapid Global Geological Events (RGGE) Kimmeridge Drilling Project boreholes, the White Stone Band was investigated at the lamination scale using BSEI and quantitative palynofacies. Fabric analysis shows the lamination to represent successive deposition of coccolith-rich and organic-matter-rich layers. Individual laminae contain unsorted palynological debris with no differential input of marine and terrestrial components. Such input is interpreted as storm transport. Linking water column processes to laminae deposition indicates seasonal input with an initial coccolith bloom followed by a more diverse assemblage including dinoflagellates and photosynthetic chlorobiaceaen bacteria. As the photic zone extended into the euxinic water column organic matter export to the seabed underwent minimal cycling through oxidation and subsequently became preserved through sulphurization with greatly increased sequestration of carbon. This was significantly increased by late season storm-driven mixing of euxinic water into the photic zone. Increased frequency of storm systems would therefore dilute the coccolith input to give an oil shale. Hence climatically induced changes in storm frequency would progressively vary the organic content of the sediment and generate the climate cycle signal.

The biotic response of calcareous nannofossils to the Messinian Salinity Crisis, Cyprus

Bridget Wade [a] and Paul Bown [b]
[a] School of Earth, Ocean and Planetary Sciences, Cardiff University, Main Building, Park Place, Cardiff, CF10 3YE, UK; [b] Department of Earth Sciences, University College London, Gower Street, London, WC1E 6BT, UK.

The rapidly changing and extreme environmental conditions of the early Messinian Salinity Crisis are reflected in abrupt variations in nannofossil assemblages within the Messinian units (Kalavasos Formation) from the Polemi Basin, Cyprus. During the Messinian, the Polemi Basin was a semi-enclosed, neritic to littoral environment, subject to repeated influxes of marine and freshwater. Nannofossil diversity (3 to 11 species) is greatly reduced in comparison to the open ocean and assemblages are highly uneven with high dominance. One of five nannoplankton species were observed to dominate any of the assemblages, these were *Reticulofenestra minuta*, *Dictyococcites antarcticus*, *Helicosphaera carteri*, *Umbilicosphaera jafari* and *Sphenolithus abies*. The associated diatom and sedimentological evidence from the Polemi Basin are used to indicate the palaeoecology of key nannofossil taxa. D. antarcticus predominated in normal salinity, mesotrophic, shallow water environments; *H. carteri* in shallow, hyper-eutrophic environments with enhanced salinity; *U. jafari* hypersaline conditions; *R. minuta* in hyper-eutrophic conditions with an abnormal salinity from brackish to hypersaline; *S. abies* in mesotrophic, deeper and normal salinity environments. These species are indicated to be opportunistic taxa, adapted to unstable environments. Fluctuations in nutrient levels and salinity are interpreted as the primary factors controlling the overall nature of the nannoplankton assemblages and the species which dominate at any one level.

Are diatom records from Antarctic coastal sediments anything but relict assemblages?

Jennifer Pike[1], Claire S. Allen[2], Catherine E. Stickley[1], Amy Leventer[3] and Carol J. Pudsey[2]
[1]School of Earth, Ocean and Planetary Sciences, Cardiff University, PO Box 914, Cardiff, CF10 3YE, UK; [2]British Antarctic Survey, High Cross, Madingley Road, Cambridge, CB3 0ET, UK; [3]Geology Department, Colgate University, Hamilton, NY 13346, USA

Palaeoecological information from fossil diatom assemblages is widely used in the reconstruction of ocean and climate history, particularly in the Southern Ocean. When analysing the diatom record of palaeoceanographic change it is important to understand the taphonomic processes that act to produce the fossil record from the

original water column assemblages. It is acknowledged that only a fraction of the diatom flora in the water will be preserved in the sediment – weakly silicified diatoms that are important in surface waters are often dissolved before they become incorporated into the fossil record whilst robust, heavily silicified taxa are dissolution resistant and often over represented in the fossil record. This study aims to address the magnitude of the introduced bias and assess the implications for diatom-based palaeoceanographic reconstructions, and is the first detailed comparison of diatom surface water assemblages with those in the underlying sediments across the Scotia Sea and around the Antarctic Peninsula (AP). Water samples were collected during austral summer 2001-02 and austral spring 2003-04 aboard the RRS James Clark Ross and traverse the major oceanographic boundaries of the Scotia Sea and AP including the Polar Front and the sea-ice zone. Water column assemblages have been compared with existing surface sediment samples from the region to assess the contribution of the surface water community to the fossil assemblage. Results from the first season demonstrate that summer surface water assemblages are very poorly represented in the fossil record and data from the western Antarctic Peninsula will be presented. The fossil assemblages are either (1) dominated by spring diatom flux, or (2) taphonomic processes significantly distort the signal of the water column assemblage, hence the palaeoenvironmental data available. The results from the second season (spring) of data will provide the necessary information to address these scenarios and assess the full impact of taphonomy on the diatom fossil record from coastal Antarctica.

New data on the palaeoecology of Late Cretaceous dinoflagellates from shallow Chalk Sea sequences
Martin A. Pearce
Statoil ASA, Grenseveien 21, N-4035 Stavanger, Norway.

The dinoflagellate cyst record from an Upper Cretaceous (uppermost Cenomanianæupper Coniacian) Chalk core, drilled at Banterwick Barn, Berkshire, is described and statistically correlated with elemental and stable isotope bulk sediment geochemical data from the same core. Seventy-two dinocyst species and subspecies are recorded, and stable carbon and oxygen isotopic ($\delta^{13}C$, $\delta^{18}O$) trends are documented. Lithostratigraphy and chemostratigraphic correlation of the $\delta^{13}C$ curve with an expanded section at Dover, Kent, are used to identify stratigraphically significant marls, and determine the positions of macrofossil zones and stage boundaries in the Banterwick Barn core. These data indicate that >30 m of chalk at Dover are represented by <2 m of Chalk Rock at Banterwick Barn, with much of the succession being absent due to erosion and non-deposition. First and last appearance datums (FAD, LAD), first and last common occurrences, and acmes of key TuronianæConiacian dinocyst species are documented and compared with other records from the AngloæParis Basin. An extremely impoverished assemblage of dinocysts in the highest Cenomanian to lowest Turonian is considered to be largely a preservational artefact of intraclastic nodular and calcarenitic chalks, and is not related directly to the well-documented global oceanic anoxic event (OAE2) occurring at that time (~93.5 Ma). A sharp increase in dinocyst abundance in the lower Turonian corresponds with a change in lithology to more marly chalks. A gradual decrease in the number of species is observed through the middle Turonian to upper Coniacian; $\delta^{18}O$ records show that this was associated with global climatic cooling. Cluster analysis of the dinocyst abundance record with geochemical data indicates four distinct species groups with characteristic geochemical associations. Groups 1 and 2 are associated with phases of increased siliciclastic supply; a positive correlation with higher $\delta^{13}C$ values differentiates the latter. Group 3 is independent of carbonate and detrital input, and Group 4 is associated with high carbonate flux and low detrital supply. These groupings suggest that cyst-forming dinoflagellates exhibited a range of ecological niches in the Late Cretaceous. Key environmental factors are likely to be sea-level and climate related, controlling nutrient supply, sea-surface temperature, and environmental stability.

Micropalaeontology News

The Atlas of Paleocene Planktonic Foraminifera
The Atlas of Paleocene Planktonic Foraminifera, which was published in 1999 by Smithsonian Institution Press (R.K. Olsson, C.Hemleben, W.A. Berggren, B.T. Huber, editors and members of the Paleogene Planktonic Foraminifera Working Group, Smithsonian Contributions to Paleobiology, v. 85, 252 pages, 71 plates) is now available online at the CHRONOS web site. See http://services.chronos.org/foramatlas/pages/home.htm. The text, figures, and select species images from the Atlas were converted to html format in 1999 by staff at the Smithsonian Institution for use on any web browser. One of the more convenient features of the html version is the quick lookup capability for the planktonic species providing split screen viewing of images and text. Additional taxonomic and chronostratigraphy related resources can be found on the CHRONOS web page at http://www.chronos.org.

Update on the Eocene Atlas of Planktonic Foraminifera
The Paleogene Planktonic Foraminifer Working Group has nearly completed their work on the Eocene Atlas of Planktonic Foraminifera and expects to submit it to the Cushman Foundation Special Publication editor during Summer 2004. The biostratigraphy, taxonomy, and phylogenetic systematics of Eocene planktonic foraminifera are treated in an illustrated atlas format including 134 plates, with 11 families, 24 genera (two of which are new), and 162 species of Eocene planktonic foraminifera described and illustrated. Scanning electron micrographs of the type specimens of 127 species are illustrated for the first time, providing new insight to the shell architecture and wall texture, particularly for species that had been poorly illustrated. The phylogenetic relationships of all species of Eocene planktonic foraminifera are reviewed and presented in phylogenetic range charts. Analysis of wall textures, based on well-preserved material, provides the basis for the higher taxonomy. The biostratigraphic occurrences of all species of Eocene planktonic foraminifera are reviewed. New modifications to the standard (sub) tropical and Antarctic zonations, and a new nomenclature for these zones are proposed.

Brian T. Huber
Smithsonian National Museum of Natural History

Forthcoming Conferences

Pre IGC workshop, Florence, Italy (18th-19th August 2004)
As part of the 32nd International Geological Congress to be held in Florence a nannoplankton workshop entitled “Past and future contribution of nannoplankton research to global change questions” is being held before the congress begins.
The workshop is intended to address:
1) the current researches on calcareous nannoplakton for interpreting global change in the geological record;
2) the implications of this pytoplankton group for oceanography, paleoceanography, geobiology and geoarcheaology.
For more information on the congress and the workshop, please visit the website: www.nhm.ac.uk/hosted_sites/ina/announce/igc32.htm

INA 10, Lisbon, Portugal (August 28th – 4th September 2004)
Hosted by the University of Lisbon, the tenth International Nannofossil Association conference is running the theme ‘Focus on the smallest, understand the global’. Themes include taxonomy, palaeoecology, oil industry applications and developments, ODP/IODP results and plans and evolution. The meeting, to be held over 8 days includes talk and poster sessions, workshops and field excursions to the Setubal Peninsula to see dinosaur footprints (amongst other things) and to see the Jurassic sections at Coimbra and Condeixa. One highlight no doubt will be the pre-conference football match on the beach…… For more information on INA 10, see the conference website (www.ina.fc.ul.pt/home.htm)

LYELL MEETING 2005

'APPLIED PHYLOGENY'

FEBRUARY 9TH, 2005 at The Geological Society,
Burlington House, London.

The **2005 Lyell Meeting**, sponsored by the Joint Committee for Palaeontology, is being organised by **The Micropalaeontology Society** (Joint Convenors Haydon Bailey & John Gregory). This prestigious one day meeting will be held at Burlington House, London on February 9th, 2005. This is the third call for papers on the theme of 'Applied Phylogeny'. Contributions will be arranged into three sessions, arranged stratigraphically (Palaeozoic, Mesozoic and Tertiary), each with a key note speaker.

Palaeozoic - Prof. Simon Conway-Morris (Cambridge) on Early life forms
Mesozoic - Dr. Peter Skelton (Open Univ.) on mid Cretaceous rudists
Caenozoic - Prof. Paul Pearson (Cardiff) on Palaeogene foraminifera

Contributors are asked to consider a single phylogenetic lineage and pursue it's development and application stratigraphically or in any other area of applied usage. We intend to publish the meeting proceedings at the earliest opportunity as a Special Publication of the Geol. Soc. (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 once an initial programme has been established. Details will also be posted on TMS website at www.tmsoc.org.

Contact Details:-

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Evolution of Protozoa and Other Protists, London (13th September 2004)
A joint meeting organised by the British Section of the Society of Protozoologists, the Linnean Society and the Systematics Association, at the Linnean Society of London, Burlington House, Piccadilly, London. Protozoa were the first eukaryotes and gave rise to all the higher kingdoms of life: animals, fungi, plants and chromists. At roughly the same time as the famous Cambrian explosion of animal phyla, Protozoa and other protists (notably algae) underwent a similar massive radiation. Expert speakers at this meeting will discuss the molecular, morphological, cell biological and palaeontological evidence beari ng on the origin of the eukayote cell and how it diversified to produce the major groups of Protozoa and unicellular algae – some realted to animals and some to plant. This often controversial topic will evoke lively discussion. More information can be found on the Lineean Society wesite News and Events page (www.linnean.org).

15th International Symposium on Ostracoda, Berlin, 12-15 September 2005
Organiser: Dr Michael Schudack.
Website: http://userpage.fu-berlin.de/~palaeont/iso15/iso15-main.htm

Association of French Palynologists (APLF) and The Micropalaeontological Society (TMS) Palynology Group Joint Meeting, Paris from 3 - 7 October 2005
"Palynology, Palaeolatitudes, Palaeoaltitudes: Land/ocean distribution patterns controlling climate and biodiversity" plus open sessions. Edwige Masure from Paris University Pierre et Marie Curie is the local organiser and the venue will be the *'Auditorium de la Grande Galerie'* at the Natural History Museum in Paris. See first circular and registration form in this Newsletter.

Meeting Reports

XI International Palynological Congress, Granada, Spain, 4-9th July 2004.
Susanne Feist-Burkhardt
<s.feist-burkhardt@nhm.ac.uk>

The XI International Palynological Congress was held at the Conference Centre in Granada, Spain, 4 to 9 July 2004. More than 500 delegates did attend this very successful meeting and a total of about 800 contributions were presented either as oral or poster presentations. Despite the large number of participants, only four sessions were held simultaneously. This arrangement turned out to be very useful, and in this way clashing of interesting talks was reduced to a minimum.
A bit unusual for the participants coming from more northerly countries, the meeting officially started in the evening of Sunday the 4th at 19:00h with the Welcoming Speeches and a first Plenary Session. The advantages of adopting the Andalucian daily rhythm became immediately obvious when we left the air-conditioned interior of the conference centre at 21:30h for the Cocktail Reception on the roof terrace of the Conference centre. With still nearly 30°C (85° Fahrenheit for the British and US colleagues) we enjoyed the breathtaking views over Granada to one side and the Sierra Nevada to the other, while chatting to colleagues and friends and degusting the first Spanish wines and gastronomic delights.
The next four days were densely packed with an intense scientific programme. Sessions were held from 8:30h in the morning to 20:30h or later in the evening with just an hour lunch

break and short breaks in the morning and the afternoon. In the following I will report on parts of the scientific programme, concentrating on those sessions relevant to palaeopalynology, but unavoidably somewhat biased by personal interest. Please note that all abstracts are published in the Spanish journal "Polen", including an index of all authors. It is also worth checking the conference website at <www.11ipc.org> for the list of participants.

On Monday morning, the sessions (g) on Palaepalynology and Evolution started off with a keynote lecture by Barrie Dale on dinoflagellate cysts as ecological/palaeoecological indicators. In the short time available, Barry tried his best to give an overview and describe the need for integrating biological, geological and environmental information. Several talks on dinoflagellate cysts, acritarchs and dinoflagellate biology followed this introduction. In the evening (at 19:30h) Karin Zonneveld summarised the knowledge on calcareous dinoflagellates as environmental tools. Later in the morning, the first session on Palaeozoic palynology (CIMP symposium) took place, sessions which were organised by Thomas Servais and Charles Wellman. Palaeozoic palynology was very well represented. The session started with talks in more or less stratigraphical order from the Cambrian to the Devonian, dealing with all aspects of acritarch, chitinozoan, prasinophyte and (crypto)spore research. A very interesting and well-attended session (a4) took place in the afternoon, unfortunately in parallel to the CIMP symposium, on palynomorph wall chemistry, structure and assembly, organised by A. Hemsley. In the keynote lecture, J.W. de Leeuw et al. explained carefully how scarce our knowledge on the structure and composition of the organic macromolecules composing palynomorphs still is and outlined the possibilities of newer technologies that will, hopefully, shed some light on these still enigmatic substances in the future.

Tuesday was again a day very strong in Palaeozoic, but also Precambrian palynology. The morning was dedicated to the continuation of session (g4) on Upper Palaeozoic palynology, followed after lunch by session (g2) on Precambrian palynology – with e.g. some amazing results presented by Kathy Grey on acritarchs from Australia, and the session (g5) on pre-Jurassic palynology of the Arabian plate and the adjacent regions, organised by Bernard Owens and Florentin Paris. Other interesting talks to the palaeopalynologist were found in the afternoon session (b2.2) on the evolution of angiosperm pollen characters (e.g. by J. E. Doyle). The last two hours of the afternoon were dedicated to the poster sessions (g1) to (g4), where the poster presenters had the opportunity to present in a few minutes the main results of their work in the lecture theatre. After this hard day of listening and scientific discussions, most of the participants opted for a well-deserved social event and attended the Andalusian dinner. .... Music, Flamenco, buffet dinner, beautiful setting of ... gardens not far outside Granada.

On Wednesday, a long day started for Henrik Nøhr-Hansen, who organised the session (g6) on Mesozoic palynology together with K. Nuñez Betelu. Starting with the Triassic of Qatar, Austria and Mexico, the talks proceeded through terrestrial and marine palynology of the Mesozoic and ended at the K/T boundary. I felt a special interest in a number of talks dealing with early angiosperm pollen from the Lower Cretaceous. E.g. the contribution of U. Heimhofer et al., presented by Peter Hochuli, in which they provided new, much better age dating (younger than previously thought) of the well-known, early angiosperm pollen bearing deposits from Portugal.

During lunchtime on Wednesday, the AASP luncheon took place in the conference centre's restaurant. A special point on the agenda was the bestowal/presentation of the AASP Medal of Scientific Excellence to David Wall and Barrie Dale. Martin Head presented the eulogy/laudation for both of them for this biggest honorary award in palynology. David Wall was not present but a letter of response upon receiving the medal was read out to the audience. Barrie Dale was there to accept the award and gave an honest, modest and very emotional word of thanks. Barrie clearly was deeply moved by receiving this great honorary award and his emotion was quite infectious for all those who attended the scene.

Thursday was the last day of scientific sessions. Again a full day of talks, from early in the morning to late in the evening. This day was essentially dedicated to Tertiary palynology, session (g7), and to pollen databases, sessions (i1) and (i2). The programme concluded in the

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
Newletter Editor

Rachel Preece
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Paul Smith
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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

late afternoon with the 2nd IFPS Plenary session and the Closing Ceremony.
In the evening then, there was the final Gala Dinner, where all participants were invited to attend. This took place in another beautiful Hazienda-like garden setting. The wine and food was just gorgeous. I cannot remember when I last had a similar meal, and I had quite a few occasions during the years I spend in the French cultural society/surroundings. After the dinner, the event was not over. Some stayed on and danced until late in the night, trying to be back the next morning, in time for the departure to the joint visit of the UNESCO Word Heritage site of Alhambra, in Granada.
In short, it was a great congress: a very good scientific programme and a very thoughtfully organised social programme. Congratulations to our Spanish fellow palynologists for this successful organisation of the 11th IPC.
During the Granada meeting it has been decided that the next IPC will take place in four years in Bonn, in Germany. The Germans will have to work hard trying to match the success of the meeting in Andalucia.

Book Shelf

John Gregory produced a review of the following book for the previous *Newsletter of Micropalaeontology*. The summary tables that John compiled were not reproduced, neither was the review attributed to him. Apologies to John, and the Membership. Here is the review in full. If there are any recently published books that you would like to review for the Newletter, drop me a line and I'll obtain a review copy for you.
Jenny Pike, Editor
<pikej@cardiff.ac.uk>

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 Sociètè Géologique de France.
ISBN 90-5699-336-4. Price approx £70, order through the Amazon link on TMS web-page

Reviewed by F. John Gregory
Natural History Museum, Department of Palaeontology & Kronos Consultants
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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 diagentically 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. I have summarised the key features used (Table 1).

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

Character	Order	Superfamily	Family	Subfamily	Genus	Species
initial spicule '+/-	■					
Spicule structure		■	■	■		
Relation of spicule to first shell			■			
Morphology of spicule		■	■			
Skeletal growth pattern		■	■			
No. shells/chambers/segments			?			
No. spines/arms			?	■	■	
Aperture/pylome '+/-			?	?	■	

Table 1: Key morphological features

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) (I have produced a summary of the complete hierarchical listing, Table 2). 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.

References

ANDERSON, O. R. 1983. Radiolaria. Springer-Verlag, Amsterdam, 1-355 p.
BLUEFORD, J. R., AND B. MURCHEY. 1993. Radiolaria of giant and subgiant fields in Asia. Micropaleontology Special Publication, 6, 1-299 p.
BOWN, P. R. 1998. Calcareous Nannofossil Biostratigraphy. Chapman & Hall, 381 p.
DYER, R., AND P. COPESTAKE. 1989. A review of Late Jurassic to earliest Cretaceous radiolaria and their biostratigraphic potential to petroleum exploration in the North Sea, p. 214-235. *In* D. J. Batten and M. C. Keen (eds.), North western European Micropalaeontology and Palynology. Ellis Horwood, Chichester.
HAECKEL, E. 1881. Entwurf eines radiolarien-Systems auf grund von studien der Challenger-Radiolarien. Jenaische Zeitschrift fur Medizinund Naturwissenschaften, 15:418-472.
HAECKEL, E. 1887. Report on the Radiolaria collected by the H.M.S. Challenger during the years 1873-1876. Reports of the Voyage of the Challenger, Zoology, 18:1-1893.
HAYNES, J. R. 1981. Foraminifera. Macmillan, London, 433 p.
KIESSLING, W. 1999. Upper Jurassic Radiolarians from the Antarctic Peninsula. Micropaleontology Supplement, 45:1-96.

Table 2 is overleaf

Table 2: Summary of radiolarian hierarchy as erected in De Wever et al. (2002)

Order	Superfamily	Subsuperfamily	Family	Subfamily
Archaeospicularia	Echidninacea		Echidninidae	
	Secuicollactacea		Secuicollactidae	
			Pseudorotasphaeridae	
Albaillellaria			Ceratoikiscidae	
			Albaillellidae	
			Follicucullidae	
			Corythoecidae	
			Palacantholithidae	
Latentifistularia			Pseudolitheliidae**	
			Latentifistulidae	
			Ruzhencevispongidae	
			Cauletellidae	
			Ormistonellidae**	
Spumellaria**			Anakrusidae	
	Actinommacea** (A)		Astrosphaeridae	
			Pantanelliidae	Capnodocinae
				Pantanelliinae
				Vallupinae
			Parvivaccidae**	Acaeniotylinae
				Heleninae
				Leugeoninae
				Parvivaccinae**
			Cavaspongiidae	
			Xiphostylidae**	
			Stylosphaeridae	
			Entapiidae*	
	Actinommacea** (B)		Actinommidae**	
			Coccodiscidae	Coccodiscinae
				Artiscinae
			Heliodiscidae	
			Suttoniidae	
	Actinommacea** (C)		Conocaryommidae**	
	Pyloniacea	Dactyliosphaerilae**	Patruliidae	
			Catenopylidae	
			Veghicycliidae	
			Dactyliosphaeridae	
			Hagiastridae	
			Emiluviidae	
			Hexaporobrachiidae	
		Patulibracchiilae**	Angulobracchiidae**	
			Patulibracchiidae**	
			Pseudoaulophacidae	Pseudoaulophacinae**
			Pentapyloniinae*	
			Tritrabidae	
		Pyloniilae	Miropylidae	
			Pyloniidae	Palaeotetrapylinae
				Pyloniinae
				Dipylissinae
				Pylodiscinae

		Larnacillilae	Larnacillidae	Larnacillinae
				Circodiscinae
				Cryptolarnaciinae
				Histriastrinae
			Tholoniidae	
	Spongodiscacea		Spongodiscidae	
			Myelastridae	
			Relindellidae	
	Sponguracea		Archaeospongoprunidae	
			Gomberellidae**	
			Litheliidae	
			Phaseliformidae	
			Pyramispongiidae**	
			Sponguridae	
			Oertlispongidae	
Collodaria			Collosphaeridae	
			Thalassosphaeridae	
			Sphaerozoidae	
Entactinaria			Proventocitidae	
			Palaeoscenidiidae	
			Thalassothamnidae	
			Inaniguttidae	
			Entactiniidae	
			Spongentactiniidae	
			Palaeolithocycliidae	
			Pylentonemidae	
			Polyentactiniidae	
			Orosphaeridae	
			Pentactinocarpidae	
			Eptingiidae	
			Spongosaturnaloididae	
			Kungalariidae	
			Hindeosphaeridae	
			Multiarcusellidae	Multiarcusellinae
				Austrisaturnalinae
			Heptacladidae**	
			Centrocubidae	
			Quinquecapsulariidae	
			Rhizosphaeridae	
			Hexastylidae	
			Capnuchosphaeridae	
			Saturnalidae	Heliosaturnalinae
				Hexasaturnalinae
				Saturnalinae
				Axopruninae
			Hexalonchidae	
Nassellaria			Archocyrtiidae	
			Popofskyellidae	
			Archaeosemantidae**	
			Plagiacanthidae	Zamolxinae
				Plagiacanthinae
			Poulpidae	
			Tripedurnulidae	

			Hexapylocapsidae	
			Nabolellidae	
			Lophophaenidae	
			Pseudosaturniformidae	
	Acanthodesmiacea		Triospyrididae	
			Acanthodesmiidae**	
			Stephaniidae	
			Neosciadiocapsidae	
			Rotaformidae	
			Sethophormididae	
			Sethoperidae	
			Theopiliidae	
			Livarellidae**	
			Foremanellinidae	
			Cuniculiformidae**	
			Monicastericidae**	
			Cannobotryidae	
			Acropyramididae	
			Ultranaporidae	
			Spongolophophenidae	
			Deflandrecyrtiidae**	
			Spongosilicarmigeridae*	
			Bulbocyrtiidae	
			Sethocapsidae	
			Williriedellidae	
			Eucyrtidiellidae	
			Artrostrobiidae	
			Carpocaniidae	Dicanthocapsinae
				Carpocaniinae
			Pterocorythidae	
			Planispinocyrtiidae	
			Ruesticyrtiidae	
	Archaeodictyomitracea		Bagotidae	
			Archaeodictyomitridae	
			Hsuidae	
			Unumidae	
	Amphipyndacea		Amphipyndacidae	
			Canoptidae	
			Parvicingulidae	Parvicingulinae
				Wrangelliinae
			Syringocapsidae	
			Spongocapsulidae	
	Eucyrtidiacea		Obeliscoitidae	
			Pseudodictyomitridae	
			Xitidae	
			Eucyrtidiidae	
			Theocotylidae	
			Theoperidae	
			Lophocyrtiidae*	
			Bekomidae*	

*** new group**
**** emended group**

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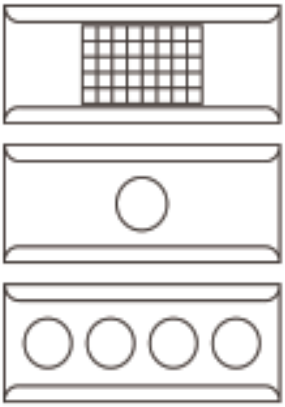

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