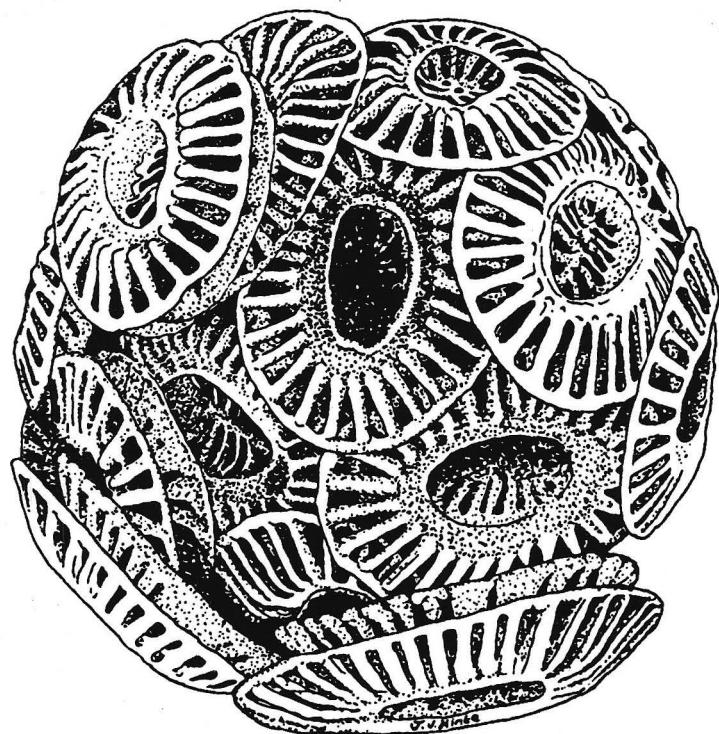


Journal of Nannoplankton Research

(Formerly INA Newsletter)



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JOURNAL OF NANNOPLANKTON RESEARCH

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NEWS AND GOSSIP

Compiled and edited by Jeremy R. Young and Jackie A. Burnett on behalf of the INA Committee

EDITORSHIP

As mentioned in the last issue I have taken on rather too many commitments recently, which is why this issue is so late. Mainly because of this I will be stopping editing the JNR after this issue. We have had two volunteers to replace me - Ric Jordan and Jackie Burnett. Decisions on this and on the rest of the composition of the INA committee will be made during the Copenhagen INA Conference, and will be fully explained in the next issue of the JNR. In the interim existing committee members can of course be sent journal items, membership fees, address changes, reprints, complaints and suggestions.

Jeremy Young

COMPUTING - DATABASES, SOFTWARE, MAILING LISTS

Nannobase

As announced previously, this database system is *freely* available now. The content is essentially similar to that of the Bibliography and Taxa of Nannoplankton, although there are plans to expand it to include other data, and illustrations. It includes some 6500 bibliographic references and 3500 taxa. Several of us are using it already. To obtain a copy send TWO DOS-formatted high-density floppy disks to Laurel.

To access the database you also need a suitable database management program on your computer. The database is compiled in *dBASEIII plus* on an IBM-compatible computer so this (or *dBASEIV*) is the obvious program to use, but many database programs can read this file format. For information/copies contact:

Laurel Bybell, U.S. Geological Survey, 970 National Center, Reston, VA 22092, USA; phone: 703-648-5281, fax: 703-648-5420, e-mail: lbybell@geochange.er.usgs.gov

Bugware

Mitch Covington is making BUGWARE, his stratigraphic database/range-chart creation program, available as shareware to academics, with a \$75 registration fee (as with other shareware, you can obtain the program without payment in order to see if it suits your purpose. If it does then you pay the registration fee). It is a DOS application requiring a 386 processor, or better, with 4Mb RAM and VGA graphics. The program is available by anonymous FTP from *geomag.gly.fsu.edu/pub/covington/bugware*. The program has been in active industrial use for several years but shareware release is a new development and the consequently the total file structure is still a bit disorganised and documentation is limited. Direct queries and complaints to:

Mitch Covington, 8331 Chickasaw Trail, Tallahassee, FL 32312, USA. Fax (904) 668-3899. Email: mitch@geomag.gly.fsu.edu or bugware@aol.com

ODP on the world wide list

There is now a major ODP WWW site with a lot of information available. - <http://www-odp.tamu.edu>. In addition a digital version of Lazarus et al. (1995 - *Revised chronology of neogene DSDP holes from the world ocean*) is available at <http://www.ngdc.noaa.gov/mgg/geology/lazarus.html> - see announcement below (books). For general palaeontology browsing a good starting point is the paleonet page at <http://www.nhm.ac.uk/paleonet>.

EMAIL-mailing list

The **coccoliths** mailing list continues usefully, under the supervision of Helen Gillespie. Currently it has about 80 subscribers, of whom maybe half are INA members. A couple of other mailing lists are worth mentioning. There is the **micropal** mailing list, looked after by Jere Lipps, and **paleonet** from Norm MacLeod in the NHM. **Micropal** aims to provide a general forum for micropalaeontology, whilst **paleonet** extends to all palaeontology. There are also specialist lists for other groups, e.g. **radfolk** dealing, predictably, with radiolaria. Perhaps unsurprisingly, there is a lot of overlap of membership and most general discussion is now taking place on **paleonet**, which can be very busy - 5-10 messages per day, versus only a few a week on coccoliths. All the mailing lists work in basically the same way: messages are sent in to the host computer and it then broadcasts them to everyone on the mailing list. To subscribe to any of the lists simply send a message along the following lines: *subscribe coccoliths Erwin Kamptner* (but use your own name, not Kamptner's, or life will get confusing!). The relevant addresses are:

*coccoliths - listserv@morgan.ucs.mun.ca
micropal - listproc@ucmpl.berkeley.edu
radfolk - listserv@ucsd.edu
paleonet - listserver@nhm.ac.uk*

MOUNTING MEDIA SURVEY

There has been a useful response to this survey, particularly via e-mail. Results will be included in the next issue, so as to allow me to extract more data from Copenhagen attendees.

Shirley E. van Heck, c/o Sarawak Shell Berhad, XGS/1, 98100 Lutong, Sarawak, Malaysia

MEMBERS' NEWS & GOSSIP

- After 18.5 years at Yamagata University, Hisatake Okada has moved back to his *Alma Mater*, Hokkaido University, in Sapporo.
- Hisatake has left behind the newly-wed Ric Jordan, to whom we offer our congratulations and best wishes for many years of happily-marriedness!
- Congratulations to Jörg Bollman on completing and defending his PhD on *Gephyrocapsa* biogeography, he has Post Doc funding to stay in ETH-Zürich for a couple of years more.

- **Brigitta van Niel** has left the Institute of Oceanographic Sciences and is currently somewhere in Asia thinking about nanno workers whilst travelling for a few months. **Donata Zucchi** who we reported as joining IOS last issue only stayed briefly before moving on to Millenia, a young biostratigraphy consultancy. However, Phil Weaver has not been abandoned at IOS, **Richard Howe** has been persuaded over from Australia.

- **Patrizia Ziveri** is Jan van Hinte's latest recruit at Amsterdam, she will be working on and supervising research on nannofossil biogeography from sediment traps.

- Other Italian movements include: **Andrea Fiorentino** who is back in Rome after the best part of a year in Florida, whilst **Francesca Lozar** has moved to Torino to work on the Late Cretaceous Scaglia Rossa (well since last October but we missed mentioning it last issue).

- **Thomas Ehrendorfer** meanwhile has returned to his native Austria, after a prolonged exile, two years in London and four in Woods Hole, with Marie-Pierre Aubry. Sadly he is now employed to work on hydrogeology rather than nannos, although he assures us he won't abandon them.

Sorry this is a bit thin, nothing much has happened in the UK after all the excitement reported last time, and we still are not very effective at getting news from the rest of the world (Japan excepted). Please don't be bashful, an informal note to either of us is all it will take to get mentioned here.

Jackie Burnett, Jeremy Young

BOOKS

Evolutionary, Biostratigraphic and Taxonomic Study of Calcareous Nannofossils from a continuous Paleocene-Eocene Boundary Section in New Jersey

*Laurel M. Bybell & Jean M. Self-Traill
U.S.G.S. Professional Paper 1554,
p. 1-36 and plates 1-38.*

This volume is now published. It is a major monograph of Palaeogene (NP8-11) nannofossils with extensive illustration, description of a number of new taxa (see bibliography) and a challenging discussion of evolutionary patterns. Anyone working on Palaeogene nannofossils should obtain a copy.

Available from USGS, Information services, Box 25286, Federal Center, Denver, CO 80225, U.S.A.

Revised Chronology of Neogene DSDP Holes from the World Ocean

David Lazarus, Cinzia Spencer-Cervato, Milena Pika-Biolzi, Jean Pierre Beckmann, Katharina von Salis, Heinz Hilbrecht and Hans Thierstein

After nearly 30 years of growth in geochronologic knowledge, the originally published age models for many older deep sea marine sections have become badly outdated. In this report, we present newly revised age models for Neogene sediments from 94 DSDP holes. Biostratigraphic data for planktonic foraminifers, calcareous nannofossils, diatoms and radiolarians, paleomagnetic and other stratigraphic

data were compiled from the original Initial Reports volumes of DSDP. The Berggren *et al.* (1985) scale was used for the age of magnetic reversals, and a variety of recent papers were used to establish a standard modern set of calibrations for marine microfossil events to the magnetic reversal scale. New age vs depth plots were made for each hole, and for each a new line of correlation was created. All tabulated stratigraphic data, new age models, and age depth plots are given as appendices to the report.

The report is available in two forms. A printed version (301 pp.; incl. approx. 130 pp. of tables and 157 black & white plots) is available from the Ocean Drilling Program as Technical Note # 24. Single copies are normally free of charge. Contact:

Alexandra Moreno; Publications Distribution/ODP-TAMU; Ocean Drilling Program; 1000 Discovery Drive; College Station, TX 77845 USA. Email: Alexandra.Moreno@odp.tamu.edu

An interactive hypertext version, including full colour plots, freely downloadable computer readable versions of all files, etc, is available from the NGDC via the World-Wide-Web. The URL for this is: <http://www.ngdc.noaa.gov/mgg/geology/lazarus.html>. The NGDC version also includes a downloadable copy of the Age Depth Plot program used to create most of the figures in the report (runs only on Macs).

Questions, comments and suggestions for improvements may be directed to the senior author:

Dave Lazarus; Geologisches Institut; ETH-Zentrum CH-8092; Zurich, Switzerland; Fax: 041-1-632-1080. E-mail: gonzo@erdw.ethz.ch

MEETINGS

Italian Nanno-Group, inaugural meeting, June 1994
Anna Farinacci has, over the past four years, succeeded in persuading Italian palaeontologists to come to Rome once a year, in early June. This provides an opportunity to exchange information on work in progress and, when possible, try to coordinate research activities. The contributions presented are published in a volume called *Paleopelagos*, which is distributed free. The meetings generally last a couple of days or so and, since the 1994 meeting was well-attended, Elisabetta Erba and I encouraged them to get them together again. About 20 people participated at the nanno-meeting and we counted about 15 more whom we know, but who could not come. We gave ourselves an almost "formal" definition as the Italian Nanno-Group, and divided into smaller groups according to the time periods studied (Jurassic, Cretaceous, Palaeogene, Neogene). There should be another meeting this June and we also plan to present a report on our scheduled activity at the INA Conference.

Andrea Fiorentino, Roma

Emiliania huxleyi and the Oceanic Carbon Cycle, London, April 1995

This conference was organised to mark the end of the, perhaps by now infamous, EC (MAST II) programme,

Coccolithophorid Dynamics: The European *Emiliania huxleyi* Programme (EHUX). It was organised, by me, in the Natural History Museum (I've always wanted to hold a coccolith meeting here and we have had a London INA meeting already) - with assistance from UCL, particularly Chris Ellison and Jackie Burnett.

The meeting attracted some 70 European and American participants, about half of whom had participated formally in the MAST programme. As usual with EHUX activities, they spanned a very wide range of disciplines and so INA members were in a minority (15-20).

The main sessions were preceded by a workshop day, dealing with the end of the EHUX project and plotting new projects. In particular, a group of us started devising a research network proposal to extend the multidisciplinary approach to a wider range of coccoliths with a combined biochemical-biological-geological project. This lateral successor to the EHUX project has now been submitted, although we have no idea if it will be funded. A direct successor of the EHUX project, ECOHUX, which had been submitted prior to the meeting has since failed. The hard work was followed by a few bottles of wine before I threw everyone out to risk the local restaurants.

We then had two days of scientific talks encompassing the range of coccolithophorid research, from intracellular calcium to remote sensing. A couple of clear points which stem from the meeting are that nutrient balances are a major control on phytoplankton, and that calcification by *E. huxleyi* does have the effect of offsetting the CO₂ drawdown from photosynthesis. This raised the irreverent thought that it might be easier to offset global warming by adding silica to the Atlantic than iron to the Antarctic.

For those interested in the details, the Abstracts volume is available from me (I'll swap a copy for a reprint or two). Proceedings will be published as a special issue of the *Journal of Marine Systems* (to be guest edited by Roger Harris).

Jeremy Young, Palaeontology Dept., The Natural History Museum, London SW7 5BD, U.K. Tel. 071-938-8996; Fax 071-938-9277; E-mail jy@nhm.ac.uk

The 6th INA Conference, Copenhagen, September 1995

Given the late preparation of this issue, the conference will

OCEAN DRILLING PROGRAM NEWS

John Firth, Ocean Drilling Program, Texas A & M University

ODP Leg 159 (Jan. 5 - March 2, 1995) drilled the Eastern Equatorial Atlantic Transform Margin in the Gulf of Guinea, to study the structural development of a transform margin from its inception in early Cretaceous time to the present, and to study the equatorial Atlantic gateway opening from the mid to late Cretaceous. Sediments from the Lower Cretaceous to Quaternary were recovered. *Samir Shafik, David Watkins and Im Chul Shin* were the nannofossil specialists on this leg.

probably have taken place by the time you receive it. So we hope you will have enjoyed it and must ask non-attendees to wait for the next issue for a review of the event. In the meantime thanks again to Dave Jutson for his efforts in organizing this meeting.

International Symposium on Cretaceous Stage Boundaries, Brussels, September 1995

At last, a conference to decide on some Cretaceous stage-boundary stratotypes. This is the follow-up(!) conference to one held in Copenhagen in 1983 (which prompted much of my own research), and should prove to be a forum for some heated scientific debate over which sedimentary section and which fossil event! Don't worry - nannofossils will be well-represented. Katharina von Salis will provide an overview of the progress in nannofossil stratigraphy since the 1983 conference. There will also be presentations (talks/posters) covering all the Cretaceous stage boundaries by (in alphabetical order): Roque Aguado-Merlo, Paul Bown, Jackie Burnett, Elisabetta Erba, Mihaela Melinte, Simonetta Monechi, Danuta Peryt, (F. Robaszynski/F. Amedro), Ton Romein and Michael Wagreich. If I have left anyone out, I apologise (the word nannofossil does not always appear in the titles!).

As with the INA Conference, Brussels will have taken place before you receive this issue. A review will be included in the next issue.

Jackie Burnett, Dept. of Geological Sciences, University College London, Gower Street, London WC1E 6BT, U.K.

Asian INA Meeting, Lucknow, November 1995

Due to poor response from overseas colleagues, this meeting has been called off. We are planning to organise a smaller meeting, like the one we had in Kuala Lumpur - Workshop on Neogene nannofossils of Indian Ocean. For this please be in look out for announcement in JNR issues.

Sayed A. Jafar, The Palaeobotanical Society, 53 University Road, Lucknow 226 007, India. Tel/Fax: +91-522-381948, +91-522-2210376; +91-522-222061, E-mail: lkuniv@sirnetd.ernet.in

ODP Leg 160 (March 12 - May 3, 1995) drilled the eastern Mediterranean collisional margin to the west, south and east of Crete, and studied sapropel development in this region. *Enrico Di Stefano and Scott Staerker* were the nannofossil specialists on this leg.

ODP Leg 161 (May 8 - July 4, 1995) drilled the Alboran Basin to study the structural development of an extensional basin within a collisional margin area, and studied sapropel

history in the western Mediterranean. Sapropels were recovered for the first time in the western Mediterranean. Continental metamorphic crust was recovered in the Alboran Sea. *William Siesser* and *Eric de Kaenel* were the nannofossil specialists for this leg.

ODP Leg 162 (July 9 - Sept. 3, 1995) is the second leg of the North Atlantic-Arctic Gateways program (the first being Leg 151), and will study gateway development between the Arctic and Norwegian-Greenland Seas, and the Atlantic Ocean from the Palaeogene to Quaternary, as well as the palaeoceanographic and palaeoclimatic history of this region. *Wuchang Wei* is the nannofossil specialist for this leg.

Leg 163 (Sept. 7 - Oct. 28, 1995) will drill the southeastern Greenland margin, at 66°N, to study the seaward-dipping basalt reflectors that formed massive flows along this margin during the early rifting of the Norwegian-Greenland Sea. No nannofossil specialists will sail on this leg.

Leg 164 (Nov. 1-Dec. 19, 1995) will drill the Blake Ridge and Carolina Rise to study gas hydrate formation. *Hisatake Okada* will be the nannofossil specialist on this leg.

Leg 165 (Dec. 24, 1995 - Feb. 18, 1996) will drill in the Caribbean Sea and the Cariaco Basin to study Cretaceous, Palaeogene and Neogene ocean history, the Cretaceous/Tertiary boundary event, and high resolution Quaternary sedimentation in an anoxic basin. *Tim Bralower* and *Koji Kameo* will be the nannofossil specialists for this leg.

Leg 166 (Feb. 23 - April 11, 1996) will study the sea-level and fluid-flow changes in the Bahamas carbonate platform, and the history of changes in oceanic circulation and climate from the mid Cretaceous to Recent. Staffing is now underway for this leg.

Leg 167 (April 21- June 16, 1996) will study the variability in strength and heat/salt transport capacity of the California Current due to climatic and tectonic changes in the Pacific Basin, and its relationship to fluctuations in upwelling and primary productivity, and CCD changes in the NE Pacific. Staffing is now underway for this leg.

Leg 168 (June 21 - Aug. 16, 1996) will investigate the nature and consequences of hydrothermal circulation in oceanic crust; specifically, to obtain information on lateral gradients in fluid composition, formation pressures and temperatures, formation-scale permeability, and circulation vigour. Staffing is now underway for this leg.

Leg 169 (Aug. 23 - Oct. 18, 1996) will drill the Juan de Fuca-Gorda spreading system to study the inter-relationships of tectonic, igneous and sedimentary processes in controlling fluid-flow, energy and mass flux, and formation of hydrothermal deposits at sediment-dominated rift environments. Staffing is now underway for this leg.

Leg 170 (Oct. 23 - Dec. 18, 1996) will drill the Costa Rica accretionary prism to study the mass- and fluid-flow patterns through the prism to establish the mechanical and chemical behaviour of accretion and underplating, tectonic erosion, and to determine how deformation and dewatering are distributed throughout an accretionary prism. Staffing is now underway for this leg.

Scientific Prospectuses for upcoming ODP Legs, beginning with Leg 164, and Preliminary Reports of past legs, beginning with Leg 159, are now available on the World Wide Web at <http://www-odp.tamu.edu>

For more information on Ocean Drilling and other JOIDES activities, write to Joint Oceanographic Institutions, Inc., 1755 Massachusetts Ave., NW, Suite 800, Washington, D.C., 20036-2102, U.S.A.; Phone: 202-232-3900; Internet: joi@iris.edu; to request copies of the JOIDES Journal.

To apply for participation as a shipboard scientist on an ODP cruise, send a letter of request and a resumé to the Manager of Science Operations, Ocean Drilling Program, Texas A&M University Research Park, College Station, TX, 77845. You will receive an application form to fill out and return to ODP.

To request samples from ODP/DSDP cores, send a letter of request to Chris Mato, Assistant Curator, Ocean Drilling Program, Texas A&M University Research Park, College Station, TX, 77845. You will receive an application form to fill out and return to ODP.

THE ICBN: THINGS YOU NEED TO KNOW - 12

Shirley E. van Heck, SSB, Lutong, Sarawak, Malaysia

A new version of the International Code of Botanical Nomenclature has now been published (Greuter *et al.* 1994). I prepared this issue using the old code but it has been amended where necessary to follow the new code, in particular some article renumbering has occurred [the old numbers are given in square brackets]. I hope to give a review of the new code in the next issue.

After exploring the rules that deal with typification, we return to rules dealing with validity, and pick up the story with Article 41. This article, together with Article 32

(discussed in issue 7, INA Newsletter 14/3), contains the most basic, and therefore the most important, validity rules.

ARTICLE 41 41.1. *In order to be validly published, a name of a family must be accompanied (a) by a description or diagnosis of the taxon, or (b) by a reference (direct or indirect) to a previously and effectively published description or diagnosis of a family or subdivision of a family.*

No surprises here, as this is pretty standard.

41.2 In order to be validly published, a name of a genus or subdivision of a genus must be accompanied (a) by a description or diagnosis of the taxon (but see Art. 42), or (b) by a reference (direct or indirect) to a previously and effectively published description or diagnosis of a genus or subdivision of a genus.

Article 42 deals with monotypic genera, a special case that means that the genus consists of only one species:

ARTICLE 42 **42.1.** The names of a genus and a species may be simultaneously validated by provision of a single description (*descriptio generico-specifica*) or diagnosis, even though this may have been intended as only generic or specific, if all of the following conditions obtain: (a) the genus is at that time monotypic; (b) no other names (at any rank) have previously been validly published based on the same type; and (c) the names of the genus and species otherwise fulfil the requirements for valid publication. Reference to an earlier description or diagnosis is not accepted as provision of such a description or diagnosis.

42.2 [formerly Art 42 Note 1] For the purposes of Art 42, a monotypic genus is one for which a single binomial is validly published, even though the author may indicate that other species are attributable to the genus.

Examples are: *Ceratolithus*, of which only one species (*C. cristatus*) was published originally. *C. cristatus* is therefore automatically the type species. Another example is *Coccolithus*, of which the only included species was *C. oceanicus*.

We return to Article 41, with the rules for species:

41.3. In order to be validly published, a name of a species must be accompanied (a) by a description or diagnosis of the species (but see Arts. 42 and 44), or (b) by a reference to a previously and effectively published description or diagnosis of a species or infraspecific taxon, or (c), under certain circumstances, by reference to a genus whose name was previously and validly published simultaneously with its description and diagnosis. A reference as mentioned under (c) is acceptable if neither the author of the name of the genus nor the author of the name of the species indicate that more than one species belongs to the genus in question.

The reference to article 42 again applies to monotypic genera, and we can ignore Art. 44. Note that species names that are introduced without description (and hence invalid according to this rule) are generally referred to as *nomen nudum*. These *nomina nuda* occur fairly frequently, for instance when an author is aware of a name in print, and cites it in the expectation that the publication with the new name will be published before the paper in which he cites it. They should be rigorously avoided. The statement under (c) is interesting, as it indicates that (before 1958, when no type was required) a genus name is perfectly valid and legitimate if no species have been included, provided the other requirements of the ICBN are fulfilled.

The next is a famous article, that has caused much confusion:

ARTICLE 43 **43.1.** A name of a taxon below the rank of genus is not validly published unless the name of the genus or species to which it is assigned is validly published at the same time or was validly published previously.

Kamptner has provided us with numerous examples of this. For instance the genus *Coccolithites* Kamptner, 1955 is invalid because it was introduced as a provisional name (contra Art. 34, see issue 9, INA Newsl. 16/1), and all the species (well over 50) included in the genus are likewise invalid, because of Art. 43. However, note that this Article only deals with INVALID genera, not ILLEGITIMATE genera, for which other rules apply:

ARTICLE 55 **55.1.** [formerly Art 68.1] A name of a species or subdivision of a genus, autonyms excepted (Art. 22.1), may be legitimate even if its epithet was originally placed under an illegitimate generic name.

Example: In 1877 Wallich introduced the genus *Coccospaera*, with two named species: *C. pelagica* and *C. carteri*. The name *Coccospaera* is a homonym, and hence illegitimate, but the species names remain available to be used in other combinations. See also van Heck (1990) for a complex case history - *Pseudoemiliania lacunosa* which had been considered illegitimate. Similarly for varieties and other sub-specific ranks..

55.2 An infraspecific name, autonyms excepted (Art. 26.1), may be legitimate even if its final epithet was originally placed under an illegitimate specific name.

The last article of this section is Article 45:

ARTICLE 45 **45.1** The date of a name is that of its valid publication. When the various conditions for valid publication are not simultaneously fulfilled, the date is that on which the last is fulfilled. However, the name must always be explicitly accepted in the place of its validation. A name published on or after 1 Jan. 1973 for which the various conditions for valid publication are not simultaneously fulfilled is not validly published unless a full and direct reference (Art. 33.2) is given to the places where these requirements were previously fulfilled.

The application of this article is basically for validations, for which several examples can be found in earlier issues of the INA Newsletter. A discussion of Art. 33.2 and in particular 33A.1, which explains how a full and direct reference is defined, is given in issue 8 (INA Newsl. 15/1).

45.3. A correction of the original spelling of a name (see Art. 73) does not affect its date of valid publication.

Art. 60 [formerly 73] explains what the correct spelling is, and has been discussed in detail in issue 2 (INA Newsl. 12/2). This rule applies in particular to terminations, which should always be corrected (see Art. 32.6, briefly referred to in issue 3, INA Newsl. 12/3, and to be discussed more extensively in the next issue). Thus, one should refer to *Reticulofenestra umbilicus* and *Micula murus*, without changing the name of the original author or date of publication.

45.4. For purposes of priority only legitimate names are taken into consideration (see Arts. 11, 52-54). However, validly published earlier homonyms, whether legitimate or not, shall cause rejection of their later homonyms, unless the latter are conserved or sanctioned (but see Art. 15 note 2).

Note again the distinction between *valid* and *legitimate*. The last 5 issues have dealt mainly with validity and some of the coming issues will deal with legitimacy. Hence, the references to these articles will not be followed up now, but left for the near future.

The last point of Article 45 causes much confusion:

45.5: If a taxon originally assigned to a group not covered by this Code is treated as belonging to a group of plants other than algae If the taxon is treated as belonging to the algae, any of its names need satisfy only the requirements of the pertinent non-botanical code for status equivalent to valid publication under the botanical Code (but see Art.54, regarding homonymy).

The reference to Article 54 [formerly 65] will be followed up in a later issue. Right now I would like to draw your attention to some controversial issues related to this article. Two problems arise with early publications: 1) it is not always clear whether the original author treated the nannofossils as plants (algae) or animals. In fact, when I wrote to one author asking him about this to solve a nomenclatural problem, he answered that at the time of publication he considered them as belonging to a third kingdom, Protista. To my knowledge, there are no guidelines for cases like this, and I recommend that in case of doubt the ICBN is applied. 2) Note that this article only states that taxa should be considered valid / legitimate if

they comply with the pertinent non-botanical code (in our case the ICZN). There is no rule that states that the reverse should also apply. In other words, if a name, published under the zoological code, is either invalid or illegitimate according to that code, but would be valid / legitimate under the botanical code, what is its status? Loeblich and Tappan (1966 - 1973) considered such names invalid / illegitimate, and they have been generally followed, but I am not convinced this is correct. In this matter I intend to seek the advice of the Botanical Committee, and work out some of the consequences for our nomenclature.

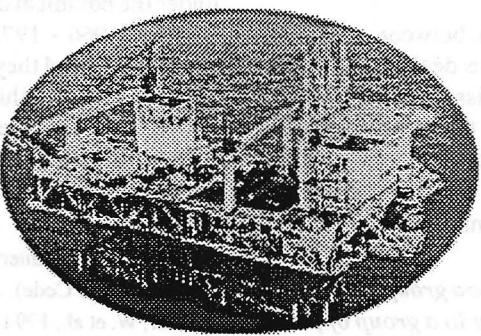
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the oil and gas industry from the shales and sandstones of the Lower Paleogene (P12) to the upper Paleogene (P13). The latter is characterized by a marked increase in organic-rich shale facies, which is interpreted as reflecting a change in the depositional environment from a continental margin setting to a more marine setting, with a corresponding increase in the diversity of nannoplankton.

but avoided "facing" each other about the area of the basin margin. This is believed to have been the result of the presence of a large number of small, shallow, embayments and sand banks, which provided shelter from the waves and currents. The area was also characterized by a high degree of biological activity, particularly in the form of burrowing organisms, which helped to maintain the stability of the sediments.

The area of the basin margin was characterized by a high degree of biological activity, particularly in the form of burrowing organisms, which helped to maintain the stability of the sediments. The area was also characterized by a high degree of biological activity, particularly in the form of burrowing organisms, which helped to maintain the stability of the sediments.



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UNCOATED, LOW-VOLTAGE SEM ANALYSIS OF BOTH PROXIMAL AND DISTAL VIEWS OF THE SAME COCCOLITHS

Hartmu Mai, Universität Bremen, Fachbereich Geowissenschaften, Postfach 330440, D-28334 Bremen, Germany

Abstract: Proximal and distal views of the same coccoliths are figured. High-resolution images of both sides of a coccolith can be achieved by subjecting uncoated specimens to a low-acceleration voltage with a reduced emission current of between 6 and 12 μ A. A highly-polished carbon stub provided with a TEM "locator grid" is used in order to decrease charging and to ensure accurate relocation of the specimens.

Introduction

Mai (1988) described a new method for examining both sides of a single coccolith in the scanning electron microscope. This method has not been widely noted and so as a contribution to the current interest in methods (van Heck 1994) we give a brief summary with some improvements of the technique here and provide new examples of the results.

Method

Flood a few drops of cleaned (i.e. centrifuged) coccoliths in suspension over a highly-polished carbon stub and allow to dry at about 50°C. Place a TEM "locator grid" on the stub. If necessary, affix the grid with quick-drying silver paint.

In order to observe the specimens, set the SEM at

between 3 and 6 kV acceleration voltage and 6-12 μ A emission current. The working distance should be 8 mm or less.

When photographing the coccoliths, make a note of their index positions on the grid, so that they can be relocated. To observe the obverse sides, place a double-sided adhesive carbon tab over the grid. Take care to apply only a little pressure. Remove the tab from the stub. The "locator grid" and the coccoliths will adhere to the tab. Mount the tab on a normal aluminum SEM stub and observe as detailed above.

Reference

Mai, H., 1988: A new method for SEM analysis of both proximal and distal sides of the same coccolith. - *J. Paleont.*, 62(1), pp. 151-152.

PLATE 1

- Schematic drawing of the nannoplankton species mentioned in the text. Scale bar = 10 μ m.
 1: *Eiffellithus turriseiffelli* (Deflandre, in Deflandre & Fert) Reinhardt 1965
 2: *Prediscosphaera cretacea* (Arkhangelsky) Gartner 1968
 3: *Prediscosphaera spinosa* (Bramlette & Martini) Gartner 1968
 4: *Staurolithites compactus* (Bukry) Thierstein 1971

1: *Eiffellithus turriseiffelli* (Deflandre, in Deflandre & Fert) Reinhardt 1965
 A small, roughly rectangular cell with a central apertural area. The surface is relatively smooth, with some faint, irregular, wavy lines. The apertural area is slightly larger than the rest of the cell and has a more irregular shape, with some small, irregular protrusions or "teeth".

2: *Prediscosphaera cretacea* (Arkhangelsky) Gartner 1968
 A large, roughly circular cell with a prominent, roughly triangular apertural area at the top. The surface is relatively smooth, with some faint, irregular, wavy lines. The apertural area is slightly larger than the rest of the cell and has a more irregular shape, with some small, irregular protrusions or "teeth".

3: *Prediscosphaera spinosa* (Bramlette & Martini) Gartner 1968
 A large, roughly circular cell with a prominent, roughly triangular apertural area at the top. The surface is relatively smooth, with some faint, irregular, wavy lines. The apertural area is slightly larger than the rest of the cell and has a more irregular shape, with some small, irregular protrusions or "teeth".

4: *Staurolithites compactus* (Bukry) Thierstein 1971
 A small, roughly rectangular cell with a central apertural area. The surface is relatively smooth, with some faint, irregular, wavy lines. The apertural area is slightly larger than the rest of the cell and has a more irregular shape, with some small, irregular protrusions or "teeth".

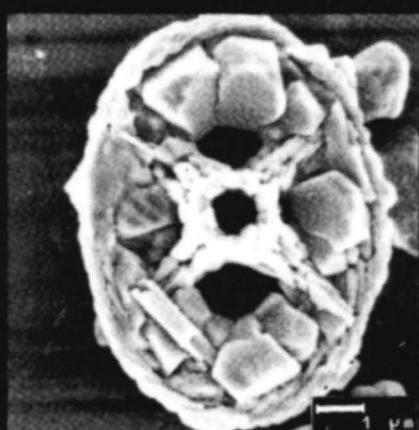
1: *Eiffellithus turriseiffelli* (Deflandre, in Deflandre & Fert) Reinhardt 1965
 A small, roughly rectangular cell with a central apertural area. The surface is relatively smooth, with some faint, irregular, wavy lines. The apertural area is slightly larger than the rest of the cell and has a more irregular shape, with some small, irregular protrusions or "teeth".

2: *Prediscosphaera cretacea* (Arkhangelsky) Gartner 1968
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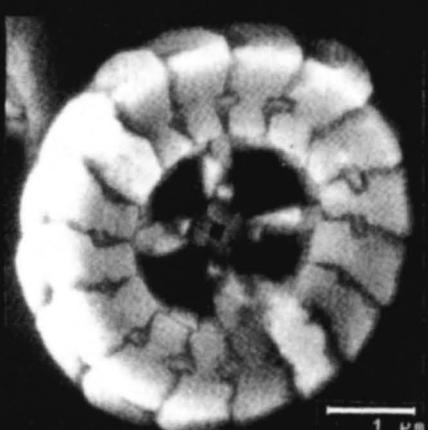
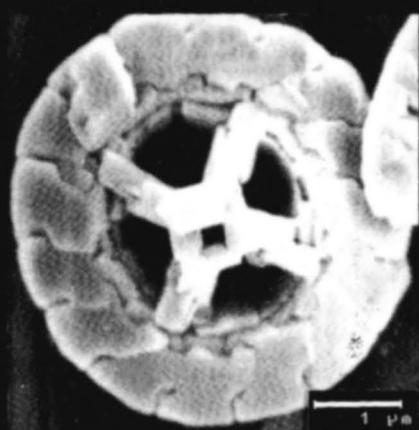
PLATE 1



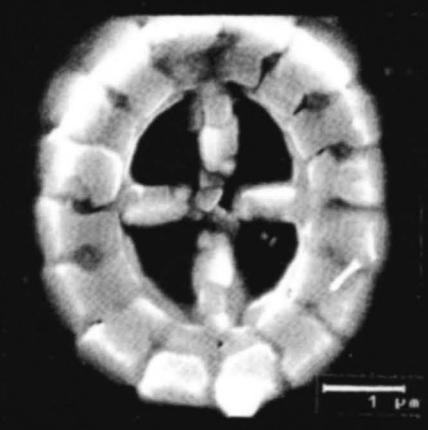
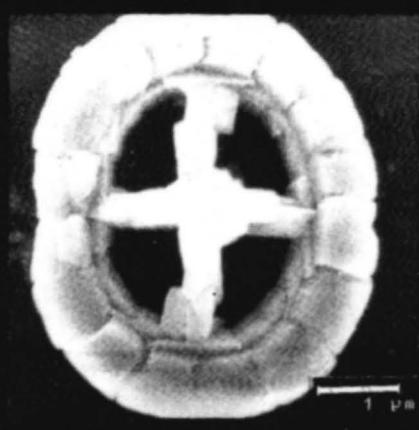
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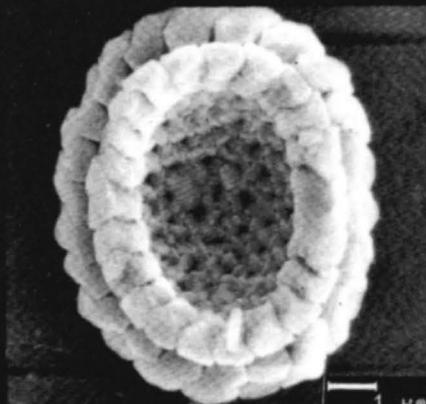
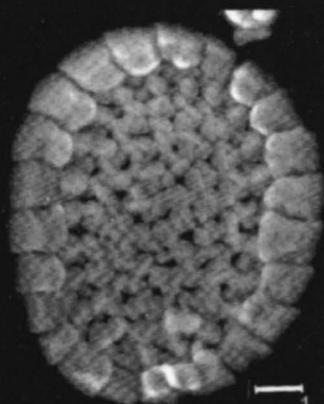
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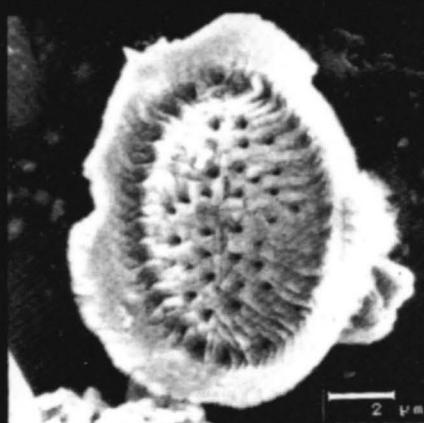
PLATE 2

- 5: *Cribrosphaerella ehrenbergi* (Arkhangelsky) Deflandre in Piveteau 1952
- 6: *Kamptnerius magnificus* Deflandre 1959
- 7: *Arkhangelskiella cymbiformis* Vekshina 1959
- 8: *Micula staurophora* (Gardet) Stradner 1963

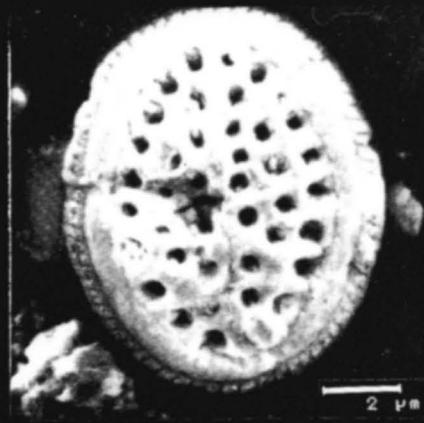
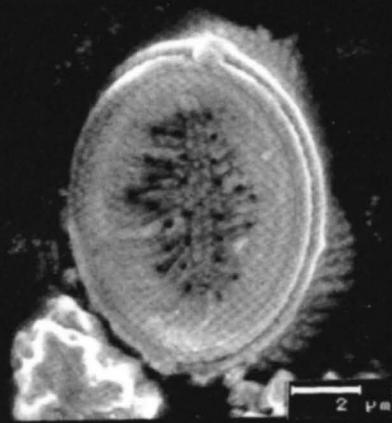
PLATE 2



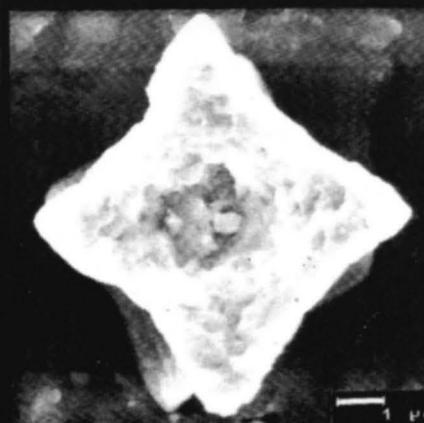
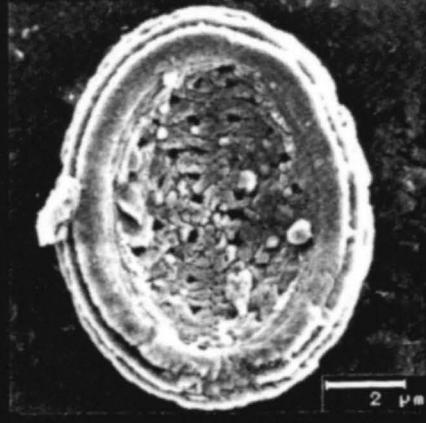
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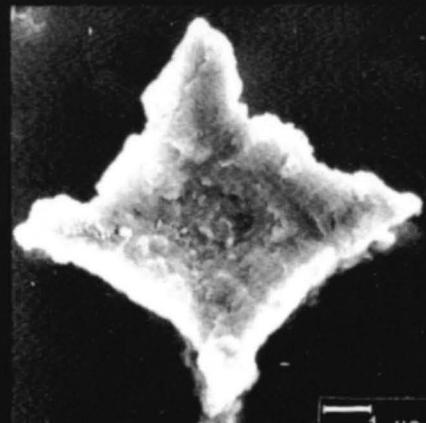
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THE DECLINE AND EXTINCTION OF UPPER PLIOCENE DISCOASTERS: A COMPARISON OF TWO EQUATORIAL PACIFIC OCEAN RECORDS

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Abstract: High-resolution records of Upper Pliocene *Discoaster* abundances were analysed from two ODP (Ocean Drilling Program) Sites, Site 677 (1°N, 84°W) and Site 806 (0°N, 159°E). Both sites are in the equatorial Pacific Ocean, but almost 13,000 km apart. A high-resolution oxygen isotope stratigraphy from Site 677 has formed the basis of a revised, orbitally-tuned timescale. This timescale was extrapolated to Site 806 using biostratigraphic datums. The *Discoaster brouweri* records at both sites prior to its extinction at 1.95 Ma (isotope Stage 72) document a dramatic reduction in abundance between 2.15 and 2.12 Ma (isotope Stages 82 and 80, respectively). The *Discoaster triradiatus* acme (2.15-1.95 Ma) coincides with this interval of low *Discoaster* abundance but is still clearly discernible. Site 677 in the eastern Pacific is affected by the cold Peru Current. It is suggested that the advection of cooler water intensified during glacial isotope Stage 82, causing increased upwelling and lower sea-surface temperatures, which suppressed *Discoaster* production. Site 806, in the western Pacific is affected by divergence related to the equatorial currents, rather than by a cool boundary current system, so surface-water temperatures are relatively stable on a glacial-interglacial scale. The decline in *Discoaster* abundance in the western equatorial ocean, during isotope Stage 80, is, therefore, more likely to be attributable to the position of equatorial divergence and corresponding changes in the thermocline and nutricline. The decline in abundance patterns observed in the two equatorial Pacific sites are also evident in records from the equatorial Indian and Atlantic Oceans, although the reduction in *Discoaster* abundances in these two regions are less extreme.

Introduction

The genus *Discoaster* first appeared in the oceanic record in the late Palaeocene. The last two species, *Discoaster brouweri* and *Discoaster triradiatus*, became extinct in the late Pliocene, just prior to the Olduvai Subchron at 1.95 Ma (e.g., Takayama, 1970; Rio, 1982; Backman & Shackleton, 1983; Driever, 1988). A number of studies have concluded that discoasters favoured warm water-masses (e.g., Haq & Lohmann, 1976; Bukry, 1978; Backman & Pestiaux, 1987) and that their abundance decreased markedly with increasing latitude. Cyclic fluctuations of discoasters, especially in records from the tropics (Chepstow-Lusty *et al.*, 1989, 1991, 1992), pointed to the importance of a factor other than temperature, which was suggested to be productivity pressure.

Study of Hole 806C provided high-resolution data (Backman & Chepstow-Lusty, 1993) from this extreme western Pacific site, influenced by a low-intensity upwelling regime. This can be compared with Site 677 in the far

eastern Pacific, located within a major upwelling area (Figure 1, Table 1). Site 806 is located on the Ontong Java Plateau, which is a broad, shallow, mid-ocean highland in the western equatorial Pacific. The sediments from Site 806 consist of foraminifer/nannofossil ooze. Site 677 is situated in the eastern equatorial Pacific between the Ecuador and Panama Fracture Zones (Becker *et al.*, 1988), and is characterised by pelagic, siliceous/ calcareous nannofossil ooze. Both sites are above the CCD and have very good carbonate preservation, hence *Discoaster* abundances are unlikely to be influenced by diagenesis. Discoasters are useful for quantitative studies since they are less prone to dissolution than planktonic foraminifera and most placoliths (Lohmann & Carlson, 1981). The semi-quantitative counting technique and taxonomy employed here follows that of Backman & Shackleton (1983).

The goal of this work is to compare the *Discoaster* abundance records from Sites 677 and 806 using a common timescale. The time interval investigated is approximately

Table 1

Hole Location	Depth	Reference
806C	0°N 159°E	2,521 Kroenke, L. W., Berger, W. H., Janacek, T. R., <i>et al.</i> , 1991
677A	1°N 84°W	3,461 Becker, K., Sakai, H., Merrill, R.B. <i>et al.</i> , 1988

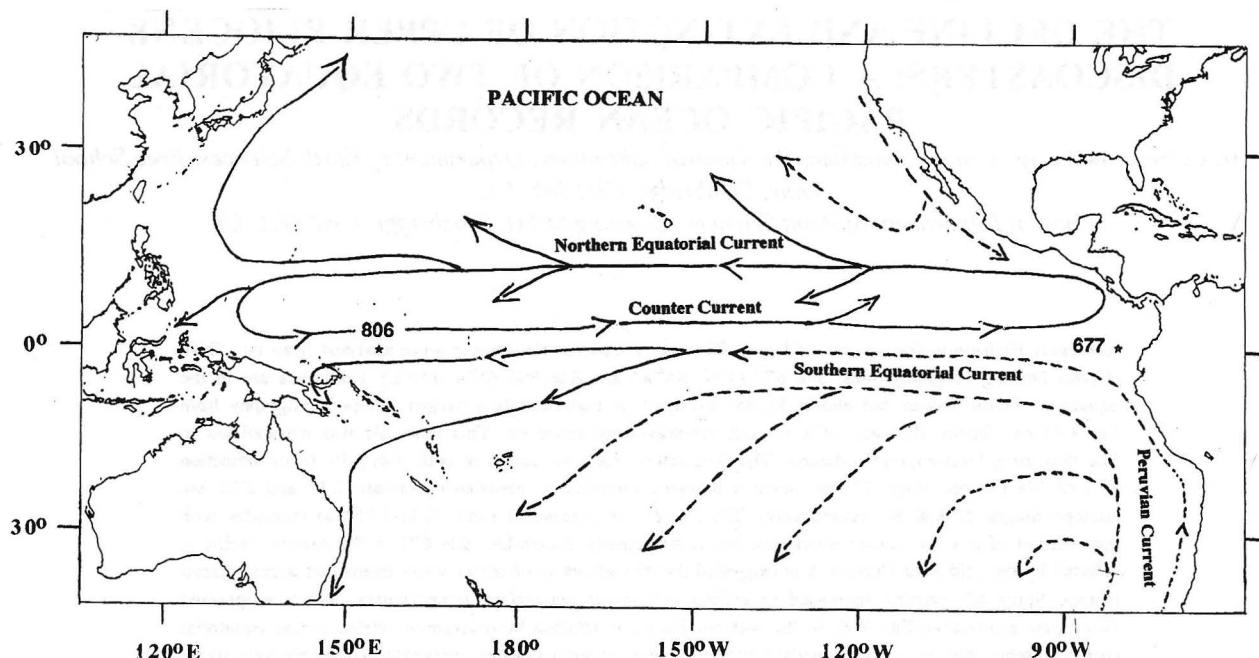


Figure 1: Location map of ODP Sites 677 and 806 with schematic representation of warm (solid line) and cold (dashed line) surface currents.

the 700 krys preceding the extinction of the discoasters (1.95–2.65 Ma) and the closely-spaced samples analysed (10 cm intervals) correspond to a temporal resolution of around 3 krys for both sites.

Age models

Detailed work at Site 677 has provided an orbitally-tuned oxygen isotope stratigraphy and high-resolution *Discoaster* abundance record (Shackleton *et al.*, 1990; Chepstow-Lusty, 1990). The age model for Site 677 is discussed fully in Shackleton *et al.* (1990). At Hole 806C, the extinctions of *D. brouweri*, *D. triradiatus* and *D. pentaradiatus* are well defined, as is the base of the *D. triradiatus* acme (Backman & Chepstow-Lusty, 1993). The *D. triradiatus* acme is located using the percentage abundance of *D. triradiatus* within the combined *D. triradiatus* and *D. brouweri* assemblage (Backman & Shackleton, 1983). Prior to the acme *D. triradiatus* usually forms <1% of the *D. brouweri* plus *D. triradiatus* assemblage, whilst during the acme it usually forms over 20% of the assemblage. The acme begins at Site 806 with a distinctive peak

in *D. triradiatus*, similar to that observed at Site 607 (Chepstow-Lusty *et al.*, 1989). It is assigned the age of 2.15 Ma in accordance with the orbitally-tuned oxygen isotope stratigraphy for Site 607 (Raffi *et al.*, 1993). The age for the last appearance datum of *D. pentaradiatus*, at 2.52 Ma, follows the oxygen isotope chronology of Jansen *et al.* (1993) from Hole 806B. There is a core break before the distinctive decline in abundance of *D. brouweri*, but samples analysed adjacent to this gap indicate that the abundances are genuinely suppressed either side of this hiatus. Table 2 summarises the control points for Hole 806C.

Interpretation

Although the sites are approximately 13,000 km apart, and affected by very different oceanographic conditions, there are obvious parallels to be observed, since similar and marked fluctuations in abundance occur at certain intervals. It is apparent that the intense glacial corresponding to isotope Stage 96 had an impact on *D. brouweri* abundances that can be correlated between both sites. However, the preceding glacial isotope Stages 98 and 100 are of a similar

Table 2

Hole 806C			
Datum Age (Ma)	Depth (mbsf)	Event	
<i>D. brouweri</i> & <i>D. triradiatus</i>	1.95	39.30	Extinction
<i>D. triradiatus</i>	2.15	43.15	Abundance Increase
<i>D. pentaradiatus</i>	2.52	53.80	Extinction

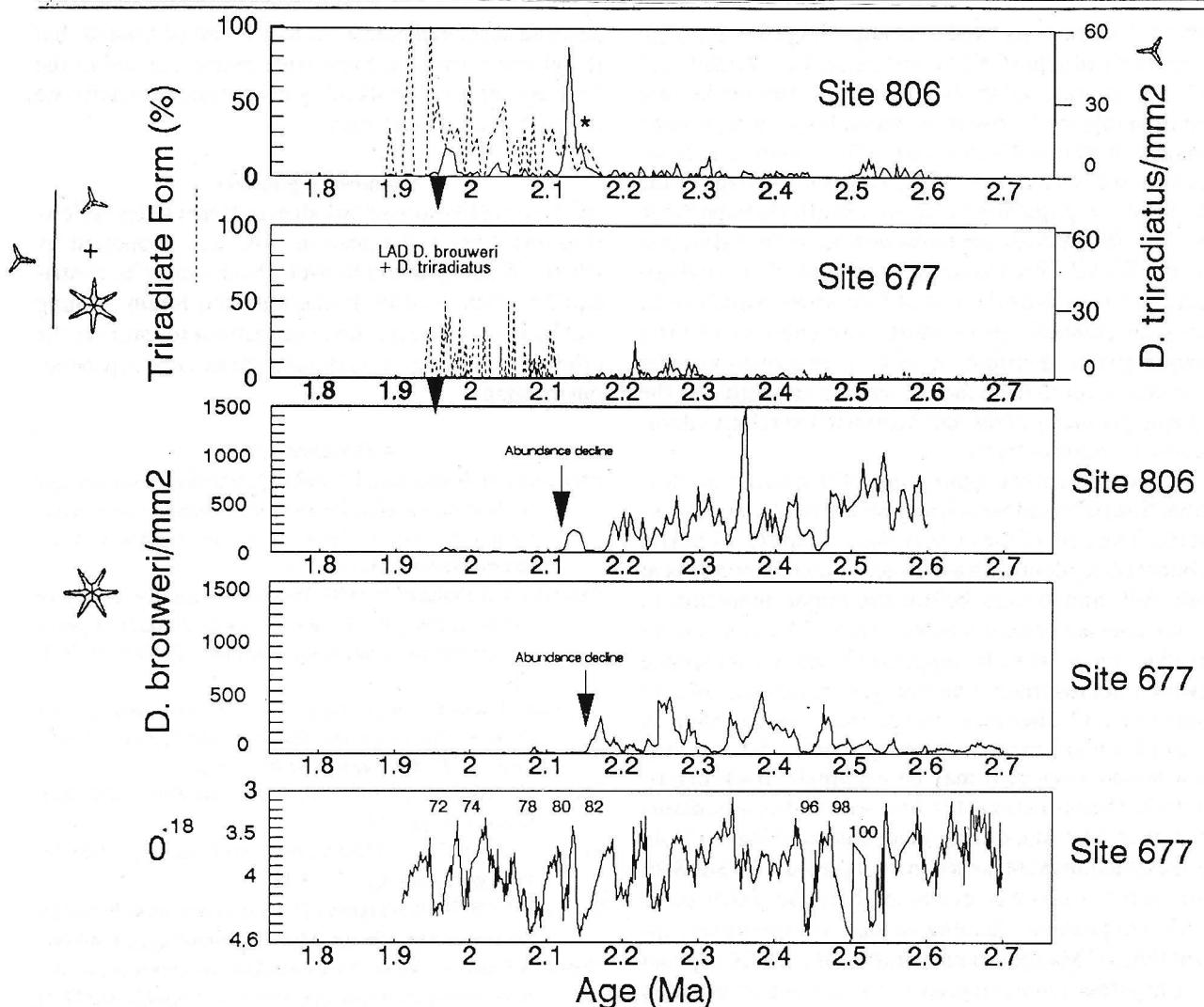


Figure 2: Abundance plots of *D. brouweri*, *D. triradiatus* and the *D. triradiatus* acme for Sites 677 and 806 versus the orbitally tuned oxygen isotope stratigraphy for Site 677. * indicates the increase in *D. triradiatus* abundance used as a control point for constructing the age model at Site 806.

magnitude in the isotope record but only at Site 677 is *Discoaster* production greatly suppressed, whilst abundance patterns remain largely unaltered at Site 806. Quaternary palaeoceanographic reconstructions, inferred from the composition of planktonic foraminiferal faunas, have shown that surface ocean circulation patterns are modified in response to prevailing glacial or interglacial conditions (CLIMAP, 1976). The CLIMAP results indicate that the difference between modern and glacial (18,000 B.P.) biogeographic patterns within the low latitude Pacific Ocean is much more pronounced in the eastern region of the equatorial divergence. Therefore, the differences observed in the Upper Pliocene *Discoaster* abundances from the eastern (Site 677) and western (Site 806) Pacific Ocean are probably a result of contrasting regional oceanographic responses to climatic change.

The major abundance decline at Site 677, during glacial isotope Stage 82 (2.15 Ma), is believed to represent an increase in equatorial upwelling, possibly amplified by the effects of the cool Peru Current moving northwards up the western coast of South America. Planktonic foraminiferal records from ODP Site 846 have documented analogous glacial-interglacial shifts in the intensity of the eastern

boundary current system throughout the late Quaternary (Le *et al.*, 1995). At Site 806, the major abundance decline occurs later, at 2.12 Ma, corresponding to glacial isotope Stage 80. Circulation in the western part of the Pacific, where there is no advection of cool surface-waters originating in higher latitudes, is dominated by upwelling driven by equatorial divergence. Any increase in the intensity, or proximity, of divergence will have modified the regional temperature, nutrient, and upper water-structure characteristics. This is likely to have affected *Discoaster* production, because of their preference for warm, low-nutrient waters. It may be that the different age estimates for the decline in *Discoaster* abundance document significant circulation differences and climatic responses between the equatorial eastern and western Pacific. However, caution is required because, while the Site 677 age model is rigorously constrained, the age model for Site 806 is constructed by interpolation between three control points and would benefit from independent chronostratigraphic data. In the equatorial Atlantic and Indian Oceans, at ODP Sites 662 and 709 (Chepstow-Lusty *et al.*, 1992; Chapman & Chepstow-Lusty, in prep.), a marked abundance reduc-

tion is likewise observed in isotope Stage 82, although the sustained suppression is less emphatic. Variability in glacial-interglacial shifts in the oxygen isotope data are comparable for the two time intervals spanning isotope Stages 78-82 and 96-100, but the *Discoaster* abundance records differ markedly. Following isotope Stage 96 the *D. brouweri* population recover, but after isotope Stage 80 low abundances are sustained up to the extinction event. This difference could be attributable to ecological criteria such as the size of *Discoaster* populations, varying competition pressure, and changes in their biogeographic distribution, which in turn relate to wider climatic forcing from factors such as variability in the spatial geometry of the ice sheets and the relative duration of climatic extremes.

In spite of the suppression of *Discoaster* production, Sites 677 and 806 clearly record the *D. triradiatus* acme. The base of the *D. triradiatus* acme (2.17 Ma) is almost coincident with a distinctive abundance peak at Site 806 and occurs before the major reduction in *Discoaster* abundance, whereas at Site 677 the *Discoaster* production is already suppressed and a comparable event is not recorded. The younger age estimate of 2.12 Ma at Site 677, between isotope Stages 79 and 80, may result from this event remaining unnoticed due to very low abundances or it may be genuinely diachronous. Finally, the extinction of *D. brouweri* and *D. triradiatus* occurs at 1.95 Ma, during glacial isotope Stage 72. As this extinction event is used in the age model for Site 806, this datum cannot be evaluated here, but other cores with independent, detailed isotope stratigraphies support the 1.95 Ma age estimate (Raffi *et al.*, 1993; Chapman & Chepstow-Lusty, in prep.). The extinction event, is marked by the end of continuous distribution; occurrences of single or very few specimens above the extinction event are considered to be reworked. The pattern seen here of some 200kyrs of suppressed abundances prior to extinction is worth noting. It clearly shows that an abrupt abundance drop near a last occurrence level cannot be assumed to be the extinction level.

Although both *D. brouweri* and *D. triradiatus* abundance records exhibit variability in relation to climatic change, they also appear to record two major thresholds of temperature reduction and nutrient increase in the equatorial Pacific. The first threshold, at isotope Stage 82 in the eastern Pacific, did not take effect until isotope Stage 80 in the western Pacific and marked the onset of cooler temperatures associated with upwelling, cold currents or equatorial divergence. The extinction of the discoasters is believed to signify an intensification of these conditions resulting in greater environmental pressure and declining population sizes, which may have allowed other phytoplankton species to outcompete them. The morphology of *D. triradiatus* (only three arms) was the final modification in a lineage that had been continually reducing skeletal calcification and the number of arms (Bukry, 1971). The increase in *D. triradiatus* may represent the last observed adaptive response of *Discoaster* to the accentuation of glacial-interglacial climatic variability during the late Pliocene. Since the discoasters favoured stable, warm conditions

and had speciated across 55 Ma, it can be argued that this global extinction event truly marks the end of the Tertiary and is an ideal biological criterion for defining the base of the Quaternary.

Acknowledgements

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<i>Biscutum zulloi</i> COVINGTON 1994, p. 121, pl. 1, figs. 1 - 5. Kansas, USA; upper Turonian - lower Campanian.	A5155
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<i>Sullivania consueta</i> (SULLIVAN 1961) VAROL 1992, p. 148; (ex <i>Coccolithus</i>).	A5187
<i>Sullivania danica</i> (BROTZEN ex VAN HECK & PERCH-NIELSEN 1987) VAROL 1992, p. 148; (ex <i>Cribrosphaerella</i> , <i>Chiasmolithus</i>).	A5187
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<i>Watkinsia pedalion</i> COVINGTON 1994, pp. 122 - 123, pl. 4, figs. 1 - 4. Kansas, USA; Santonian.	A5155

NEW TAXA

Genera

Sullivania
Watkinsina

Species and Varieties

anartios, *Discoaster*
applegatei, *Rotelapillus*
arca, *Hornbrookina*
asanoi, *Reticulofenestra*
cubitermalinus, *Lucianorhabdus?*
decorata, *Pontosphaera*
dekaenelii, *Biscutum*
eminens var. *eminens*, *Toweius*

eminens var. *tovae*, *Toweius*
lageniformis, *Lucianorhabdus*
ono, *Discoaster*
pedalion, *Watkinsia*
serotinus, *Toweius*
sidereus, *Fasciculithus*
wiedmannii, *Cyclagelosphaera*
zulloi, *Biscutum*

BIBLIOGRAPHY AND TAXA OF SILICOFLAGELLATES VI

Compiled by Stacia A. Spaulding

First of all, my apologies for not including references which were published in the latest volumes of the Ocean Drilling Program. After traveling 160 kilometers to the library at the University of Vermont I learned that the section which houses this type of document is closed on the weekends (at least in the summer). I will include these in the next edition of this bibliography. Secondly, please keep in mind that I have very limited access to materials which are published outside the U.S.A. The only way that this bibliography can be brought (and kept) up to date is with your help.

Kindly send all of your reprints or publications concerning silicoflagellates to: *Stacia A. Spaulding, RR 1 Box 127, Proctorsville, Vermont 05153 U.S.A.*

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E506	JORDAN, R.W., PRIDDLE, J., ET AL. Unusual diatom layers in upper Pleistocene sediments from the northern Weddell Sea. ♦ Deep Sea Res. 38(7): 829-843, 4 figs.	1991	Ecol. Quat. Southern
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E508	JOUSÉ, A. P. Diatom biostratigraphic zones of the Eocene. ♦ In: Simonsen, R. (ed.) Fifth Symposium on Recent and fossil diatoms. Nova Hedwigia Beihefte, 64: 427-445, 5 pls.	1979	(Strat.) TERT.L. Europe E.
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As with previous membership lists we have included all East European, Former Soviet Union and Chinese nannofossil workers irrespective of whether they are actually INA members, we hope this will be of value in aiding collaboration with these countries. The list of Chinese workers was updated by Cheng Xinrong who copies and distributes the JNR within China. For the rest of the world only INA members are included. For this issue email addresses have been added wherever we know them.

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