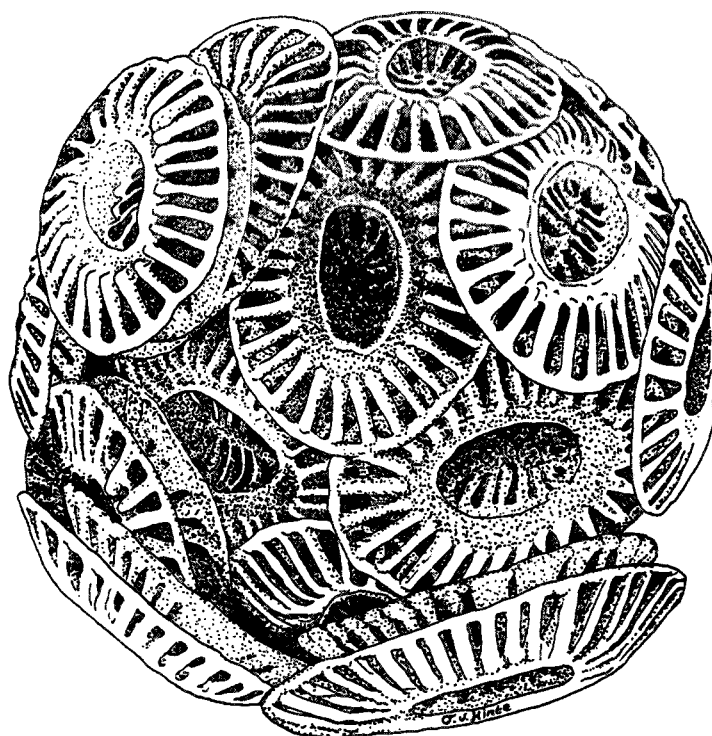


INA

NEWSLETTER



INTERNATIONAL NANNOPLANKTON ASSOCIATION

VOLUME 14

NUMBER 3

1992

THE INTERNATIONAL NANNOPLANKTON ASSOCIATION

PRESIDENT

Katharina von Salis Perch-Nielsen
Geologisches Institut ETH-Z
CH-8092 Zürich
Switzerland
Tel. 41-(0)1-256-3695
Fax. 41-(0)1-256-0819

SECRETARY

Kevin Cooper
Stratigraphic Services Int.
Surrey Research Park
Guildford GU2 5YL, UK
Fax 44-(0)483-31106

TREASURER

Nicky Hine
British Geological Survey
Keyworth
Nottingham NG12 5GG, UK
Fax 44-(0)602-363200

US TREASURER

Stephan A. Root
Mobil EPSI
P.O. Box 650232
Dallas
Texas 75265-0232, USA

NOMENCLATURAL SECRETARY

Shirley E. van Heck
Sarawak Shell Berhad
Sabah Shell Petroleum
Lutong
Sarawak, Malaysia

NEWSLETTER EDITOR

Jeremy R. Young
Palaeontology Dept.
The Natural History Museum
London SW7 5BD, UK
Tel. 44-(0)71-938-8996
Fax. 44-(0)71-938-9277
EMAIL palaeo@nhm.ic.ac.uk

DEPUTY EDITOR

Paul R. Bown
Micropalaeontology Unit
University College London
London WC1E 6BT, UK
Fax. 44-(0)71-387-8057

BIBLIOGRAPHER

William G. Siesser
Dept. of Geology
Vanderbilt University
Nashville
Tennessee 37235, USA

SILICOFLAGELLATE BIBLIOGRAPHER

Stacia Spaulding
1929 Brighton Place
Harvey
Louisiana 70058, USA

ODP CORRESPONDENT

John Firth
Ocean Drilling Project
Texas A&M University
College Station
Texas 77840, USA

INA MEMBERSHIP: Open to anyone interested, on receipt of subscription. Subscription is £12 (students £6) per annum. Send to Treasurer. Or \$20 (Students \$10), send to US Treasurer. Membership queries and changes of address send to Secretary.

BIBLIOGRAPHIES: Please send reprints of any coccolith, calcisphere or silicoflagellate articles to the relevant bibliographer.

BACK ISSUES: All issues available, except 7/2 and 11/2 (conference abstracts). Price per issue: Non-members £8/\$14; Members, Issues 1/1 to 7/2 £5/\$8, Issues 8/1 to 14/2 £3/\$5. 30% discount for students and/or bulk orders (10 or more issues). For air mail delivery add £1/\$2 per issue. **Full set of back issues £70 (inc. postage).** Send orders to the Treasurer.

COPYRIGHT: Any part of the Newsletter may be reproduced for scientific or educational purposes. Wherever appropriate the source and authors should be clearly noted.

NEWSLETTER MATTERS: Send all contributions, suggestions etc. to the editor. *Deadline for next issue 15th May 1993.* For advice to contributors see inside back cover.

ADVERTISING: Advertisements are welcome, at a rate of £40/page, £20/half page etc. Contact editor for queries.

INA NEWSLETTER

Proceedings of the International Nannoplankton Association

Volume 14

Number 3

November 1992

NEWS AND ANNOUNCEMENTS	86
ELECTION OF A NEW PRESIDENT OF INA	86
INA MEMBERSHIP SUBSCRIPTIONS	86
SALAMANCA CONFERENCE	86
PRAGUE CONFERENCE PROCEEDINGS	87
FLORENCE CONFERENCE PROCEEDINGS	87
BRITISH NANNOFOSSIL WORKERS TRIP TO SCARBOROUGH	87
FORTHCOMING MEETINGS	88
AAPG/SEPM ANNUAL CONVENTION - New Orleans, April 1993	88
ARHELL SYMPOSIUM ON JURASSIC GEOLOGY - London, Sept. 1993	88
BIOLOGY OF THE PRYMNESIOPHYTA - Plymouth, March 1993	88
INA MEMBERSHIP CHANGES	88
2nd ASIAN/PACIFIC INA CONFERENCE - Yamagata, Sept. 1992	89
Conference Report - <i>Katharina von Salis</i>	89
List of oral presentations, and participants	90
EARLY MIOCENE NANNOFOSSILS FROM INDONESIA <i>Kadar</i>	91
BIOSTRATIGRAPHY OF THE KLONDYKE FM. PHILIPPINES <i>de Leon et al.</i>	91
SILICOFLAGELLATES IN THE SOUTHERN OCEAN <i>Kawabata & Nishida</i>	92
NEOGENE CALCAREOUS NANNOFOSSIL ZONATION <i>von Salis & Biolzi</i>	92
TEMPERATURES FROM RECENT NANNOFOSSIL ASSEMBLAGES <i>Wei</i>	94
USE OF MICROBEADS TO ESTIMATE NANNOFOSSIL ABUNDANCE <i>Okada</i>	96
OCEAN DRILLING PROGRAM NEWS, <i>John Firth</i>	98
THE ICBN: THINGS YOU NEED TO KNOW - 7, <i>Shirley E. van Heck</i>	100
3rd <i>EMILIANA HUXLEYI</i> WORKING GROUP MEETING - Sept. 1992, <i>Jeremy Young</i>	102
AN HIERARCHICAL DESCRIPTIVE CHECKLIST FOR CALCAREOUS NANNOFOSSILS <i>Jackie A. Burnett & Paul R. Bown</i>	103
BIBLIOGRAPHY AND TAXA OF SILICOFLAGELLATES - IV <i>Stacia A. Spaulding</i>	107
BIBLIOGRAPHY AND TAXA OF CALCAREOUS NANNOPLANKTON - 20 <i>William G. Siesser</i>	111
INA MEMBERSHIP DIRECTORY	124

NEWS AND ANNOUNCEMENTS

ELECTION OF A NEW PRESIDENT OF INA

The new president of INA will be Shirley van Heck. 72 votes were received by October 1st: 27 for Sherwood W. Wise and 45 for Shirley van Heck.

Thank you for voting. The new president will take over from the old for the next four years at the INA Conference in Salamanca (1993).

Katharina von Salis

INA MEMBERSHIP SUBSCRIPTIONS

An invoice for this year's subscription is included with the Newsletter. Please pay promptly - it is much appreciated.

Also please note that we have introduced new charges, generally greatly *reduced*, for back issues of the Newsletter (details on inside cover). The objective is to reduce, and use, our large stock of back issues.

Nicky Hine

SALAMANCA CONFERENCE

Over 80 first circular returns have been received and the preferred data is late August/Early September. Full details will be sent shortly in a second circular. Anyone who is interested in attending and did not return the questionnaire from the first circular should please write to me now to be placed on the mailing list.

The registration fee is likely to be about 10,000ptas normal, 6,000ptas students - (*at current exchange rates* this is about \$100 and \$60).

Provisional timetable

28-29 August: Arrival, registration, pre-conference excursion (Neogene).

30 August - 2nd September: Scientific sessions.

2-4 September: K/T excursion (leaving night of 2nd Sept).

Abstracts The Abstract Volume will be published as a special issue of the INA Newsletter, and will be sent out to all members before the meeting. To make administration simpler for us all abstracts should be sent direct to Jeremy Young in London. Abstracts can be sent for both talks and posters.

The most convenient technology is for people to submit printed text which will be compiled by electronic scanning and optical character recognition. For this the advice is:

1. Use a good printer, and white paper.
2. Avoid complex formatting, multiple fonts etc.
3. *Do not fax abstracts.*
4. Figures are very welcome, and can be submitted on separate sheets.
5. We may make minor grammatical corrections, unless specifically asked not to.
6. *Nomina nuda* will not be published.
7. Maximum length - one page of the Newsletter (but it can be a bit longer if there are diagrams).
8. *Deadline (for Air Mail posting of abstracts) - 1st May 1993*

Alternative means of submission are by EMAIL (palaeo@nhm.ic.ac.uk) or on disk (worthwhile if several abstracts are sent together).

Send abstracts to: J.R. Young, Palaeontology, Natural History Museum, London SW7 5BD, UK, by 1st May 1993. *Please do not fax abstracts.*

All other matters: Jose-Abel FLORES, Dep. de Geologia, Fac. de Ciencias, Univesidad, 37008 Salamanca Spain. Fax 34-23-294514

PRAGUE CONFERENCE PROCEEDINGS

The proofs from volume 1 (General topics and Mesozoic) have mostly been returned, we hope to print it in December or January. The first proofs for Volume 2 (Cenozoic and Living) are currently being checked by the editors, second proofs will be sent to the authors shortly.

Bohumil Hamršmíd, Jeremy Young

FLORENCE CONFERENCE PROCEEDINGS

F. Proto Decima, S. Monechi, D. Rio (eds.) 1992.

Proceedings of the International Nannoplankton Association Conference, Firenze 1989

Memorie di Scienze Geologiche, 43. p.1-467.

This volume has now been published. It comprises an overview of nannoplankton evolution by Bown et al and 25 papers arranged in stratigraphical sequence including 3 on the Jurassic (Cobianchi et al, Erba et al, Reale et al.); 4 on the Cretaceous (Bown & Ozkan, Kale & Phansalkar, Kilasonia, Pospichal et al.); 2 on the K/T boundary (Pospichal & Wise, Lamolda & Gorostidi); 7 on the Palaeogene (Gavtadze, Janin, Wei & Wise, Wei, Firth, Olafsson & Villa, Minashvili); 5 on the Neogene (Olafsson, Patacca et al., Beaufort, Bonci & Pirini-Radrizzani, Chepstow-Lusty et al.); 3 on Quaternary palaeoecology (Giraudeau, Spaulding & Oba, Pujos); and 1 on Recent nannofossils (Okada). This is certainly the largest collection of nannofossil papers ever published, it is also extremely useful with many detailed investigations of particular lineages, several reviews of biostratigraphy, and details of previously unrecorded nannofossil riches from areas such as Georgia. The volume is magnificently produced on large format (32x23cm) high quality paper, with excellent reproduction of figures and plates. There is foreword by Katharina von Salis and a taxonomic index.

Availability: For legalistic reasons retail copies are only available through the INA. Price £68 (including £8 postage). Cheques payable to INA.

Send orders to *Nicky Hine, British Geological Survey, Keyworth, Nottingham, NG12 5GG, UK.*

BRITISH NANNOFOSSIL WORKERS TRIP TO SCARBOROUGH

Nannofossil workers based in the UK are lucky enough to receive the specialist attentions of two societies, the INA of course, but also the British Micropalaeontological Society, which has a nannofossil specialist group. The current officers of this valuable group, Nicky Hine and Liam Gallagher, decided it was time we got together again. So at the beginning of October they persuaded about 12 of us to go to Scarborough on the Yorkshire Coast to investigate the Jurassic sediments of the region, under the expert guidance of Ray Bate (Kevin Cooper's boss at SSI).

Paul Bown, Jackie Burnett and I drove up in my increasingly dilapidated Fiat Panda and so missed the first outcrop. But we met up with the others in time to go to Scarborough Castle Cliff. We collected a few Kimmeridgian samples here but had more fun watching splendid North Sea waves crashing against the road which runs along the bottom of the cliff. We spent the evening practising our football, singing and dancing skills for Salamanca ending up in a rave(?) club.

Ray Bate had missed out on the nocturnal activities and was not impressed by our abilities to do serious fieldwork the next morning. The weather and scenery was beautiful though and we enjoyed a walk on the beach at Cayton Bay followed by the traditional pub lunch, a couple of quarries, and some valuable scientific discussions before heading home.

Jeremy Young

FORTHCOMING MEETINGS

AAPG/SEPM Annual Convention 25-28th April 1993 - Nannofossil Biostratigraphy Poster Session

The 1993 AAPG/SEPM Annual Convention will be held in April in the spacious New Orleans Convention Center. For the first time for a long while calcareous nannofossils will receive special attention - Woody Wise and Richard Constans are co-convenors of an SEPM poster session, *Nannofossil Biostratigraphy*. Hopefully this will also provide a chance for American nanno workers to meet. (N.B. The deadline for abstracts was 1 October 1992, but any nanno workers planning to attend the meeting could still usefully get in touch with Richard).

R.E. Constans, Chevron U.S.A., 935 Gravier St., New Orleans, LA 70112, USA

Arkel International Symposium on Jurassic Geology - London 7-21 Sept. 1993

This symposium will be held at University College London under the auspices of the Geological Society of London to celebrate the 60th anniversary of W.J. Arkell's "The Jurassic System in Great Britain". The object of the symposium is to demonstrate the British Jurassic. This will be done by posters and invited talks in London followed by extended field excursions. Correspondence and enquiries should be sent to: Dr. Stewart Brown, Petroleum Sci. & Tech. Inst., Dunedin House, 25 Ravelston Terrace, Edinburgh, EH4 3EX.

Paul R. Bown

Biology of the Prymnesiophyta, Plymouth, UK 29th March - 1st April 1993.

Deadline for abstracts and registration 31st January 1993. See last newsletter for more details.

INA MEMBERSHIP CHANGES

(N.B. Full addresses are given in the membership directory, pp.118-122)

NEW MEMBERS

Corelab Indonesia, Jakarta, Indonesia

Michel Gosselin, Université de Quebec à Rimouski, Canada

Will Harpur, Halliburton, Aberdeen, U.K.

Amina Karega, Tanzania Petroleum, Dar-es-Salaam, Tanzania

Sarawak Shell Berhad, Sarawak, Malaysia

J. Williams, University of North Carolina, U.S.A.

Mohamed Khaled Yzbek, Syrian Embassy, Cairo, Egypt

Donata Zucchi, Stratigraphic Services Int., Guildford, U.K.

CHANGES OF ADDRESS

Maria Baldi-Beke, Urom, Hungary

Jim A. Bergen, Amoco, Texas, U.S.A.

Joan-Antoni Curto Homedes, Barcelona, Spain

T. Dunn, Shell, New Orleans, LA, U.S.A.

Anna Farinacci, Roma, Italy

Shirley van Heck, Shell, Sarawak, Malaysia

Martin Jakubowski, Shell, The Hague, The Netherlands

Jason Jeremiah, Shell, London, U.K.

Ed Joyce, Houston, Texas, U.S.A.

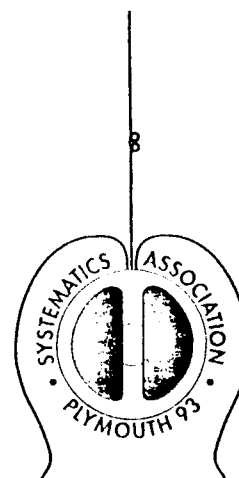
David J. Jutson, Danish Geol. Surv., Copenhagen, Denmark

Purtyasti Resiwati, Gadjali Mata University, Indonesia

Lauralee Reugger, Nanno Investigs., Covington, LA, U.S.A.

Tokiyuti Sato, Akita University, Japan

Charles C. Smith, Geol. Survey of Alabama, U.S.A.



2nd ASIAN/PACIFIC INA CONFERENCE
Yamagata, Japan, 1st - 4th September 1992, Convenor Hisatake Okada

CONFERENCE REPORT

After the CH-INA meeting 1986 in Shanghai, the 2nd Asian/Pacific Conference was held in Yamagata, Japan. The organising committee consisted of Hisatake Okada, Toshiaki Takamana and Tokiyuki Sato, who were supported by an enthusiastic group of helpers. To Hisatake's disappointment, only a few non-japanese INA-members found their way to Yamagata. To Katharina's joy, some nineteen Japanese and three members from other Asian countries were present: Marietta M. de Leon from the Philippines, Adi P. Kadar from Indonesia and Razali Mohd Chekob from Malaysia. Taiwan was represented by Kuo-Yen & Mrs. Wei who presently live in the USA. Only Marie-Pierre Aubry, Bill Berggren and Katharina von Salis attended an Asian INA meeting for the second time. As the French say: *les absents ont toujours tort* - those absent are always wrong. With Shirley van Heck, the future president of INA, now also in the Asian region, I am sure she will take it upon herself to intensify the contact amongst Asian INA-members!

The first morning started with a short walk to the "Yugakukan", the Yamagata Prefectural Lifelong Learning Centre, where the day's talks were presented. After the opening address by Hisatake we were treated to two invited lectures: one by Isao Inoue on systematics and biology of the Haptophyceae and the other by Eiji Takahashi on the distribution and ecology of the Chrysophyta (siliceous nannoplankton). Then followed an impressive video showing the movements of many species, and oral and poster presentations in the afternoon. The evening was enjoyed at a Welcome Party with an excellent buffet in the hotel.

The second day was spent at the University in Hisatake's lab with informal talks, microscope study of comparative material, SEM demonstrations and poster explanations. For the evening, the members of the Earth Sciences Department treated us to a party complete with Japanese food, dance and magic.

On the excursion of the third day, Hisatake led us to the "suburbs of Yamagata", which stretched to the not so nearby mountains. One sample was collected, a fish-trap in a river inspected, and we were ready for lunch and a Japanese bath before returning to Yamagata. There, departure was swift with the high-speed train to Tokyo and on to the hotel in Kisarazu in Chiba Prefecture.

The leaders of this second fieldtrip were Toshiaki Takayama, Tokiyuki Sato and Isao Mita. Thanks to the instructive guidebook that they had prepared, it was easy to exactly determine, where the Pliocene/Pleistocene samples were to be taken to get the desired assemblage of nannos along the Urasiro and Yoro Rivers. At the return to Tokyo that evening, the group dissipated.

On behalf of the participants I would like to thank the organisers for the friendly, interesting conference and excursion that they organised for us. We have gained insights into the fields of nanno-research that our Asian/Pacific colleagues are interested in and met old and made new friends.

There are no firm plans yet to organise a third Asian/Pacific INA conference. Taiwan looked like a possibility - or Sarawak, where our new president will reside for some years? Be ready to discuss this topic in Salamanca in 1993!

Katharina von Salis

LIST OF ORAL PRESENTATIONS.

Marie-Pierre AUBRY	Woods Hole	Palaeogene calcareous nannoplankton evolution: controlled by temperature or nutrients?
Isao INOUE	Tsukuba Univ	Systematics and biology of the Haptophyceae.
Adi Priyadi KADAR	GRDC Bandung	Early Miocene calcareous nannofossils from western Indonesia.
Yoshiko KAWABATA	Kyoto Univ	Silicoflagellate flora in the Southern Ocean with special reference to skeleton morphology.
Marietta M. de LEON	Phillipines	Biostratigraphic study of the Klondyke Formation, Phillipines.
Hiroshi MATSUOKA	Kochi Univ	Morphometric changes of genus <i>Gephyrocapsa</i> in the Atlantic Ocean.
Hisatake OKADA	Yamagata Univ	Late Pleistocene Nannoflora as an indicator of upwellings - A preliminary result. Use of microbeads to estimate absolute abundance of nannofossils (demonstration).
Katharina von SALIS	ETH-Zürich	A critical look at calcareous nannofossil zonation in the Neogene.
Shinji SHIMADA	Tohoku Univ	Short-term changes in cell number of choanoflagellates and so-called parmales in light and dark
Eiji TAKAHASHI	Yamagata Univ	The Chrysophyta - taxonomy, distribution and ecology.
Kuo-Yen WEI	Yale Univ	On establishment of a taxonomic protocol of Quaternary nannoplankton for past global climate change research. A new quantitative method for reconstructing palaeoceanographic conditions using nannoplankton.
Masamichi YAMAZAKI		Morphometric changes of genus <i>Cyclicargolithus</i> in the Pacific Ocean.

Other participants

Razali Mohd CHE KOB, Petronus, Malaysia
Chikara HIRAMATSU, JAPEX, Japan
Takehiko HIWATARI, JANUS, Japan
Seiji HORIUCHI, Palinosurvey Co, Japan
Kohji KAMEO, Teikoku Petroleum Co, Japan
Takeshi KATAYAMA, Niigata Univ, Japan
Masanobu KAWACHI, Tsukuba Univ, Japan
Isao MITA, Japan Natural Gas Co, Japan
Shiro NISHIDA, Nara Educational Univ, Japan
Tokiyuki SATO, Akita Univ, Japan
Toshiaki TAKAYAMA, Kanazawa Univ, Japan
Satoshi UZAWA, Tohoku Univ., Japan

ABSTRACTS FROM THE YAMAGATA MEETING

EARLY MIOCENE CALCAREOUS NANNOFOSSILS FROM WESTERN INDONESIA.

Adi Priyadi Kadar, Geological Research and Development Centre, Bandung, Indonesia

Summaries of the calcareous nannofossil biostratigraphy are presented for the Early Miocene of the East Kalimantan, South Sumatra and south Central Java, Western Indonesia. The Lower Miocene sediments in the Kutai Basin, East Kalimantan, consist of deltaic facies interfingered with open marine microplankton-rich calcareous sediments, characterized by an high diversity species of *Sphenolithus*, such as: *S. delphix*, *S. dissimilis*, *S. belemnos*, and *S. heteromorphus* and less dominant species *Helicosphaera*. The nanno-assemblages in the lowest part of the Miocene contain *Cyclicargolithus abisectus*, *Helicosphaera euphratis*, *Sphenolithus delphix*, *S. furcatholioides*, *Triquatorrhabdulus carinatus*, but lack *Dictyococcites bisectus*, *Sphenolithus ciperoensis*, and *Zygrhablithus bijugatus*. Further up-section, the index species *Sphenolithus belemnos* and *S. heteromorphus* are common and moderately well preserved.

The Kutai Basin assemblages differ from the flora in the sediments of equivalent age exposed in the South Sumatra Basin, where species of *Helicosphaera*, such as *H. ampliaperta* and *H. scissura*, are common and well preserved. However, the index species *S. belemnos* is sparse or absent, probably due to the fact that sedimentation in the South Sumatra Basin was initially in a shallow marine environment, and was probably linked to the Indian Ocean only through a few passages in the Proto-Barisan Mountain island chain.

Deep marine turbiditic sequences of Early Miocene age are exposed in the Yogyakarta Sub-Basin, south Central Java. These contain abundant and moderately well preserved nannoflora. Within this area the index species *H. ampliaperta* and *S. belemnos* are only rare to few.

BIOSTRATIGRAPHIC STUDY OF THE KLONDYKE FORMATION SECTION ALONG KILOMETRE POSTS 278-251, MARCOS HIGHWAY. BAGUIO CITY-LA UNION PROVINCE, PHILIPPINES

Marietta M. de Leon, Emmanuel V. Tamesis and Priscilla J. Militante-Matias, National Institute of Geological Sciences, College of Science, University of the Philippines, Diliman, Quezon City 1101, Philippines.

The Klondyke Formation is a thick clastic sequence exposed on the southwestern flank of the Central Cordillera of Luzon. It consists of coarse clastic rocks including polymict conglomerates, conglomeratic sandstones and flow breccias interbedded with thin to medium beds of shale and siltstone. Various authors have assigned the rock unit an age range of Middle Miocene to Late Miocene based on foraminifera and stratigraphic position; the rock unit is underlain by the Middle Miocene Kennon Limestone and overlain by the Late Miocene Amlang Formation.

The present work attempts to further define the age of the Klondyke Formation using calcareous nannofossils. A total of forty-one samples from twenty-seven sampling stations have been studied. Preliminary results indicate the calcareous nannofossil Zones NN5-NN10 (Martini, 1971) equivalent to Middle Miocene-Late Miocene age.

SILICOFLAGELLATE FLORA IN THE SOUTHERN OCEAN, WITH SPECIAL EMPHASIS ON THE SKELETON MORPHOLOGY

Yoshiko Kawabata, Laboratory of Fishery Resources, Kyoto University, Japan

Shiro Nishida, Department of Earth Sciences, Nara University of Education, Japan

The geographical distribution of modern silicoflagellates was investigated along longitudes 150°E and 115°E in the Southern Ocean, and three floral assemblages were recognized. In the Subtropical Zone the maximum population of silicoflagellates was observed in the upper 50m of the water column. By contrast in the Antarctic Polar Front Zone it generally occurs in the lower part of the photic layer. In the Antarctic Zone, silicoflagellates are universally more abundant than in the northern two zones, and the highest concentration of cells is observed within this zone.

Although double skeletons are usually rare in nature, they are common in the studied samples. Double skeletons in the natural environment are usually formed as mirror images, but some specimens observed here are not mirror images but are constructed of combinations of two different types of skeletons.

The classification of silicoflagellates is currently in confusion, and *Dictyocha speculum* is often described as *Distephanus speculum*. Moestrup and Thomsen (1990) who have studied the ultrastructure and physiological character of cultured *Dictyocha speculum* concluded that *D. speculum* and *D. fibula* are different species, but that the separation of the genera *Dictyocha* and *Distephanus* is not justifiable. Consequently, they regard *Distephanus* as a junior synonym of *Dictyocha*.

Van Valkenburg and Norris (1970) have studied cultured specimens of *Dictyocha fibula* and have illustrated a form without an apical window as *Dictyocha fibula* var. The asymmetrical double skeletons observed in this study consist of a combination of the *D. speculum* type and a skeleton quite similar to *Dictyocha fibula* var. Apparently, modern silicoflagellates are highly variable in their skeleton morphologies, and it is inappropriate to rely on the skeleton morphology alone for their classification. The present classification scheme of modern silicoflagellates need to be re-examined.

REFERENCES

- Valkenburg S. D. van, & Norris R. E. 1970: The growth and morphology of the silicoflagellate *Dictyocha fibula* Ehrenberg in culture. *J. Phycol.*, 6, 48-54
- Moestrup O. & Thomsen H. A. 1990: *Dictyocha speculum* (Silicoflagellate, Dictyochophyceae), studies on armoured and unarmoured stage. *Biol. Skr.*, 37, 1-57

A CRITICAL LOOK AT CALCAREOUS NANNOFOSSIL ZONATION IN THE NEOGENE

Katharina von Salis Perch-Nielsen, Geological Institute ETH-Z, Zürich, Switzerland

Milena Biolzi, Istituto di Geologia, Università di Parma, Italy.

The zonation scheme first proposed by Hay *et al.* (1967) and completed and presented as a "standard zonation" for the Neogene by Martini (1971) has served well for the past 25 years. So well, actually, that many biostratigraphers and users have stopped questioning the global synchronicity of the marker events used. Berggren *et al.* (1985) assigned numerical ages to most of these events and to events used in zonal schemes of other microfossil groups.

By not looking globally at first and last occurrences (FO's and LO's) closely over space and time we missed an opportunity to find out, when and where exactly a given species evolved or became extinct. In an ongoing project of a team of colleagues in Zürich including J.P. Beckmann, H. Hilbrecht, D. Lazarus, C. Spencer-Cervato, H.R. Thierstein and the authors, we address this among many other questions. Hopefully this will also lead us to a better biostratigraphic tool.

Material and Methods. More than 1000 holes have been drilled by the Deep Sea Drilling Project and the Ocean Drilling Programme of these we selected over 100 for this project. We mainly considered holes with a reasonably complete Neogene section and magnetic data. Only a few holes include data in the form of the necessary distribution charts on all microfossil groups considered

(calcareous nannofossils, diatoms, planktonic foraminifera and radiolarians). The FO's and LO's of all marker and some additional species as well as the magnetic reversals were extracted from the charts in the Initial Reports and assigned the ages given in Berggren et al. (1985). From this information, age-depth plots were constructed using a Macintosh computer with the program described by Lazarus (1992).

While we did not expect to find all data points on a nice straight line, neither did we expect the serious problems we encountered in actually drawing a line through the points. The experienced biostratigrapher suddenly saw her tool disintegrate: calcareous nannofossil data points could lie completely outside any reasonable age-depth plot as drawn from magnetic and other microfossil data points. So could data points derived from other fossil groups in other holes. A second look, at the original distribution charts and at remarks in the text of the relevant chapter, could sometimes help explain why a given point would not fit into the expected age slot: poor preservation, species present in only one sample, or possibly an unusual species concept.

Next, the data of one species were plotted against the (present-day) latitude of the site. Again, some species showed a remarkable synchronicity in their FO's and/or LO's. Other events are more or less strongly diachronous (Spencer-Cervato *et al.*, 1992 and in press). Rather than crying over the partial loss of a biostratigraphic tool, we recognised the possibility to investigate the area in which the species probably first appeared or finally became extinct. Since the database is still relatively small, we cannot be sure to actually have found the precise place. We can, however, concentrate our search for ancestors of a given form, in holes in the area where the oldest forms of a given species were found.

A few examples

The LO of *D. tamalis* (BERGGREN-age 2.6my) was found to range from 2.9my at Site 284 W of northern New Zealand, to over 2.8my a few degrees to the NW, then to over 2.5my to 2.3my at Site 588.

The FO of *C. rugosus* (BERGGREN-age 4.5my) shows the opposite trend: 4.6my at Site 588, becoming younger towards the South with 4.2my at intermediate Site 589 and 4.0my at the southernmost Site investigated, 502.

The LO of *S. heteromorphus* is assigned an age of 14.4my by BERGGREN et al. 1985. We found ages ranging from as old as 16.5my at the Southern Indian Ocean Site 266, where the species had appeared only 0.3my before, to as young as 12.5my at the Indian Ocean Site 253, where the species had appeared about 2my earlier.

The LO of *T. carinatus* (Berggren-age about 21.5my if taken as near the FO of *S. belemnus*) is scattered from 28.2my (!) at Site 278 south of New Zealand to 12.0my at Site 573 in the Eastern Equatorial Pacific. Clearly the LO of *T. carinatus* is a rather unreliable marker event.

Generally, we observed a shorter residence time in higher than in lower latitudes. *D. hamatus* (Berggren-ages 10.0-8.85my) for example was present at Site 265 in the Southern Indian Ocean for only 0.1my (represented by 5 samples), while it lasted 1.7my at Site 253 in the central part of that ocean.

REFERENCES

- Berggren W.A. *et al.* 1985: Cenozoic geochronology. *Bull. geol. Soc. Am.*, **96**, 1407-1418.
- Hay W.W. *et al.* 1967: Calcareous nannoplankton zonation of the Cenozoic of the Gulf Coast and Caribbean-Antillean area and transoceanic correlation. *Trans. Gulf Cst. Ass. geol. Socs.*, **27**, 428-480.
- Lazarus D. 1992: Age Depth Plot and Age Maker: Age Modelling of Stratigraphic Sections on the Macintosh Series of Computers. *Geobyte*, **2/92**, 7-13.
- Martini E. 1971: Standard Tertiary and Quaternary calcareous nannoplankton zonation. *Proc. Second Plankt. Conf. Roma, 1970*, **2**, 739-777.
- Spencer-Cervato C., *et al.* 1992: Revised Neogene Plankton Biochronology. *Abstract Int. Geol. Congr. 1992*.
- Spencer-Cervato C., *et al.* (In press). New calibration of Neogene radiolarian events in the North Pacific.

RECONSTRUCTING SEA SURFACE TEMPERATURES USING PATTERN RECOGNITION TECHNIQUE: A CASE STUDY OF THE RECENT NANNOFOSSIL ASSEMBLAGES IN THE SOUTH CHINA SEA

Kuo-Yen Wei, *Department of Geology and Geophysics,
Yale University, New Haven, CT 065110-8130, USA*

A pattern recognition method, SIMCA-MACUP (Soft Independent Modelling of Class Analog - Modelling And Classification Using Partial least squares) (Wei, in press), has been applied to evaluate the possibility of establishing a predictive relationship between the abundance of Recent nannofossils in sea-floor sediments (Chen and Shieh, 1982) and sea-surface temperatures (SSTs) in the South China Sea.

The floral census data were first transformed using logratio logarithm as recommended by Aitchinson (1986) to mitigate the undesirable statistical properties of the constant-sum inherited in the percentage data. The SIMCA-MACUP methodology was then used to find the optimal linear relationship between the nannofossil contents and the February and August sea surface temperatures (Bottomley et al., 1990). A nannofossil dissolution index (NDI), defined similarly to the foraminiferal dissolution index of Vincent and Berger (1981), was calculated from the nannofossil census data to monitor the effect of dissolution on nannofossils. As a control experiment, the NDI of each sample was predicted from the nannofossil abundance data and compared to the original NDI derived directly from the percentage data. The SIMCA-MACUP was proved to be an effective prediction method because it estimated successfully the NDI values (Fig. 1). On the other hand, the predicted February SSTs deviated from the observed SSTs by +3° to -2°C while the total temperature range is 7°C (Fig. 2). Furthermore, the residuals vary systematically with temperature, indicating a poor predictive relationship. The reconstruction of August temperatures also failed.

The failure to establish a reliable temperature transfer function might be a result of one, or a combination, of the following: (1) the floral variation may not have a multivariate linear relationship with sea-surface temperature; (2) the resolution of the data of Bottomley et al (1990) may be too coarse (1° x 1°) to reflect the true relationship between the floral variation and the finer-scaled control of temperature; or (3) the floral variation in the South China Sea may be dominated by dissolution instead of temperature.

REFERENCES

- Aitchison J., 1986: *The Statistical Analysis of Compositional Data*. Chapman and Hall, New York.
- Bottomley M., Folland C. K., Hsiung J., Newell R. E. & Parker D. E., 1990: *Global Ocean Surface Temperature Atlas*. The Meteorological Office and Massachusetts Institute of Technology, 313 plates.
- Chen M.-P. & Shieh K.-S., 1982: Recent nannofossil assemblages in sediments from Sunda Shelf to abyssal plain, South China Sea. *Proc. Nat. Sci. Council, Taipei*, A/6, 250-285.
- Vincent E. & Berger W. H., 1981: Planktonic foraminifera and their use in paleoceanography. In Emiliani, C. (ed.) "The Sea", 7, Wiley-Interscience, New York. p. 1025-1119.
- Wei K.-Y., (in press): Statistical pattern recognition in paleontology using SIMCAMACUP. *J. Paleont.*, 67.

$$y = 2.4822 + 0.79725x \quad R^2 = 0.797$$

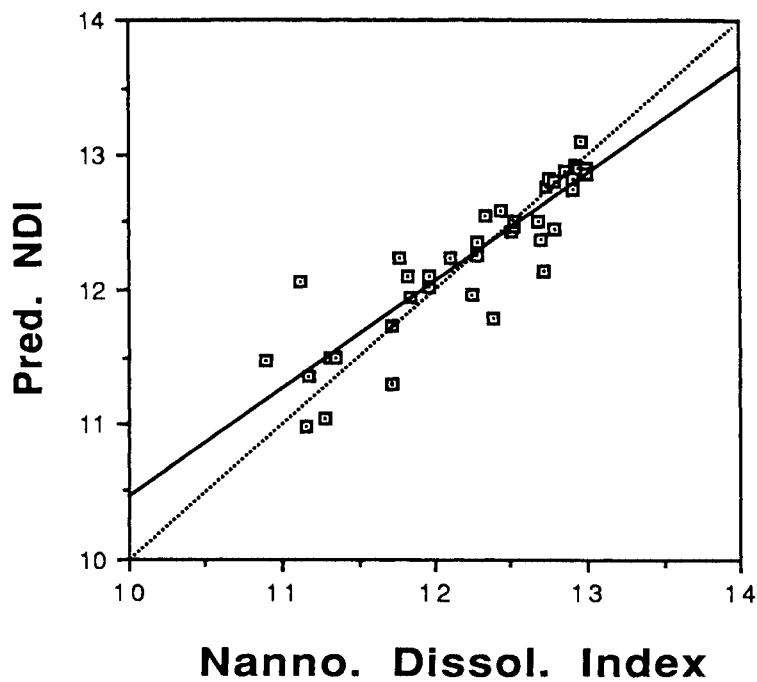


Fig.1. Predicted versus observed values of nannofossil dissolution index (NDI). The dotted line is the 1:1 line and the solid is the linear regression line.

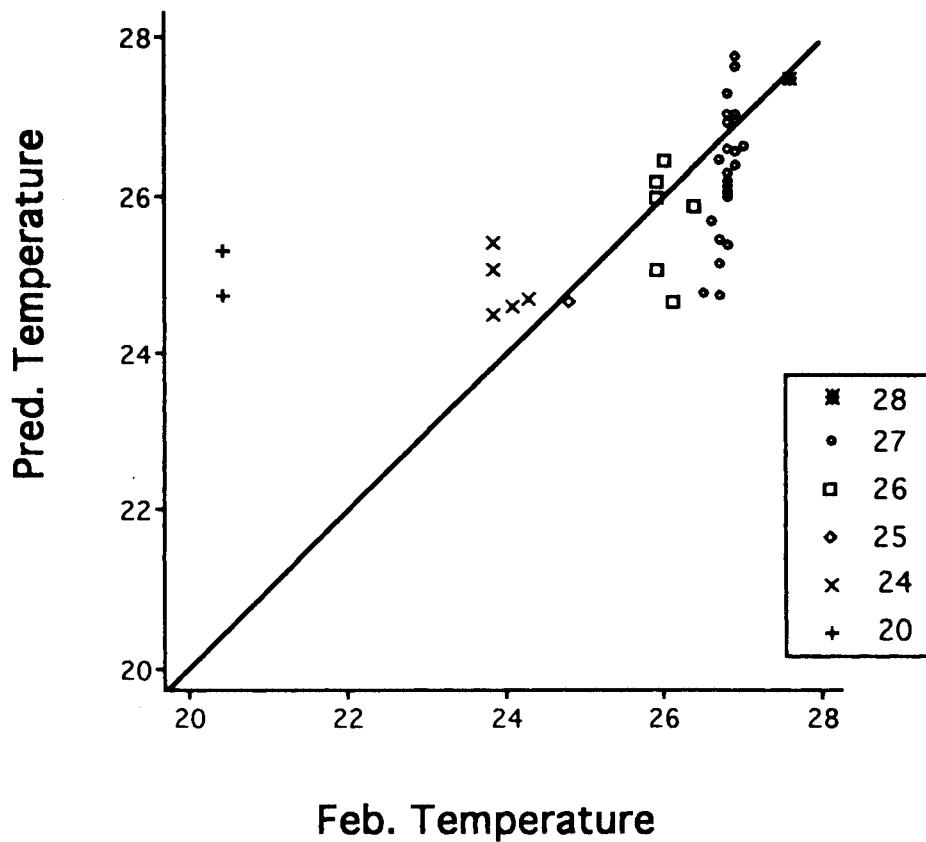


Fig.2. Predicted versus observed values of February temperatures in the South China Sea. The solid line is the 1:1 line.

USE OF MICROBEADS TO ESTIMATE THE ABSOLUTE ABUNDANCE OF NANNOFOSSILS

Hisatake Okada, Dept. of Earth Sciences, Yamagata University, Japan

Unless your project is purely biostratigraphical, and nothing else, it is very important to know the absolute abundance of nannofossils (number/volume of nannofossils per unit volume/weight of sediment) in each sample. Because of the minute size of nannofossils, however, we can not easily obtain an absolute "nannofossil number", as foraminiferal workers can. A realistic alternative for us is to get a relative abundance that can be used as a proxy for the absolute abundance. You can obtain the proxy abundance by counting nannofossils per given area of slide, but only if you can always make slides with uniform and consistent densities, which is almost impossible even for one person, and absolutely impossible between different workers.

Here I would like to introduce a new technique to obtain a proxy value for absolute abundance by mixing a measured weight of microbeads with the sample. The microbeads I have been experimenting with are *MB-10*; these are soda-ash glass spheres (s.g. 2.5g/cm³) from 2 to 10 μ m in diameter. These microbeads have been manufactured as a filler for precision casting. Most packages of microbeads on the market are manufactured for mixing with paint, for use on night-time reflective road markings, these usually contain larger beads (20-40 μ m), and are not suitable for our purpose. *MB-10* is a new package with a size distribution comparable to that of nannofossils.

Availability: *MB-10*, which will soon be widely available, is manufactured by Toshiba Ballotini Company, a joint venture between Toshiba (Japan) and Potters Industries Inc. (USA), and Ballotini is a trade name for their microbeads. You can buy *MB-10* from distributors in various countries, and the price will be ca 40,000 yen (\$320) per 10 kg package. Unfortunately, no smaller pack is offered (at least in Japan), although you may not need more than a few hundred grams of the stuff for your entire career. Please ask the following companies for the name of distributors.

Toshiba Ballotini Co. 3-3-10 Shiba, Minato-Ku, Tokyo 105, Japan.

Tel: 03-3455-2321; FAX: 03-3455-2923

Potter Industries Inc. 377 Route 17, South Hasbrouck Heights, NJ 07604, USA

Tel: 201-288-4700; FAX: 201-288-7696

Potters Ballotini Ltd. Pontefract Road, Barnsley, South Yorkshire, S71 1HJ, UK

Tel: 226-287591; FAX: 226-207615

Potters-Ballotini S. A. z.1. du Pont-Panay, Boite Postale 67, 03500, St. Pourcain-sur Sioule, France.

Tel: 70-45-9499; FAX: 70-45-5780

Potters-Ballotini GmbH. Morschheimer Strasse 9, Postfach 1226, 6719, Kirchheimbolanden, Germany

Tel: 6352-8484; FAX: 6352-1853

PROCEDURE TO OBTAIN PROXY ABSOLUTE ABUNDANCE VALUE

- 1) Mix powdered sample with 5 to 10% (by weight) of the glass beads. If your sample is a nannooze and tends to coagulate when wetted, mix a measured amount of carbonate-free clay to prevent coagulation. Both the powdered sample and microbeads have to be accurately weighed. This requires a precision balance with a resolution of 10⁻³g.
- 2) Place the mixture into a centrifuge (or test) tube and add an adequate quantity of buffered distilled water.
- 3) Homogenize the muddy mixture by using a touch-mixer, and make a smear slide (or a spray slide if you like). [N.B. touch-mixers are also referred to as spin-mixers and vortex-mixers, see any laboratory catalogue for details].
- 4) Count the number of nannofossils under cross-polarized illumination (Fig. 1), and then count the glass beads in the same view-field under phase-contrast illumination (Fig. 2).

Since smaller microbeads are difficult to recognize when mixed with clay minerals, an arbitrary cut-off point of 3 μm is recommended. According to the manufacturer, less than 8 % (by weight) of the beads are smaller than 3 μm in the MB-10 package.

5) Stop counting when the tally of glass beads reaches a predetermined number (e.g. 200 or 500), and calculate the nannofossil / 100 beads ratio.

6) Convert the calculated ratio to a hypothetical standard ratio which is equivalent to the number of nannofossils per 100 glass beads if the mixing ratio of microbeads is 50 % by weight (1 to 1 mixture).

You can modify the bead:sample ratio to suit your preferences and the material. Then so long as step 6 is taken and we use the same glass bead package, we can compare other people's abundance data to our own. Moreover, if we can select a standard sample like PDB for oxygen isotope analysis, we can use different products of microbeads and still express the observed abundance on a common scale; a percentage abundance to the standard sample. Does anybody have a candidate for the standard?

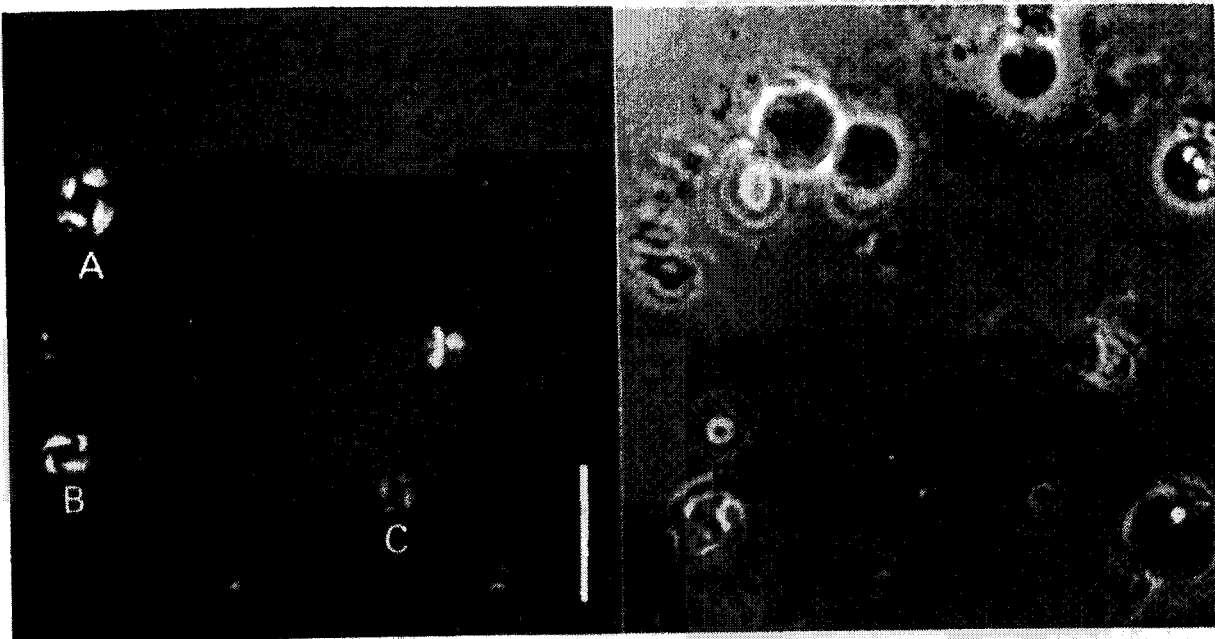


Fig. 1. (left) Middle Pleistocene nannoflora observed under a cross-polarized illumination. Three relatively large placoliths (marked A-C) are observable but no microbead is not recognizable. The scale bar in the lower right corner indicates 10 μm .
Fig. 2. (right) The same view field under phase-contrast illumination. Five microbeads are recognizable as dark spheres.

OCEAN DRILLING PROGRAM NEWS

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

ODP Leg 141 (November 17, 1991 - January 13, 1992) drilled the Chile Triple Junction, in order to provide a history of processes of the collision of a spreading centre with a subduction zone. No nannofossil palaeontologists sailed on this cruise, but Carla Müller provided crucial nanno age dates of recovered sediments post cruise.

ODP Leg 142 (January 18 - March 19, 1992) drilled the East Pacific Rise, to test the Diamond Coring System. This system experienced lots of problems, which will need another couple years to resolve before further testing on ship. No palaeontologists sailed on this cruise.

ODP Leg 143 (March 24 - May 19, 1992) drilled guyots in the Mid-Pacific Mountains, and recovered two long sequences of shallow-water carbonates of Barremian to Albian, and late Albian age. Palaeoenvironments were mainly lagoonal and open carbonate-platform, with some sponge/rudist bioherms on the edge of the guyots. On Allison Guyot, a thick low latitude Palaeocene/Eocene pelagic sequence was recovered, with well preserved nanno assemblages. A thick basal section was drilled in the Marshall Islands which yielded extended Cenomanian and Campanian volcanoclastic deposits. Tim Bralower and Jorg Mutterlose were nannofossil palaeontologists for this leg. John Firth sailed also, as Staff Scientist and palynologist/nanno specialist.

ODP Leg 144 (May 24 - July 19, 1992) was the second atolls and guyots leg, which drilled seven sites on guyots of the Marshall Islands, recovering mid Cenozoic and Campanian-Maastrichtian shallow water carbonate sequences, with reef and lagoonal facies, and one thick pelagic sequence of late Oligocene to Recent age. Two guyots in the northwest Pacific were drilled near Japan which yielded Aptian/Albian limestone sequences comparable to those on Leg 143. Dave Watkins and Elisabetta Erba sailed as nannofossil palaeontologists on this leg.

ODP Leg 145 (July 24 - September 21, 1992) drilled a North Pacific transect to study the palaeoceanography and plate reconstruction of northern latitude Neogene and older sediments. Pelagic sequences recovered included bio-siliceous rich sediments of late Miocene to Late Pliocene age. Complete recovery of high latitude sediments of the last 10 m.y. with integrated palaeomag and diatom stratigraphy was accomplished. Gunnar Olafsson and Luc Beaufort were the nannofossil palaeontologists for this leg.

ODP Leg 146 (September 26 - November 21, 1992) drilled the Cascadia accretionary prism, in order to determine the nature of channelled and unchannelled flow of fluids escaping from the Cascadia margin. No nannofossil palaeontologists sailed on this leg.

ODP Leg 147 (November 26, 1992 - January 21, 1993) will core through a complete section of oceanic crust (layers II and III) generated at a fast-spreading ridge - Hess Deep. No palaeontologists will sail on this leg.

ODP Leg 148 (January 26 - March 10, 1993) will return to Hole 504B in the Eastern Pacific to deepen the hole beyond the present 2km, and to penetrate into layer III of the crust. No palaeontologists will sail on this leg.

ODP Leg 149 (March 14 - May 27, 1993) will drill three sites off in the Iberian Abyssal Plain to study the tectonic development of a non-volcanic rifted margin, and to study the transition from oceanic to continental crust. Ton Romein and Philippe De Kaenel will be the nannofossil palaeontologists for this leg.

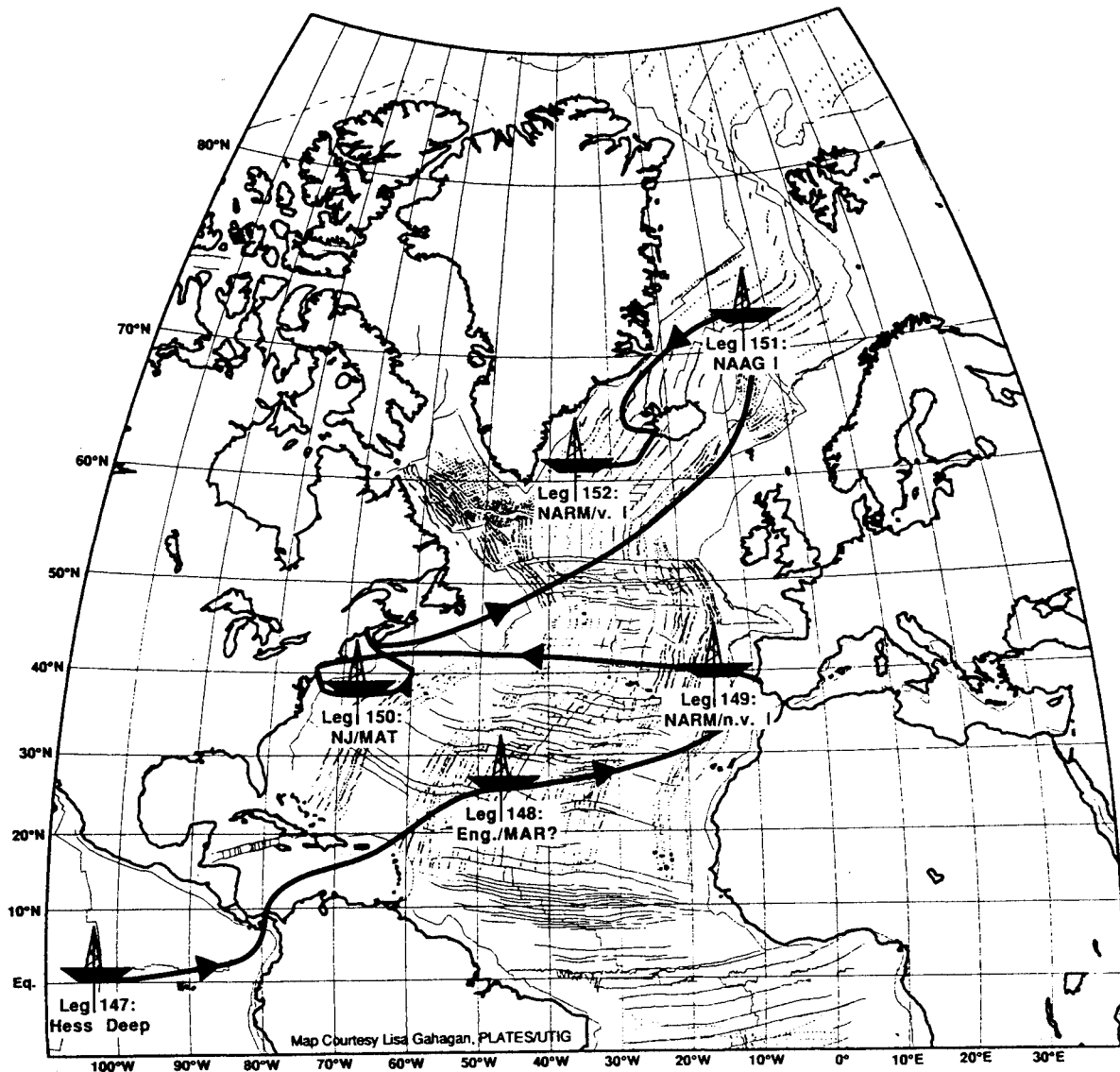


ODP Leg 150 (June 1 - July 27, 1993) will drill off the New Jersey margin to study the mid-Cenozoic sea level history recorded in the sedimentary sequences of the continental shelf and slope. Marie-Pierre Aubry and Stefan Gartner will be the nannofossil palaeontologists on this leg.

ODP Leg 151 (August 1 - September 26, 1993) will drill on the Yermak Plateau in the Arctic Ocean and in the Fram Strait between Greenland and Svalbard, to study the evolution of surface and deep water masses, climate change, ice history, and sediment budgets through the time of the opening of the Atlantic-Arctic gateway. John Firth will be sailing as Staff Scientist and palaeontologist on this leg.

ODP Leg 152 (October 1 - November 26, 1993) will drill off of East Greenland at 63°N to study the nature of deformation and volcanism during the rifting of a volcanic margin. Wuchang Wei will be the nannofossil palaeontologist for this leg.

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.



ODP Fiscal Year 1993 Drilling Schedule

THE ICBN: THINGS YOU NEED TO KNOW - 7
Shirley E. van Heck, Sarawak Shell Bhd., Lutong, Sarawak

Chapter II of Division II of the ICBN contains four sections. These are all full of cross-references to later articles, mostly in Chapter IV, so it may become quite a complicated matter to discuss them. Nonetheless, I propose we just start at the beginning, follow the references, and see where they take us. This will lead us criss-cross through the code, if you prefer a more orderly course, I suggest you buy the book!

EFFECTIVE PUBLICATION

Section 1 consists of Art.6, in which effective publication, and valid, legitimate and correct names are defined. Section 2 contains Arts. 7 - 10, and deals with typification, while sections 3 (Arts. 11 - 12) and 4 (Arts. 13- 15) deal with priority.

Article 6

6.1. Effective publication is publication in accordance with Arts. 29-31.

These three articles are to be found in Chapter IV (effective and valid publication), of which they form section 1: conditions and dates of effective publication.

Article 29

29.1. Publication is effected, under this Code, only by distribution of printed matter (through sale, exchange, or gift) to the general public or at least to botanical institutions with libraries accessible to botanists generally. It is not effected by communication of new names at a public meeting, by the placing of names in collections or gardens open to the public, or by the issue of microfilm made from manuscripts, type-scripts or other unpublished material.

This is a rather controversial rule, as it does not define how many copies should be available, or how many libraries should contain copies. In practice, any printed material that is freely for sale is considered effectively published (and that includes this Newsletter). Anything else is dubious. Unpublished theses are generally excluded. They are usually kept at one university, and although they may be available for inspection, they cannot be ordered, and are therefore, for all practical purposes, not available to the general public.

The other paragraphs of this article, although important, are fortunately not relevant to the nanoplankton literature as they deal with handwritten material, catalogues, etc.

Article 30

30.1. The date of effective publication is the date on which the printed matter became available as defined in Art. 29. In the absence of proof establishing some other date, the one appearing in the printed matter must be accepted as correct.

This is another important rule, and has led to much confusion. Many publications actually appear later than the official publication date. Some publications carry the printing date on the back, and this printing date can often be seen to be up to a year later than the bibliographic reference! Examples are: the older issues of Cahiers de Micropaléontologie, and the earlier issues of the DSDP (see van Heck 1980). The same holds true for the following:

30.2. When separates from periodicals or other works placed on sale are issued in advance, the date on the separate is accepted as the date of effective publication unless there is evidence that it is erroneous.

It is a good idea to put the date on any publication or reprint you receive, to have at least some guide to the correct date.

The rest of this section is not relevant to nannoplankton, so we may return to Art. 6:

VALID PUBLICATION

6.2. Valid publication of names is publication in accordance with Arts. 32-45 or H.9 (see also Art. 75).

H.9 deals with hybrids, so we need not worry about that. The remainder of the articles, however, take up quite a few pages, and in themselves contain again numerous cross-references to other articles, so they will take several issues to work through.

Arts. 32-45 are in Chapter IV, where they form section 2: **CONDITIONS AND DATES OF VALID PUBLICATION OF NAMES.**

Article 32

32.1. In order to be validly published, a name of a taxon (autonyms excepted) must (a) be effectively published (see Art. 29) on or after the starting-point date of the respective group (Art.13.1); (b) have a form which complies with the provisions of Arts. 16-27 and Arts. H.6-7; (c) be accompanied by a description or diagnosis or by a reference to a previously and effectively published description or diagnosis (except as provided in Art. H.9); and (d) comply with the special provisions of Arts. 33-45.

Of the Articles referred to here, we have just discussed Art.29, and we can ignore the articles starting with H, as they deal with hybrids. Articles 16 - 27 deal with the nomenclature of taxa and have been discussed in previous issues.

Art. 13 takes us back to Chapter II, section 4: **LIMITATION OF THE PRINCIPLE OF PRIORITY.**

Article 13

13.1. Valid publication of names for plants of the different groups is treated as beginning at the following dates (...)

As the dates for recent algae (1753) and fossil plants (1820) predate the discovery of nannoplankton, they need not worry us.

That leaves us with Arts. 33-45, and the remainder of Art.32, which will be continued in the next issue.

REFERENCES:

- Greuter W., 1988: International Code of Botanical Nomenclature. Koeltz Scientific Books, 328pp.
Heck S. E. van, 1980: Bibliography and taxa of calcareous nannoplankton. *INA Newsletter*, 2/2: 43-81.

3rd EMILIANA HUXLEYI WORKING GROUP MEETING - BLAGNAC 1992

13th - 18th September 1992, Chateau de Blagnac, Branne, Gironde, France

Convenor: Michael Knappertsbusch. Hosts: Dorien and Jan van Hinte.

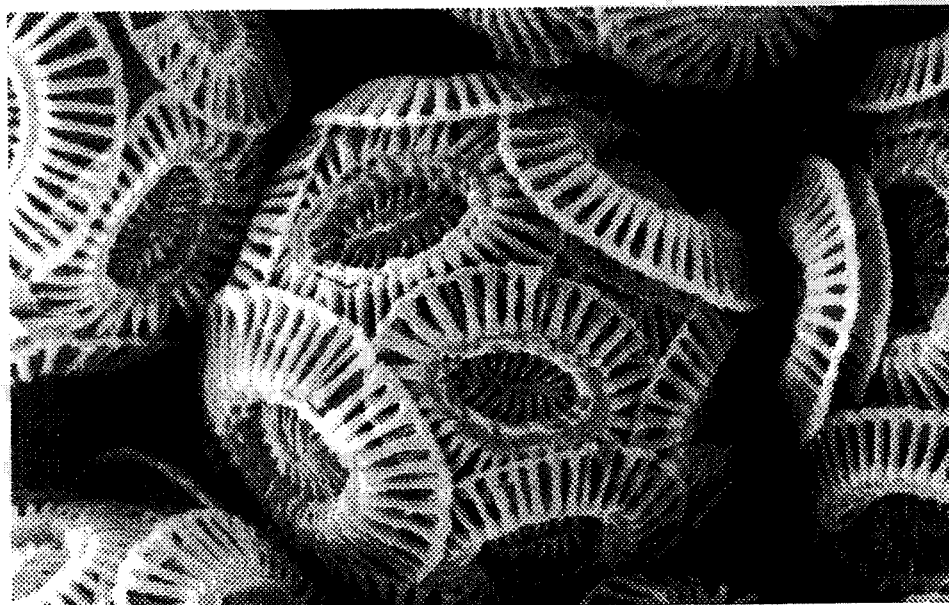
Peter Westbroek's brainchild of a multi-disciplinary study focused on the single coccolithophore species *Emiliana huxleyi* is coming of age. This was our third working group meeting and we have now obtained an EEC grant under the Marine Science and Technology Program (MAST) of 1.3M ECU (with additional funds from Norway). The broad concept is develop models of *E.huxleyi* behaviour at the cellular, population and oceanographic scales based on a wide range of new and existing experimental and observational data. These models should then be able to provide an alternative perspective to the mainstream models of biogeochemical processes which inevitably tend to treat the biological component as a "black box".

This meeting was attended by some 37 participants, primarily from the Netherlands (11), UK (9), Norway (8) and USA (4). Previous meetings were largely concerned with exploring possibilities for research, and funding, whilst future meetings will hopefully discuss detailed results. This year found us at an unsettled phase as we start research and are uncertain as to the outcome of the individual projects, let alone how they will combine. This was reflected in the format of the meeting - we had a few keynote talks, a limited number of plenary sessions and several long unmetabled sessions for informal discussion, examination of posters, planning workshops, etc. This lead to occasional perilous plunges toward anarchy but proved generally successful.

Scientific highlights of the meeting for me included: a series of critical culture experiments described by Nabil Nimer and Mike Merrett (Swansea) demonstrating that coccolith formation does allow bicarbonate to be used as a source of carbon dioxide for photosynthesis; synthesis by Chris Brown (Rhode Island) of *E.huxleyi* blooms on a global scale using LandSat data; explanation of phytoplankton modelling systems by Dag Åsknes (Bergen) and Sebastiaan Kooijman (Amsterdam); a review by Eystein Paasche (Oslo) of work on the physiology of coccolithophores; Linda Medlin (itinerant) informally describing how to make DNA sequencing techniques work; Denise Noël (Paris) giving a geological perspective of coccoliths' role in oceanography.

Even without organisation the meeting could hardly have failed given the combination of location (the Bordeaux Region of France), venue (a beautiful chateau overlooking the Dordogne), and weather (end of summer sunshine). However, Michael Knappertsbusch and Peter Westbroek did a good job organising our work, whilst Dorien van Hinte as before was wonderful as an hostess - organising the accommodation, keeping us fed, and, whenever we found the time to talk to her for a few minutes, entertained.

Jeremy Young, *The Natural History Museum, London*



AN HIERARCHICAL DESCRIPTIVE CHECKLIST FOR CALCAREOUS NANNOFOSSILS

Jackie A. Burnett & Paul R. Bown, *Micropalaeontology Unit, Department of Geological Sciences,
University College London, Gower Street, LONDON, WC1E 6BT, U.K.*

INTRODUCTION

Whilst discussing the application of coccolith terminology at the Terminology Workshop in London (April 8-10th, 1992), it became apparent that the terminology document (Young *et al.*, in prep.) could be summarised to produce a checklist for the standardisation of nannofossil descriptions. At present, many nannofossil descriptions are ambiguous, even when accompanied by a photomicrograph! By using a standard checklist each time a taxon is described, the description is made immediately intelligible to the reader (at whom it is aimed), and the systematic approach (using standard terminology in a standard order) makes the description easier to translate into other languages, promotes thoroughness whilst taking the strain off the author to remember to describe everything (in a logical order), and provides a standard format for database input.

So, below we have compiled a preliminary checklist, each section followed by a *pro forma* example. This first draft, however, is meant as a prompt for comment. We would like a response to the general idea, the format, the contents, anything you strongly disagree with, so that a checklist could be produced and circulated that would be widely accepted and used. Please note, however, that we do not wish to hear about terminology gripes (send those to Jeremy, if you must!). The purpose of this document is to define descriptive procedure only.

HIERARCHICAL DESCRIPTIVE CHECKLIST FOR NANNOFOSSILS

It may be worthwhile to consider making more use of schematic representation of the taxon being described, i.e. instead of, or as well as, a written description, a comprehensively-labelled diagram(s) (or photo(s)) of the taxon could be incorporated. Graphic representation often conveys more meaning than text and does not need to be translated, and so gives less scope for confusion. It is also recommended (and we are not alone in thinking this) that we move away from describing taxa from either an SEM or LM photomicrograph. This approach promotes ambiguity and synonymy, and is not as rigorously scientific as it should be. O.K., so you want the fame and fortune (!) that comes with naming a new species, but perhaps first you should earn it by taking the time to provide a variety of good-quality photos. If you have not got the time or access to an SEM, why not ask someone who has to help you out?

N.B. This checklist does not attempt to be utterly comprehensive. Also it is basically intended for fossil heterococcoliths. Descriptions of living species, holococcoliths or nannoliths would need modified checklists.

1. BACKGROUND INFORMATION

The following headings are already widely used. It is suggested that they appear at the top of the descriptive section, since they contain the most important data for the majority of database entries. This list could be extended to include synonyms, paratypes etc.

- 1.1 NAME : give full taxonomic citation according to rules of ICBN
- 1.2 DERIVATION OF NAME : not essential but, interesting, and aids memory
- 1.3 HOLOTYPE : reference numbers and repository of holotype specimen. If a photomicrograph, indicate whether LM, SEM or TEM, distal, proximal or side view
- 1.4 TYPE LOCALITY : geographical source of holotype
- 1.5 TYPE LEVEL : lithostratigraphical horizon from which type sample was collected

- 1.6 HOLOTYPE AGE : modern interpretation of age of horizon of holotype, with reference to chrono- &/or biostratigraphy. If possible give nanno zone.
- 1.7 REMARKS : specify whether coccolith (hetero-/holo-), nannolith, nann-onconid
: describe differences/similarities to related taxa
: comment on preservation
: comment on geographical/stratigraphical occurrence outside type locality, if known

E.g. *Watznaueria barnesae* (Black in Black & Barnes 1959) Perch-Nielsen 1968

Derivation of name: After Barbara Barnes, early nannopalaeontologist.

Holotype: No.3068, Sedgwick Museum, Cambridge University; Pl.9, fig.2 (TEM, proximal) in Black & Barnes (1959).

Type Locality: Weston Colville, Cambridgeshire, south-eastern England.

Type Level: English Chalk, Holaster planus macrofossil Zone

Holotype Age: Turonian, nannofossil zone CC12.

Remarks: This coccolith differs from *W. fossacincta* & *W. ovata* in having a closed or very small central opening; from *W. britannica* & *W. biporta* in not possessing a bar spanning the central area; from *W. manivittae* in being smaller; & from *W. quadriradiata* in not possessing a central axial cross.

Very resistant to preservational effects, which can sometimes result in apparently monospecific assemblages.

Geographically & stratigraphically widespread, with a cosmopolitan occurrence from the Bajocian (Middle Jurassic) to Maastrichtian (Late Cretaceous).

2. DESCRIPTION OF FOSSIL COCCOSPHERE

- 2.1 COCCOLITH DISTRIBUTION : monomorphic, dimorphic, polymorphic, varimorphic
: monothebate, dithebate (define endothebate and exothebate layers), multilayered
- 2.2 COCCOSPHERE SHAPE : spherical, ovoid, ellipsoidal, cylindrical, fusiform, pyriform
- 2.3 APPROXIMATE NO. OF COCCOLITHS
- 2.4 COCCOLITH ARRANGEMENT : overlapping, non-overlapping, interlocking, non-interlocking
- 2.5 FLAGELLAR OPENING : presence/absence of possible flagellar opening, nature of circum-flagellar coccoliths.

E.g. *Watznaueria barnesae* (Black) Perch-Nielsen

A monomorphic, monothebate, spherical coccosphere with approximately 10, interlocking coccoliths. No apparent flagellar opening.

3. DESCRIPTION OF HETEROCOCCOLITHS

3.1 DIAGNOSIS

3.1.1 RIM

- SIZE : give size range in microns, and/or use descriptive terms - very small, small, medium, large, very large (defined in Young *et al.*, in prep.)
- OUTLINE : give Axial Ratio, and/or use descriptive terms - circular, subcircular, broadly/normally/ strongly elliptical, oblong, polygonal, reniform, asymmetrical
- TYPE : bi-shield/tri-shield placolith, muralith, planolith

- : plano-convex, concavo-convex, tapering, parallel-sided, flaring
- : low, normal, high elevation

3.1.2 CENTRAL AREA

- TYPE : planiform, vaulted, conical, elevated
- STRUCTURE : boss, blanket, plate, longitudinal/ transverse/diagonal bar, grill, net, axial/diagonal cross, foot, longitudinal/ diagonal/lateral arm, crossbar
- : spine - long/medium/short, tapering/ straight/flared, with/without calyx.

E.g. *Lotharingius crucicentralis* (Medd) Grun & Zweili

Lotharingius crucicentralis coccoliths are small- to medium-sized, broadly elliptical, concavo-convex, bi-shield placoliths with a central area spanned by a planiform axial cross & lateral arms, which may support a medium-length, tapering spine.

3.2 DESCRIPTION OF RIM

3.2.1 ENTIRE RIM

- VIEW : distal, proximal; SEM, LM (Xp/PC/BF), TEM
- CONSTRUCTION : outer/middle/inner/distal/proximal shield (cycle), outer/middle/inner tube (cycle), wall, flange, collar, crown, wing

3.2.2 EACH CYCLE

- ELEMENT FORM
- SHAPE : tile, lath/petaloid lath/ray, rod, block, wedge
- MODIFICATIONS : hole, node, keel, ridge, spine, tooth, slit, kink, perforation, depression, notch
- ELEMENT RELATIONS
- IMBRICATION : sinistral, non-imbricate, dextral
- IMBRICATION ANGLE : high, low
- PRECESSION : sinistral, radial, dextral
- CURVATURE : laevogyre, straight, dextrogyre
- CRYSTALLOGRAPHY : strongly/moderately/weakly/non- birefringent
- : isogyre appearance, sharp/diffuse
- CRYSTAL ORIENTATION : V, R, T units can be labelled on a diagram/ photomicrograph

E.g. *Lotharingius crucicentralis* (Medd) Grun & Zweili

In distal SEM view, the rim is composed of 3 visible cycles. The outermost cycle (distal shield cycle) is the broadest, it is constructed from low-angle, dextrally-imbricate tiles joined along straight sutures with sinistral precession. The middle cycle (middle tube cycle) is constructed from tiles with near-radial, straight sutures. The innermost cycle (inner tube cycle) is constructed from tiles joined along radial & vertical sutures.

In proximal SEM view, the proximal shield can be seen to be slightly smaller than the distal shield, & is composed of only 1 cycle (proximal shield cycle), formed from non-imbricate, kinked tiles, joined along sutures with laevogyre curvature & sinistral precession. Detailed SEM analysis has shown that the distal shield, inner tube and proximal shield cycles form a single crystal-unit.

In the LM (Xp), the rim appears strongly birefringent & is crossed by sharp isogyres. The distal shield/ inner tube/proximal shield cycle crystal-unit is birefringent, and has been interpreted as an R-unit (Young & Bown 1991). The middle tube cycle is weakly/non-birefringent and has been interpreted as a V-unit. In the LM (PC), the coccolith is bright.

3.3 DESCRIPTION OF CENTRAL AREA

VIEW	: distal, proximal; SEM, LM (Xp/PC/BF), TEM
RELATIVE WIDTH	: wide, normal, narrow
OUTLINE	: circular, subcircular, broadly/normally/ strongly elliptical, oblong, polygonal, reniform, asymmetrical
	: open, closed
CENTRAL STRUCTURE	
- POSITION	: basal, elevated
- CONSTRUCTION	: compound, simple, disjunct, conjunct
- TYPE	: boss, blanket, plate, longitudinal/ transverse/diagonal bar, grill, net, axial/diagonal cross, foot, longitudinal/ lateral/diagonal arm, crossbar
	: spine - tapering/straight/flared with/without calyx; blocky/- granular/lath-like, hollow/solid, long/medium/short stem
	: description of elements (same terms as for rim elements)
- CRYSTALLOGRAPHY	: strongly/moderately/weakly/non- birefringent

E.g. *Lotharingius crucicentralis* (Medd) Grun & Zweili

In distal SEM view, the central area is wide, broadly elliptical & open. It is spanned by a basal, disjunct, compound, axial cross with 3-4 lateral arms in each open quadrant. The cross may support a medium-length, tapering, compound spine, with no calyx.

In the LM (Xp), the cross is birefringent when orientated parallel to the polarising direction. The lateral arms are usually weakly/non-birefringent.

ACKNOWLEDGEMENTS

This manuscript benefitted from discussions with Jeremy Young (NHM) and, generally, with the participants of the Terminology Workshop. JAB acknowledges the support of the NERC.

REFERENCES

- Black M. & Barnes B. 1959: The structure of coccoliths from the English chalk. *Geol. Mag.*, **96**, 321-328.
- Bown P.R. 1987: Taxonomy, evolution and biostratigraphy of Late Triassic - Early Jurassic calcareous nanofossils. *Spec. Pap. Palaeont.*, **38**, 1-118.
- Perch-Nielsen K. 1968: Der Feinbau und die Klassifikation der Coccolithen aus dem Maastrichtien- und Danienlokalitäten. *Biol. Skr. K. Danske Vidensk. Selsk.*, **16**, 1-96.
- Young, J.R. & Bown, P.R., 1991: An ontogenetic sequence of coccoliths from the late Jurassic Kimmeridge Clay of England. *Palaeontology*, **34**, 843-850.
- Young J.R. et al (in prep): Guidelines for coccolith and calcareous nanofossil terminology. *Palaeontology* (provisionally accepted).

BIBLIOGRAPHY AND TAXA OF SILICOFLAGELLATES IV

Compiled by: Stacia A. Spaulding

E44

- | | | | |
|---|--|------|---|
| 1 | <p>ALVIRA, M.P., & HOVASSE, R.
 Contribution à l'étude des Protistes à squelette siliceux des Moronitas du sud de l'Espagne.
 Estudios Geologicos, 31(5-6):705-725, 5 pls.
 (In Spanish and French with English summary)</p> | 1975 | <p>Syst.
 Strat.
 TERT.U.
 Europe</p> |
| 2 | <p>BACKMAN, J., WESTBERG-SMITH, M.J., ET AL.
 Biostratigraphy of Leg 81 sediments- a high latitude record.
 In: Roberts, D.G., Schnitker, D., et al., Init. N. Repts., DSDP, vol. 81,
 pp. 855-860, 1 tb.</p> | 1984 | <p>(Strat.)
 QUAT.
 TERT.
 Atlantic</p> |
| 3 | <p>BARASH, M.S.
 Paleoceanographic reconstructions by paleoecological data.
 28th Intl. Geol. Congress, Washington 1989-Abstracts, 28(1):84-85.</p> | 1989 | <p>Abst.
 Ecol.
 TERT.
 Worldwide</p> |
| 4 | <p>BOLLI, H.
 Synthesis of the Leg 40 biostratigraphy and paleontology.
 In: Bolli, H.M., Ryan, W.B.F., et al., Init. Repts., C. DSDP, vol. 40,
 pp. 1063-1067, 1 fig. S.</p> | 1978 | <p>(Strat.)
 QUAT.
 TERT.
 Atlantic
 Atlantic</p> |
| 5 | <p>BUKRY, D.
 Tropical Atlantic silicoflagellates from Leg 108 cores off Africa.
 In: Ruddimann, W, Sarnthein, M., et al., Proc. Sci. C. Results, ODP,
 vol. 108, pp. 487-489, 4 tbs.</p> | 1989 | <p>Strat.
 QUAT.
 TERT.
 Atlantic</p> |
| 6 | <p>BUKRY, D.
 Oligocene and Quaternary silicoflagellates from the Kerguelen
 Plateau.
 In: Barron, J., Larsen, B., et al., Proc. Sci. Results, ODP, vol. 119,
 pp. 933-934, 2 tbs.</p> | 1991 | <p>Strat.
 QUAT.
 TERT.L.
 Southern</p> |
| 7 | <p>CIESIELSKI, P.F.
 On the age of the Neogene deposits at Site 329 (DSDP, Leg 36):
 Discussion.
 Rev. Espan. Micropaleo., 12(1):87-97</p> | 1980 | <p>Strat.
 TERT.U.
 Southern</p> |
| 8 | <p>CIESIELSKI, P.F.
 Biostratigraphy of diverse silicoflagellate assemblages from the Early
 Paleocene to Early Miocene of Holes 698A, 700B, 702B and 703A:
 Subantarctic South Atlantic.
 In: Ciesielski, P.F., Kristoffersen, Y., et al., Proc. Sci. Results, ODP,
 vol. 114, pp. 49-96, 10 pls., 9 figs., 7 tbs.</p> | 1991 | <p><u>Syst.</u>
 <u>Strat.</u>
 TERT.
 Southern</p> |

E45

- | | | | |
|---|--|------|--|
| 1 | CIESIELSKI, P.F.
Relative abundances and ranges of select diatoms and silicoflagellates from Sites 699 and 704, Subantarctic South Atlantic.
In: Ciesielski, P.F., Kristoffersen, Y., et al., Proc. Sci. Results, ODP, vol. 114, pp. 753-778, 1 fig. 4 tbs. | 1991 | Strat.
TERT.
Southern |
| 2 | CLARK, D.L.
Early history of the Arctic Ocean.
Paleoceanogr., 3(5):539-550, 8 figs. | 1988 | Ecol.
TERT.L.
CRET.
Arctic |
| 3 | EHRlich, A. & MOSHKOVITZ, S.
On the occurrence of Eocene marine diatoms in Israel.
Acta. Geol. Acad. Sci. Hungar., 25(1-2):23-37, 5 pls., 2 figs., 1 tb. | 1982 | Strat.
(Syst.)
TERT.L.
Asia SW. |
| 4 | FRYDAS, D.
Coccolithen- und silicoflagellaten-stratigraphie aus dem Pliozän von NW- und W-Kreta, Griechenland.
Newsletter on Strat., 20(3):131-147, 3 pls., 3 figs., 1 tb.
(In German with English summary) | 1989 | (Syst.)
(Strat.)
TERT.U.
Europe E. |
| 5 | HALLAM, A., & PERCH-NIELSEN, K.
The biotic record of events in the marine realm at the end of the Cretaceous; calcareous, siliceous, and organic-walled microfossils and macroinvertebrates.
Tectonophysics, 171(1-4):347-357, 3 figs. | 1987 | Evol.
CRET.U. |
| 6 | INGLE, J.C., JR., SUYEHIRO, K., ET AL.
Site 798.
ODP, Proc. Init. Reps., vol. 128, pp. 121-236. . | 1990 | Strat.
QUAT.
Pacific N |
| 7 | INGLE, J.C., JR., SUYEHIRO, K., ET AL.
Site 799.
ODP, Proc. Init. Reps., vol. 128, pp. 237-402. . | 1990 | Strat.
QUAT.
Pacific N |
| 8 | LING, H.Y.
Radiolarians and silicoflagellates from Dry Valley Drilling Project Core.
In: McGinnis, L.D., (ed.), Dry Valley Drilling Project, AGU, pp. 385-390, 1 pl., 2 figs., 3 tbs. | 1981 | (Syst.)
Strat.
Ecol.
QUAT.
Antarctic |
| 9 | LUTERBACHER, H., CARON, M., ET AL.
Biostratigraphic summary of Leg 32.
In: Larson, R.L., Moberly, R., et al., Init. Reps., N. DSDP, vol. 32, pp. 941-944, 3 figs. C. | 1975 | (Strat.)
CRET.
Atlantic
Atlantic |

E46

- 1 **MARTINI, E.** 1986 Strat.
Silicoflagellates in the Paleogene of northwest Germany.
In: Tobien, H. (ed.), Northwest Germany during the Tertiary. Beitrage
zur Regionalen Geologie der Erde 18, pp. 152-156, 2 figs. TERT.L.
Europe W.
- 2 **MARTINI, E., & JENKINS, D.G.** 1986 (Strat.)
Biostratigraphic synthesis, DSDP Leg 90. QUAT.
In, Kennett, J.P., von der Borch, C.C., et al., Init. Reps., DSDP, vol. Pacific N
90, pp. 1459-1470, 8 figs., 1 tb.
- 3 **NIEMELÄ, J. & TYNNI, R.** 1979 Strat.
Interglacial and interstadial sediments in the Pohjanmaa region, (Syst.)
Finland. QUAT.
Geol. Surv. Finland, Bull. 302, 48 p., 11 pls., 27 figs. Europe E.
- 4 **PILSKALN, C.H.** 1990 Abst.
Composition of Black Sea Basin Fluff layer and under- lying surface Recent
sediments: implications for Recent mechanisms of particulate Mediterr.
deposition and geochemical transformations occurring at the
sediment/water interface.
Eos, 71(2):151.
- 5 **PUSKARIC, S., BERGER, G.W., & JORISSEN, F.J.** 1990 (Syst.)
Successive appearance of sub-fossil phytoplankton species in QUAT.
Holocene sediments of the northern Adriatic and its relation to Ecol.
eutrophication pressure. Mediterr.
Estuarine, Coastal & Shelf Sci., 31(2):177-187, 3 pls., 3 figs.
- 6 **SANCETTA, C.** 1990 Ecol.
Seasonal occurrences of silicoflagellate morphologies in different Morph.
environments of the eastern Pacific Ocean. RECENT
Mar. Micropal., 16(3-4), 285-291, 4 figs. Pacific N
- 7 **SCHERER, R.P.** 1989 QUAT.
Palaeoenvironments of the West Antarctic Interior; microfossil study TERT.
of seas below Upstream B. Antarctic
Antarctic J. of U.S., 24(5):56-57, 2 figs.
- 8 **SPAULDING, S.A.** 1992 Bibl.
Bibliography and taxa of silicoflagellates III.
INA Newsletter, 14(2):42-90.

E47

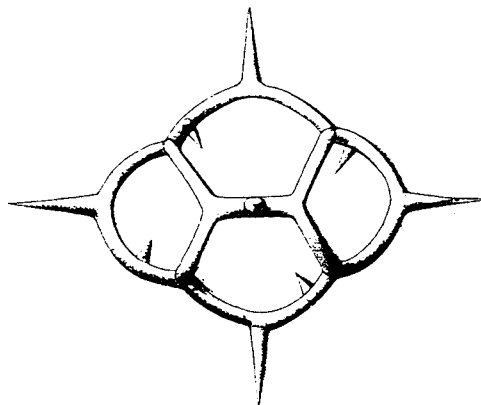
- 1 **TAKAHASHI, K., HONJO, S., & TABATA, S.** 1989 Ecol.
Siliceous phytoplankton flux: interannual variability and response to RECENT
hydrographic change in the north- eastern Pacific Pacific N
In: Peterson, D.H., (ed.), Aspects of climate variability in the Pacific
and the Western Americas, AGU, Geophysical Monograph 55, pp.
151-160, 2 tbs., 9 figs.
- 2 **WEBB, P.N.** 1991 Ecol.
Evolution of Cenozoic palaeoenvironments. QUAT.
In: Thomson, M.R.A., Crane, J.A., & Thomson, J.W., (eds.), TERT.
Geological evolution of Antarctica, pp. 599-607, 2 figs. Southern
- 3 **WETMORE, K.L. & ANDREWS, G.W.** 1990 (Syst.)
Silicoflagellate and diatom biostratigraphy in successive Burdigalian (Strat.)
transgressions, middle Atlantic coastal plain. . TERT.U.
Micropal., 36(3):283-295, 1 pl., 4 figs. America N

OTHER TITLES

- 4 **CIESIELSKI, P.F.** 1978 (Strat.)
The Maurice Ewing Bank of the Malvinas (Falkland) Plateau: TERT.U.
Depositional and erosional history and its paleoenvironmental Southern
implications.
Doctoral, Florida State University, 278 p.
- 5 **HAY, B.J.** 1987 Sedim.
Particle flux in the western Black Sea in the present and over the last Living
5000 years; temporal variability, sources, transport mechanisms. QUAT.
Doctoral, Massachusetts Institute of Technology, 201 p. Mediterr.

ACKNOWLEDGMENTS

Many thanks to Shirley van Heck and Jeremy Young for their assistance.



LIST OF TAXA

F26

- | | |
|--|-------|
| <i>Bachmannocena vetula</i> Ciesielski, 1991, p. 67, pl. 8, fig. 16; ODP Hole 702B, Islas Orcadas Rise, SW Atlantic sector of Southern Ocean, Eocene | E44-8 |
| <i>Corbisema animoparallela</i> Ciesielski, 1991, p. 73, pl. 2, figs. 17-18; ODP Hole 700B, Northeast Georgia Rise, SW Atlantic sector of Southern Ocean, Paleocene | E44-8 |
| <i>Corbisema camera</i> Ciesielski, 1991, p. 73-74, pl. 4, figs. 3-6; ODP Hole 700B, Northeast Georgia Rise, SW Atlantic sector of Southern Ocean, Paleocene | E44-8 |
| <i>Corbisema constricta</i> Ling, 1981 ssp. <i>spinosa</i> Ciesielski 1991, p. 74, pl. 1, fig. 8, pl. 3, figs. 7-8, 11-12; ODP Hole 700B, Northeast Georgia Rise, SW Atlantic sector of Southern Ocean, Paleocene | E44-8 |
| <i>Corbisema delicata</i> Ciesielski, 1991, p. 74, pl. 3, figs. 1-4; ODP Hole 700B, Northeast Georgia Rise, SW Atlantic sector of Southern Ocean, Paleocene | E44-8 |
| <i>Corbisema disymmetrica</i> (Dumitrica, 1973) Bukry, 1976 ssp. <i>crenulata</i> (Bukry, 1976) Ciesielski 1991; p. 74-75 (ex <i>Crassicorbisema inermus crenulata</i>) | E44-8 |
| <i>Corbisema hastata</i> (Lemmermann, 1901) Frenguelli, 1940 ssp. <i>alta</i> Ciesielski, 1991, p. 75-76, pl. 4, figs. 1-2, pl. 9, fig. 10; ODP Hole 700B, Northeast Georgia Rise, SW Atlantic sector of Southern Ocean, Paleocene | E44-8 |
| <i>Corbisema praedelicata</i> Ciesielski, 1991, p. 77, pl. 2, figs. 14-15; ODP Hole 700B, Northeast Georgia Rise, SW Atlantic sector of Southern Ocean, Paleocene | E44-8 |
| <i>Corbisema scapana</i> Ciesielski, 1991, p. 77, pl. 6, figs. 1-4; ODP Hole 700B, Northeast Georgia Rise, SW Atlantic sector of Southern Ocean, Paleocene | E44-8 |
| <i>Dictyochoa deflandrei</i> Frenguelli, 1940 ssp. <i>furtiva</i> Ciesielski, 1991, p. 79, pl. 7, figs. 13-14; ODP Hole 700B, Northeast Georgia Rise, SW Atlantic sector of Southern Ocean, Paleocene | E44-8 |
| <i>Distephanus antarcticus</i> (Ciesielski, 1975) Ciesielski, 1991; p. 81-82 (ex <i>Cannopilus antarcticus</i>) | E44-8 |
| <i>Naviculopsis biapiculata</i> (Lemmermann, 1901) Frenguelli, 1940 ssp. <i>nodulifera</i> Ciesielski, 1991, p. 82, pl. 10., figs. 6-7; ODP Hole 703A, Meteor Rise, SE Atlantic sector of Southern Ocean, Oligocene | E44-8 |
| <i>Naviculopsis cruciata</i> Ciesielski, 1991, p. 82, pl. 9, figs. 1-4, 5?; ODP Hole 700B, NE Georgia Rise, SW Atlantic sector of Southern Ocean, Paleocene | E44-8 |
| <i>Naviculopsis pandalata</i> Ciesielski, 1991, p. 83, pl. 9, figs. 11-16; ODP Hole 703A, Meteor Rise, SE Atlantic sector of Southern Ocean, Eocene | E44-8 |
| <i>Naviculopsis primitiva</i> Ciesielski, 1991, p. 83, pl. 9, figs. 6-9; ODP Hole 700B, Northeast Georgia Rise, SW Atlantic sector of Southern Ocean, Paleocene | E44-8 |
| <i>Naviculopsis trispinosa</i> (Schulz, 1929) Glezer, 1966 ssp. <i>eminula</i> Ciesielski, 1991, p. 83-84, pl. 8, figs. 2-6; ODP Hole 703A, Islas Orcadas Rise, SW Atlantic sector of Southern Ocean, Oligocene | E44-8 |

NEW TAXA

Silicoflagellate species in Alphabetical Order

- | | |
|---|--|
| <i>animoparallela</i> , <i>Corbisema</i> | <i>disymmetrica</i> ssp. <i>crenulata</i> , <i>Corbisema</i> |
| <i>antarcticus</i> , <i>Distephanus</i> | <i>hastata</i> ssp. <i>alta</i> , <i>Corbisema</i> |
| <i>biapiculata</i> ssp. <i>nodulifera</i> , <i>Naviculopsis</i> | <i>pandalata</i> , <i>Naviculopsis</i> |
| <i>camera</i> , <i>Corbisema</i> | <i>praedelicata</i> , <i>Corbisema</i> |
| <i>constricta</i> ssp. <i>spinosa</i> , <i>Corbisema</i> | <i>primitiva</i> , <i>Naviculopsis</i> |
| <i>cruciata</i> , <i>Naviculopsis</i> | <i>scapana</i> , <i>Corbisema</i> |
| <i>deflandrei</i> ssp. <i>furtiva</i> , <i>Dictyochoa</i> | <i>trispinosa</i> ssp. <i>eminula</i> , <i>Naviculopsis</i> |
| <i>delicata</i> , <i>Corbisema</i> | <i>vetula</i> , <i>Bachmannocena</i> |

BIBLIOGRAPHY AND TAXA OF CALCAREOUS NANNOPLANKTON - 20

Compiled by William G. Siesser

A469

- | | | | |
|---|--|------|---|
| 1 | ANTUNES, R. L. & CUNHA, A. A. S.
Considerations relative to the definition, characterization, and dating of the biozone of the nanofossil <i>Helicosphaera recta</i> .
Bull. Geoci. Petrobrás, 5(1/4): 109-128.
(In Portuguese). | 1991 | Strat.;
(Syst.)
TERT.
America S. |
| 2 | AUBRY, M.-P.
Sequence stratigraphy: eustasy or tectonic imprint?
J. Geophys. Res., 96: 6641-6679. | 1991 | (Strat.)
TERT.L.
Worldwide |
| 3 | AUBRY, M.-P.
Late Paleogene calcareous nannoplankton evolution: a tale of climatic deterioration.
In: Prothero, D. R. & Berggren, W. A. (Eds.), Eocene-Oligocene Climatic and Biotic Evolution. Princeton Univ. Press, Princeton. pp. 272-309. | 1992 | Evol.;Ecol.
TERT.L.
Worldwide |
| 4 | AUBRY, M.-P., BERGGREN, W. A., SCHAAF, A., AUZENDE, J.-M., LAGABRIELLE, Y., & MAMALOUKAS-FRANGOULIS, V.
Paleontological evidence for early exposure of deep oceanic crust on the Vema Fracture Zone southern wall (Atlantic Ocean, 10° 45'N).
Mar. Geol., 107: 1-7. | 1992 | (Strat.)
TERT.U.
Atlantic C. |
| 5 | BERGER, W. H., KROENKE, L. W., MAYER, L. A., BACKMAN, J., JANECEK, T. R., KRISSEK, L., LECKIE, M., & LYLE, M.
The record of Ontong Java Plateau: main results of ODP Leg 130.
Geol. Soc. Amer. Bull., 104: 954-972. | 1992 | Strat.
TERT.;
K/T BDY
Pacific C. |
| 6 | BURNETT, J. A., KENNEDY, W. J., & WARD, P. D.
Maastrichtian nanofossil biostratigraphy in the Biscay region (south-western France, northern Spain).
Newsl. Stratigr., 26 (2/3): 145-155. | 1992 | Strat.
CRET.U.
Europe W. |
| 7 | COLLOT, J.-Y., GREENE, H. G., STOKING, L. B., & THE SHIPBOARD SCIENTIFIC PARTY.
Proc. ODP, Init. Repts., v. 134 (Vanuatu; Sites 827-833). 1136 pp. [Nannofossils by T. S. Staerker]. | 1992 | Tech.;Strat
QUAT.;TERT.
Pacific C. |
| 8 | CONCHEYRO, A.
Calcareous nanofossils from the Man Aike Formation (Eocene, SW Cardiel Lake), Santa Cruz, Argentina.
Ameghiniana, 28(3/4): 385-399.
(In Spanish with English abstract) | 1991 | Strat.;
Syst.
TERT.
America S. |

A470

- | | | |
|----|--|---|
| 1 | <p>CUNHA, A. A. S.
 Hiatuses recognition of the gaps in the Tertiary section of the Mundaú Subbasin, Ceará Basin: a study based on calcareous nanofossils.
 Bull. Geoci. Petrobrás, 5(1/4): 69-82.
 (In Portuguese with English abstract)</p> | <p>1991
 Strat.
 TERT.
 America S.</p> |
| 2 | <p>CRUX, J. A.
 Albian calcareous nanofossils from the Gault Clay of Munday's Hill (Bedfordshire, England).
 J. Micropalaeontol., 10(2): 203-222.</p> | <p>1991
 (Strat.);
 <u>Syst.</u>
 CRET.L.
 Europe W.</p> |
| 3 | <p>DZIEWONSKI, A., WILKENS, R., FIRTH, J., & THE SHIPBOARD SCIENTIFIC PARTY.
 Proc. ODP, Init. Repts., v.136 (Hawaiian Arch; Sites 842-843). 156pp.
 [Nannofossils by J. V. Firth]</p> | <p>1992
 Tech.;Strat
 QUAT.;CRET.
 Pacific C.</p> |
| 4 | <p>EGLINTON, G., BRADSHAW, S. A., ROSELL, A., SARNTHEIN, M., PFLAUMANN, U., & TIEDEMANN, R.
 Molecular record of secular sea surface temperature changes on 100-year timescales for glacial terminations I, II and IV.
 Nature, 356: 423-426.</p> | <p>1992
 Biol.;Ecol.
 QUAT.
 Atlantic N.</p> |
| 5 | <p>ERBA, E., CASTRADORI, D., GUAISTI, G., & RIPEPE, M.
 Calcareous nanofossils and Milankovitch cycles: the example of the Albian Gault Clay Formation (southern England).
 Palaeogeogr., Palaeoclimatol., Palaeoecol., 93: 47-69.</p> | <p>1992
 Ecol.
 CRET.L.
 Europe W.</p> |
| 6 | <p>ESHET, Y., MOSHKOVITZ, S., HABIB, D., BENJAMINI, C., & MAGARITZ, M.
 Calcareous nanofossil and dinoflagellate stratigraphy across the Cretaceous/Tertiary boundary at Hor Hahar, Israel.
 Mar. Micropaleontol., 18: 199-228.</p> | <p>1992
 Strat.;
 (Syst.)
 K/T BDY
 Asia SW</p> |
| 7 | <p>FERRIER, C. & RASSOULZADEGAN, F.
 Density-dependent effect of protozoans on specific growth rates in pico- and nanoplankton assemblages.
 Limnol. Oceanogr., 36(4): 657-669.</p> | <p>1992
 Ecol.
 Living
 Mediterr.</p> |
| 8 | <p>GARTNER, S.
 Miocene nanofossil chronology in the North Atlantic, DSDP Site 608.
 Mar. Micropaleontol., 18: 307-331.</p> | <p>1992
 (Strat.); <u>Syst.</u>
 TERT.U.
 Atlantic N.</p> |
| 9 | <p>HECK, S. E. van
 The ICBN: things you need to know - 6.
 INA Newsl., 14(1): 12-13.</p> | <p>1992
 Syst.</p> |
| 10 | <p>JESUS, M. D. de, BRUNK, C. F., & CHAPMAN, D. J.
 Is <i>Thoracosphaera heimii</i> a coccolithophorid or a dinoflagellate (based on SSU rDNA data)?
 J. Phycol., Supplement, 28(3): 47.</p> | <p>1992
 Abst.
 Biol.
 Living</p> |

A471

- 1 **KWON, D-K., ARAKE, Y., MIRANDA, G., & GONZALEZ, E.** 1992 **Abst.**
 Characterization of the "coccolith-producing compartment" of *Coccolithus pelagicus*. **Biol.**
 J. Phycol., Supplement, 28(3): 51. **Living**

- 2 **MUTTERLOSE, J.** 1991 **Strat.;**
 The distribution and migration patterns of calcareous nannofossils in **Syst.;**Ecol.
 the Lower Cretaceous (Valanginian-Aptian) of NW-Germany. **CRET. L.**
 Palaeontographica, B 221: 27-152. **Europe W.**
 (In German with English abstract)

- 3 **MUTTERLOSE, J.** 1992 **Strat.**
 Biostratigraphy and palaeobiogeography of Early Cretaceous calcareous **CRET.L**
 nannofossils. **Europe W.**
 Cretaceous Res., 13: 167-189.

- 4 **MUTTERLOSE, J.** 1992 **Strat.;**
 Migration and evolution patterns of floras and faunas in marine Early **Ecol.**
 Cretaceous sediments of NW Europe. **CRET.L.**
 Palaeogeogr., Palaeoclimatol., Palaeoecol., 94: 261-282. **Europe W.**

- 5 **NIMER, N. A. & MERRETT, M. J.** 1992 **Biol.**
 Calcification and utilization of inorganic carbon by the coccolithophorid **Living**
Emiliania huxleyi Lohmann.
 New Phytol., 121: 173-177.

- 6 **PALMER-JULSON, A. & RACK, F. R.** 1992 **Sedim.;**
 The relationship between sediment fabric and planktonic microfossil **Diag.**
 taphonomy: How do plankton skeletons become pelagic ooze? **TERT.U.**
 Palaios, 7: 167-177. **Indian**

- 7 **PARSON, L., HAWKINS, J., ALLAN, J. & THE SHIPBOARD SCIENTIFIC PARTY** 1992 **Tech.;**Strat
QUAT.;TERT.
 Proc. ODP, Init. Repts., v.135, pt.1 (Lau Basin; Sites 834-841). 841p. **Pacific C-S**
 [Nannofossils by P. J. Quinterno & M. J. Styzen]

- 8 **PAVŠIČ, J.** 1991 **Strat;**Ecol.
 Frequency of nannoplankton in Oligocene marine clay in Slovenia. **TERT.L.**
 Razprave IV Razreda SAZU, 32: 153-173. **Europe E.**

- 9 **PUJOS, A. & LAMIA B.** 1991 **Strat.**
 The Quaternary Prinsiaecae (calcareous nannofossils) in a core from **QUAT.**
 the Mozambique Channel: Are these essential stratigraphical markers **Indian**
 influenced by external forcing?
 Bull. Inst. Géol. Bassin d'Aquitaine, Bordeaux, 50: 71-78.
 (In French with English abstract).

- 10 **RIO, D., SPROVIERI, R., & THUNELL, R.** 1991 **Strat.**
 Pliocene-lower Pleistocene chronostratigraphy: A re-evaluation of **TERT.U.;**QUAT.
 Mediterranean type sections. **Europe W.;**
 Geol. Soc. Amer. Bull., 103: 1049-1058. **Mediterr.**

A472

- 1 **SIESSER, W. G.** 1992 Bibl.
Bibliography and taxa of calcareous nanoplankton - 19.
INA Newsl., 14(1): 20-34.
- 2 **WEFER, G. & BERGER, W. H.** 1991 Isot.;Ecol.
Isotope paleontology: growth and composition of extant calcareous Living
species.
Mar. Geol., 100: 207-248.
- 3 **WEI, W.** 1992 Strat.;
Calcareous nannofossil stratigraphy and reassessment of the Eocene (Syst.).
glacial record in subantarctic piston cores of the southeast Pacific. TERT.L.
In: Wise, S. W. Jr., Schlich, R., et al., Proc. ODP, Sci. Results, Pacific S.
120: 1093-1104.
- 4 **WEI, W.** 1992 Strat.;
Updated nannofossil stratigraphy of the CIROS-1 core from McMurdo Ecol.
Sound (Ross Sea). TERT.L.
In: Wise, S. W. Jr., Schlich, R. et al., Proc. ODP, Sci. Results, Antarctic
120: 1105-1117.
- 5 **WEI, W. & WISE, S. W. Jr.** 1992a (Strat.);
Oligocene-Pleistocene calcareous nannofossils from Southern Ocean Syst.
Sites 747, 748, and 751. TERT.;QUAT.
In: Wise, S. W. Jr., Schlich, R. et al., Proc. ODP, Sci. Results, Indian
120: 509-521.
- 6 **WEI, W. & WISE, S. W. Jr.** 1992 (Strat.);
Selected Neogene calcareous nannofossil index taxa of the Southern (Syst.);
Ocean: biochronology, biometrics, and paleoceanography. Ecol.
In: Wise, S. W. Jr., Schlich, R. et al., Proc. ODP, Sci. Results, TERT U.
120: 523-537. Atlantic S.;
Indian
- 7 **WEI, W. & WISE, S. W. Jr.** 1992 (Strat.)
Eocene-Oligocene calcareous nannofossil magnetobiochronology of the TERT.L.
Southern Ocean. Atlantic S.
Newsl. Stratigr., 26(2/3): 119-132. Indian
- 8 **WEI, W., VILLA, G., & WISE, S. W. Jr** 1992 Strat.;
Paleoceanographic implications of Eocene-Oligocene calcareous Ecol.
nannofossils from Sites 711 and 748 in the Indian Ocean. TERT.L.
In: Wise, S. W. Jr., Schlich, R. et al., Proc. ODP, Sci. Results, Indian
120: 979-999.
- 9 **WEIWU, D.** 1988 Strat.
Mid-late Tertiary sedimentary environment in continental margin of TERT.
South China Sea. Asia E.
In: Aigner, J. S., Jablonski, N. G., Taylor, G., Walker, D. &
Pinxian, W. (Eds.), The Palaeoenvironment of East Asia from
the mid-Tertiary, v. 1, pp. 255-264.

- 1 **YOUNG, J. R., DIDYMUS, J. M., BOWN, P. R., PRINS, B., & MANN S.** 1992 Biol.;
Evol.;
Morph.
Crystal assembly and phylogenetic evolution in heterococcoliths.
Nature, 356: 516-518.

Calcspheres

- 2 **JANOFKSKE, D. & KEUPP, H.** 1992 Syst.
Mesozoic and Cenozoic "calcspheres" - update in systematics.
INA Newsl., 14(1): 14-16.
- 3 **KEUPP, H.** 1991a Strat.;
Syst.
CRET.U.
Europe W.
Calcareous dinoflagellate cysts of the Eibrunn Marls (Cenomanian-Turonian boundary) from Bad Abbach/ Southern Germany.
Berliner Geowiss. Abh., A 134: 127-145.
(In German with English abstract)
- 4 **KEUPP, H.** 1991 Syst.
"Palinosphaera": odyssey of a micropaleontological taxon.
Berliner Geowiss. Abh., A 134: 147-159.
(In German with English abstract)
- 5 **KEUPP, H., & MONNET, B.** 1991 Syst.;
Morph.
Problems with the systematics of calcareous dinoflagellate cysts based on morphologically defined taxa.
Berliner Geowiss. Abh., A 134: 161-185.
(In German with English abstract)

Other Titles

- 6 **CACHAO, M.** 1992 Review
Book Review - Calcareous Algae and Stromatolites.
INA Newsl., 14(1): 9-11.
- 7 **JORDAN, R. W.** 1991 Review
Book Review - Nannofossils and Their Applications.
Mar. Tech. Soc. J., 25(1): 65-66.
- 8 **LYLE, M.** 1992 Review
Molecules record sea change.
Nature, 356: 385-386.
- 9 **YOUNG, J. R.** 1992 Report
Report - Terminology working group meeting, London April 1992.
INA Newsl., 14(1): 6-8.
- 10 **YOUNG, J. R.** 1992 Report
Fjord coccoliths - Norwegian *E. huxleyi* Project 1992.
INA Newsl., 14(1): 17-19.

<i>Braloweria</i> CRUX 1991, p. 214, 216. Type species <i>Braloweria boletiformis</i> BLACK 1972.	A470-2
<i>Braloweria boletiformis</i> (BLACK 1972) CRUX 1991, p. 216; (ex <i>Parhabdolithus</i>).	A470-2
<i>Braloweria judithae</i> (BLACK 1972) CRUX 1991, p. 216; (ex <i>Parhabdolithus</i>).	A470-2
<i>Coccolithus pelagicus</i> subsp. <i>floralis</i> WEI & WISE 1992a, pp. 514-516, pl. 2, figs. 5-8. Falkland Plateau and Maud Rise; lower and middle Miocene.	A472-5
<i>Cryptococcolithus</i> GARTNER 1992, p. 330. Type species: <i>Cryptococcolithus takayamae</i> GARTNER 1992.	A470-8
<i>Cryptococcolithus takayamae</i> GARTNER 1992, p. 330, pl. 2, figs. 3a, 3b. North Atlantic; middle and upper Miocene.	A470-8
<i>Eiffellithus monechiae</i> CRUX 1992, p. 216. Oklahoma; upper Albian to lowest Cenomanian.	A470-2
<i>Owenia</i> CRUX 1991, p. 214. Type species: <i>Owenia hilli</i> CRUX 1991.	A470-2
<i>Owenia hilli</i> CRUX 1991, p. 214, pl. 1, figs. 3, 6; pl. 2, figs. 1-4, 8; Bedfordshire, England; upper Albian.	A470-2
<i>Reticulofenestra pseudumbilicus</i> var. <i>amplus</i> GARTNER 1992, p. 330, pl. 1, figs. 4a, 4b. North Atlantic; middle and upper Miocene.	A470-8

Calcspheres

<i>Congruentia</i> KOHRING 1991 in KEUPP & MONNET 1991, pp. 167-168. Type species: <i>Congruentia eocaenica</i> KOHRING 1991.	A473-5
<i>Congruentia eocaenica</i> KOHRING 1991 in KEUPP & MONNET 1991, p. 168, pl. 5, figs. 5-10. Denmark; upper Eocene.	A473-5
<i>Gonellum prismaticum</i> KEUPP 1991a, pp. 130-131, pl. 2, figs. 2-8. Bavaria; upper Cenomanian.	A473-3
<i>Obliquipithonella paradoxa</i> KEUPP 1991a, p. 132, pl. 3, figs. 7-12. Bavaria; upper Cenomanian.	A473-3

NEW TAXA

Calcareous Nannoplankton Genera

Braloweria
Cryptococcolithus
Owenia

Calcsphere Genera

Congruentia

Calcareous Nannoplankton Species

boletiformis, *Braloweria hilli*, *Owenia judithae*, *Braloweria monechiae*, *Eiffellithus pelagicus* ssp. *floralis*, *Coccolithus pseudumbilicus* var. *amplus*, *Reticulofenestra takayamae*, *Cryptococcolithus*

Calcsphere Species

eocaenica, *Congruentia paradoxa*, *Obliquipithonella prismaticum*, *Gonellum*

INA MEMBERSHIP DIRECTORY

This is a full listing of the membership of the International Nannoplankton Association, with some additions. In *China* copies of the newsletter are distributed by Cheng Xinrong, these associate members are included, but we do not have a recently revised list of so there may be errors. Owing to the instability in *Eastern Europe* and the former *Soviet Union*, and to the upsurge of geological interest in the region we felt it was particularly important to try to include as many nannofossil workers as possible irrespective of their INA membership. All participants at the Prague conference have been included and Bohumil Hamršík has provided extra data. We will be maintaining a database of nannofossil workers in these countries, and in less developed countries, and would be very grateful for extra information.

Kevin Cooper, Jeremy Young

INDIVIDUAL MEMBERS

Abdoerrias, R.; UNOCAL Indonesia Ltd.; Pasir Ridge, P.O. Box 276; Balikpapan 76101; Kalimantan-Timur; INDONESIA
Aguado Merlo, Roque; Dep .de Estratigrafia y Paleontologia; Universidad de Granada; Linares; 23700; SPAIN
Aguilar, P.; Darro 22; Madrid; 28002; SPAIN
Alcober, J.; Pl Andujar 3; Valencia; 46006; SPAIN
Andreeva-Grigorovitch, Aida S.; Dept. of Geology; Lvov University; s. engels 45/1; Lvov; 290044; UKRAINE
Angelozzi, Gladys; Y P F Lab Geologico; 1888 Florencio Varela; Buenos Aires; ARGENTINA
Arfstrom, C. Betelho; Kingswood Apartments 11-N; 1105 Highway 54 Bypass; Chapel Hill; NC; 27516; U.S.A.
Atri, Anna d'; Dipartimento di Scienze della Terra; Via Accademia delle Scienze 5; Torino; 10123; ITALY
Attanasio, Cecilia; Dipartimento di Scienze della Terra; Via Mangiagalli 34; Milano; 20133; ITALY
Aubry, Marie-Pierre; Lab. de Géologie du Quaternaire; CNRS-Luminy, Cose 907; Marseilles; 13288 Cedex 9; FRANCE
Backman, Jan; Dept of Geology & Geochemistry; Stockholm University; Stockholm; S-10691; SWEDEN
Baky, Alaa M.; PT Robertson Res.; Bldng 108C; Cilandak Comm Est; Jln. Cilandak, K.K.O.; Jakarta; 12560; INDONESIA
Baldanza, Angela; Dipartimento di Scienze della Terra; Piazza Università 1; Perugia; 06100; ITALY
Baldi-Beke, Maria; Rakcozi u. 42; Urom; H-2096; HUNGARY
Barbin, Vincent; Geologisches Institut; Baltzerstrasse 1; Berne; CH-3012; SWITZERLAND
Beaufort, Luc; Woods Hole Oceanographic Inst.; Woods Hole; MA; 02543; U.S.A.
Beck, Debra; RR 1 Box 328; Valley; NE; 68064; U.S.A.
Bergen, Jim A.; Amoco Production Company; PO Box 3092; Houston; Texas; 77253-3092; U.S.A.
Bleijswijk, Judith van; NIOZ, Dept. Pelagische Systemen; Postbus 59; Den Burg; Texel; 1790 AB; THE NETHERLANDS
Bogdanovitch, E. M.; Dnepropetrovsk Univ.; Dnepropetrovsk; 320027; USSR
Bonnemaison, Monique; C/del Solano 44-1A; Prado de Somosaguas - Pozuelo; Madrid; 28023; SPAIN
Boudreaux, Joseph E.; Texaco; PO Box 60252; New Orleans; LA; 70160; U.S.A.
Bown, Paul R.; Dept of Geological Sciences; University College London; Gower Street; London; WC1E 6BT; U.K.
Bralower, Tim; Dept. of Geology; Univ. of N. Carolina; CB 3315 Mitchell Hall; Chapel Hill; NC; 27599-3315; U.S.A.
Braunstein, Roswitha E.; Institute of Paleontology; University of Vienna; Universitatstr. 7/2; Wien; A-1010; AUSTRIA
Bréhéret, Jean G.; Lab. de Géologie; Faculté de Sciences et Techniques; Parc de Grandmont; Tours; 37200; FRANCE
Bubík, Miroslav; Český Geologický ústav; pobočka Brno; Leitnerova 22; Brno; 65869; Czech Republic.
Bukry, Dave; US Geological Survey, MS 915; 345 Middlefield Road; Menlo Park; CA; 94025; U.S.A.
Burnett, Jackie; Dept of Geological Sciences; University College London; Gower Street; London; WC1E 6BT; U.K.
Bybell, Laurel M.; US Geological Survey; 970 National Center - 910; Reston; Virginia; 22092; U.S.A.
Bystrická, Hedviga; Kat. geol. a pal.; Univ Komenskeho; Pav. G; Mlynska dolina; Bratislava; 84215; SLOVAK REPUBLIC
Cachao, Mario; Museu de Mineral. e Geol.; Univ. de Lisboa; Rua da Escola Politecnica 58; Lisboa; 1294; PORTUGAL
Cai Chongyang; Nanjing Inst. Geol. & Pal; Academia Sinica; Nanjing; 210008; CHINA
Cascella, Antonio; via Milano 17; Pisa; 56100; ITALY
Castradori, Davide; Dipartimento di Scienze della Terra; Via Mangiagalli 34; Milano; 20133; ITALY
Catanzariti, Rita; Via I. Possenti 10; Asciano Pisano (PISA); 56010; ITALY
Cepek, Pavel; Bundesanstalt für Geowissenschaften und Rohstoffe; Stilleweg 2; Hannover; D-3000; GERMANY
Chen, Min-Pen; Inst of Oceanography; National Taiwan Univ; PO Box 23-13; Taipei; 107; TAIWAN
Cheng Xinrong; Dept. of Marine Geology; Tongji Univ; Shanghai; 200092; CHINA
Chepstow-Lusty, Alex J.; The Goodwin Laboratory; Univ. of Cambridge; Free School Lane; Cambridge; CB2 2RS; U.K.
Cobianchi, Miriam; C 80 Strada Nuova 65; Pavia; 27100; ITALY
Concheyro, Andrea; J.B. Ambrosetti 662; Piso 6, Dto. 28-29; Buenos Aires; CP (1405); ARGENTINA
Constans, R.E.; 31147 Normandy Drive; la Combe; LA; 70445; U.S.A.
Cooper, M. Kevin E.; Stratigraphic Services Int. Ltd.; Surrey Research Park; Guildford; Surrey; GU2 5YL; U.K.
Covington, J.Mitch; 1707 Monticello Drive; Tallahassee; FL; 32303; U.S.A.
Crux, Jason A.; BP Exploration Inc; Sage Plaza; 5151 San Felipe; PO Box 4587; Houston; Texas; 77210; U.S.A.
Curto Homedes, Joan-Antoni; Dept. Geologia I.B. "Els Tes Turons"; Rial Fons de les Greus s/n; Arenya de mar; Barcelona; 08350; SPAIN
Dmitrenko, Olga B.; Inst. of Oceanology; Academy of Sciences of Russia; Krasikova 23; Moscow; 117218; RUSSIA
Dograshvili, Zeinab; Geol. Inst.; Acad. Sci. of Georgia; ul z Rukhadze 1/9; Tbilisi; 380093; GEORGIAN REPUBLIC
Driever, Ben W.M.; IVAU; Budapestlaan 4; PO Box 80.021; Utrecht; 3508 TA; THE NETHERLANDS
Duan Weiwu; Guangzhou Marine Geological Survey; 477 Huan Shi Dong Road; Guangzhou; 510075; CHINA
Dunn, T.; Shell Offshore Inc.; PO Box 61933; New Orleans; LA; 70161; U.S.A.
Duran, Isebelia; Maraven SA; Aoartado 829; Caracas; 1010A; VENEZUELA
Edwards, A.R.; Stratigraphic Solutions; PO Box 36033 Moera; Lower Hutt; NEW ZEALAND
Egger, H.; Lindenweg 1; Elsbethen; A-5061; AUSTRIA
Ehrendorfer, Thomas; Woods Hole Oceanographic Inst.; Woods Hole; MA; 02543; U.S.A.
Elbrachter, M.; Mannem Orsumtal 4; Biol. Anstalt Helgoland Hafenstrasse 43; List/Sylt; D-2282; GERMANY
Elliot Jr, Herbert A.; 10707 Normont Drive; Houston; Texas; 77070; U.S.A.
Ellis, C. Howard; 642 Cumbre Vista Drive; Santa Fe; New Mexico; 87501; U.S.A.

Erba, Elisabetta; Dipartimento di Scienze della Terra; Via Mangiagalli 34; Milano; 20133; ITALY

Erve, Antonius W. van; Abt. 51; Veba oel A.G.; P.O. Box 20-10-45; Gelsenkirchen; D-4650; GERMANY

Eshet, Yoram; Geological Survey; 30 Malkhei Yisrael St.; Jerusalem; 95 501; ISRAEL

Farinacci, Anna; Cattedra di Micropaleontologia; Citta Universitaria; Roma; 00185; ITALY

Faris, M.M.; Geology Department; Faculty of Science; Tanta University; Tanta; EGYPT

Felegyhazy, L.; Dept. of Geology; Eötvös University; Muzeum Krt. 4/A; Budapest; H-1088; HUNGARY

Filewicz, Mark V.; Union Oil Co. of California; PO Box 6176, 2323 Knoll Drive; Ventura; CA; 93006; U.S.A.

Fiorentino, Andrea; c/o Prof. A. Farinacci; Dip. di Scienze della Terra; Università di Roma "La Sapienza"; Piazzale Aldo Moro 5; Roma; 00185; ITALY

Fioroni, Chiara; Inst di Geologia; Corso Vittorio Emanuele 59; Modena; 41100; ITALY

Firth, John; Ocean Drilling Project; Texas A & M University; College Station; Texas; 77840; U.S.A.

Fisher, Cindy C.; Dept. of Geology; SUNY College, PO Box 2000; Cortland; NY; 13045; U.S.A.

Flores Villarejo, José-Abel; Fac. de Ciencias; Dto de Paleontologia; Univ. of Salamanca; Salamanca; 37008; SPAIN

Fornaciari, E.; Via per Neviano N.41; Traversetolopr (PR); Parma; 43100; ITALY

Fuchs, R.; OMV-AG; Laboratory for Exploration & Prod.; Gerasdorferstrasse 151; Wien; A-1210; AUSTRIA

Futterer, D.; Alfred Wegener Institute; Polar & Marine Research; Columbus Centre; Bremerhaven; D-2850; GERMANY

Gallagher, Liam T.; Paleo-Services Limited; Sandown Road; Watford; WD2 4XA; U.K.

Gallego, Jorge M.; Dept. de Estratigr. y Paleont.; Univ. de Granada; Campus de Fuente Nueva; Granada; 18002; SPAIN

Gard, Gunilla; Department of Geology; University of Stockholm; Stockholm; S-1069 ; SWEDEN

Garratt, Jane; School of Geol. Sciences; Kingston Polytechnic; Penrhyn Road; Kingston upon Thames; KT1 2EE; U.K.

Gartner, Stefan; Dept. of Oceanography; Texas A & M Univ.; College Station; Texas; 77843; U.S.A.

Gavtadze, Tamara; Geol. Inst.; Acad. Sci. of Georgia; ul z Rukhadze 1/9; Tbilisi; 380093; GEORGIAN REPUBLIC

Gervais, Elizabeth E.; Johan Rosenkrantzlaan 35; Heemstede; 2104 CC; THE NETHERLANDS

Gillespie, Helen; Dept. of Earth Sci.; Memorial Univ. of Newfoundland; St. Johns; Newfoundland; A13 3X5; CANADA

Giraudeau, Jacques; S. Africa Museum; PO Box 61; Cape Town; 8000; SOUTH AFRICA

Girgis, Magdy H.; Robertson Group plc; Tyn-y-Coed; Llandudno; Gwynedd; LL30 1SA; U.K.

Golubev, S.N.; Geol. Faculty; Moscow Univ.; Moscow; 119899; RUSSIA

Gorostidi, Amalia; Paleontologia; Facultad de Ciencias; Univ. Pais Vasco; Apdo 644; Bilbao; 48080; SPAIN

Gosselin, Michel; Dept. d'Océanogr.; Univ. du Quebec; 300 Allée des Ursulines, Rimouski; Quebec; G5L 3A1; CANADA

Grassi, Alexandre A.; Desud/Direp/Selag; PETROBRAS; Av. Elias Agostinho 665 - Imbetiba; Maces; RJ-28.700; BRAZIL

Gring, M.P.; Unocal Oil & Gas Div.; Unocal Corporation; PO Box 6176; Ventura; CA; 93006; U.S.A.

Hadavi Hamadian, F.; Geol Survey of Iran; PO Box 13185-1494; Tehran; IRAN

Halasova, Eva; Kat geol a pal; Univ Komenského; Pavilon G; Mlynska dolina; Bratislava; 84215; SLOVAK REPUBLIC

Hamršmíd, Bohumil; odd. Mikropaleontologie; MND Hodonín Uprokova 6; Hodonín; 695 30; CZECHOSLOVAKIA

Hao Yichun; China Univ of Geosciences; Beijing; CHINA

Harpur, Will; Halliburton Geoconsultants & Geodata; Howe Moss Pl.; Kirkhill Ind. Est.; Dyce; Aberdeen; AB2 0GS; U.K.

Harun, Awalludin; Petrol. Res. Inst.; PETRONAS; Lot 1026 PKNS Ind. Area; 54200 Hulu Kelang; Selangor; MALAYSIA

Hay, William W.; GEOMAR; Marine Geowiss.; C Albrechts Univ. zu Kiel; Wischhofstr. 1-3; Kiel; D-2300; GERMANY

Heck, Shirley E. van; Sarawak Shell berhad, XGS/1; Lutong; 98100; Sarawak; MALAYSIA

Heimdal, Berit R.; Dept of Fisheries & Mar. Biol.; Univ of Bergen; Bergen High Tech. Centre; Bergen; N-5020; NORWAY

Hekel, H.; 226 Rainbow Street; Sandgate; QL 4017; AUSTRALIA

Henriksson, Anders; Paleontologiska Inst.; PO Box 558; Uppsala; S-75122; SWEDEN

Hine, Nicky M.; British Geological Survey; Biostratigraphy Group; Keyworth; Nottingham; NG12 5GG; U.K.

Honda, N.; Japan Nat. Oil Company; Tech Research Centre; Hamba 1-2; Chiba City; JAPAN

Houghton, Simon; Adams Environmental; Unit 54; 103-109 Lavender Hill; London; SW11 3SQ; U.K.

Hsu, Ken; Geological Institute; ETH Zentrum; Zürich; CH-8092; SWITZERLAND

Huang Lushen; China Corelab 1; Shang Yie Warehouse-D; Tai Zi Road; CMSN Shekou Ind. Zone; Shekou; 1696; CHINA

Huang Yongyang; South China Sea Geol. Investigation; Ministry of Geology; PO Box 850; Guangzhou; CHINA

Hulme, Niel; Paleoservices Limited; Sandown Road; Watford; WD2 4XA; U.K.

Jakubowski, Martin; Shell International; Carel van Bylandtlaan, PO Box 162; The Hague; 2501 AN; THE NETHERLANDS

Janin, Marie-Christine; 27 Rue de Clignancourt; Paris; 75018; FRANCE

Janofske, Dorothea; Inst. fur Paläontologie; Freie Univ. Berlin; Schwedenerstrasse 8; Berlin 33; D-1000; GERMANY

Jeremiah, Jason; Shell (UK) Expl. & Prodn.; Shell Mex House; The Strand; London; WC2R 0DX; U.K.

Jiang, Mark M.; (Ming-Jung Jiang); Arco Oil and Gas Company; 15375 Memorial Drive; Houston; Texas; 77079; U.S.A.

Jiang Yan Wen; Dept of Geology; Jiangnan Petroleum College; Hubai Province; Jiangling; CHINA

Jordan, Ric W.; Institute of Oceanographic Sciences, Deacon Lab.; Brook Road; Wormley; Surrey; GU8 5UB; U.K.

Joyce, Ed; 6710 Roos Road; Houston; Texas; 77074; U.S.A.

Jutson, David J.; Danmarks Geologiske Undersogelse; Thoravej 8; Kobenhavn NV; DK-2400; DENMARK

Kaenel, Eric de; Department of Geology; Florida State University; Tallahassee; FL; 32306-3026; U.S.A.

Kale, Anand S.; 917/25 Ganeshwadi; Deccan; Gymkhana; Pune; 411004; INDIA

Kalinitchenko, G.I.; Geol. Faculty; Kiev Univ.; Kiev; 252000; UKRAINE

Kapellos, C.; c/o PD Oman XXG; PO Box 81; Muscat; OMAN

Kapid, Rubiyanto; Dept of Technic Geology FTM-ITB; Jl. Ganesha 10; Bandung; 40132; INDONESIA

Karega, Amina; Tanzania Petroleum Development Corp.; PO Box 5233; Dar-es-Salaam; TANZANIA

Keupp, Helmut; Inst. fur Paläontologie; Freie Univ. Berlin; Schwedenerstrasse 8; Berlin 33; D-1000; GERMANY

Kheradyar, Tara; 1111 Compass # 113; Foster City; CA; 94404; U.S.A.

Kienel, Ulrike; Paläontologisches Inst.; Freie Univ. Berlin; Schwedenerstrasse 8; Berlin 33; D-1000; GERMANY

Kilasoniya, Eteri; Geol. Inst Academy of Sciences; ul z Rukhade 1/9; Tbilisi; 380093; GEORGIAN REPUBLIC

Kirsch, Karl-Heinz; Inst f Paläontol und Historische Geologie; Richard-Wagnerstr 10; Munchen 2; D-8000; GERMANY

Kleijne, Annelies; Earth Sciences; Vrije Universiteit; de Boelelaan 1085; Amsterdam; 1081 HV; THE NETHERLANDS

Kling, Stanley A.; 416 Shore View Lane; Leucadia; CA; 92024; U.S.A.

Knappertsbusch, Michael; Earth Sciences; Vrije Univ.; de Boelelaan 1085; Amsterdam; 1081 HV; THE NETHERLANDS

Korábová, Katarína; Geologický ústav Dionýza Štúra; Mlynská dolina 1; Bratislava; 81404; SLOVAK REPUBLIC
Koshkarly, Reykhan O.; Inst. of Geology; Acad. Sci. of Azerbaijan; Nazimanov str. 29a; Baku; 370143; AZERBAIJAN
Krhovský, Jan; Katedra paleontologie; Karlovy Univ.; Albertov 6; Praha 2; 12843; CZECH REPUBLIC
Lauer, Gerhart W.; Erndtgassee 7; Wien; A-1180; AUSTRIA
Leffingwall, H.; Unocal Science & Tech Div; Unocal Corporation; PO Box 76; Brea; CA; 92621; U.S.A.
Leon, M. Marietta de; Nat. Inst. of Geol. Sci.; Univ. of The Philippines; Diliman; Quezon City 1101; THE PHILIPPINES
Leshner, O.; 26 Davenport Road; West Hartford; CT; 06110; U.S.A.
Leu, Mircea; Oil Geological Research Inst.; 103 Toamnei Street; Bucharest; 72152; ROMANIA
Li Qianyu; Department of Geology and Geophysics; Univ of Adelaide; Adelaide; S.A. 5001; AUSTRALIA
Li Wenqin; First Institute of Oceanography; SOA; Qingdao; CHINA
Lida, Koletti; Ifaistou 13; Ekali; Athens; GREECE
Lima, Fancisco H. de O.; PETROBRAS; Dexes/Selag; BR 101 km 67.5, Nova Esperance; Sao Mateus; Espirito Santo; 29930; BRAZIL
Lin Chuanlian; Dept. of Marine Geology; Tongji Univ; Shanghai; 200092; CHINA
Lin Meihua; Institute of Oceanology; Academica Sinica; Qingdao; CHINA
Liu, Huaibao; Dept. of Geology; Univ. of Nebraska; Lincoln; NE; 68588-0340; U.S.A.
Liu, Xinlan; Department of Geology; Florida State University; Tallahassee; FL; 32306; U.S.A.
Lohman, William H.; 1175 W. Hinsdale Drive; Littleton; Colorado; 80120; U.S.A.
Lopesdo Nascimento, N.; PETROBRAS/CENPES/DIVEX; Av. Ilha do Fundao Q. 7; Cidade Universitaria; Rio de Janeiro; RJ. CEP 21910; BRAZIL
Lord, Alan R.; Dept. of Geological Sciences; University College London; Gower Street; London; WC1E 6BT; U.K.
Lord, Minoo; 11 Glenilla Road; Hampstead; London; NW3 4AJ; U.K.
Loureiro Antunes, R.; PETROBRAS/CENPES/DIVEX; Av. Ilha do Fundao Q. 7; Cidade Universitaria; Rio de Janeiro; RJ. CEP 21910; BRAZIL
Lozar, Francesca; Dip. di Scienze della Terra; Via Mangiagalli 34; Milano; 20133; ITALY
Luleva, S.A; Geol. Inst. Acad. Sci.; Kiev; 252054; UKRAINE
Mahani, Mohamed; Core Laboratories.; Lot 10B - Jalan 51A/223; 46100 Petaling Jaya; Selangor; MALAYSIA
Maiorano, Patrizi; Ila Trav via Pizzillo; Palese; Bari; 70054; ITALY
Maiya, S.; Petroleum Exploration Co Ltd; Central Technical Laboratory of Japan; 3-5-5 Midorigaoka, Hamuramachi; Nishitama-gun; Tokyo; 190-11; JAPAN
Marino, Maria; Via E. Orabonai; Bari; 70125; ITALY
Marks, Ed; Marks & Associates; 12200 E. Washington Blvd; Suite E; Whittier; CA; 90606; U.S.A.
Marks, S.; Rudolf von Langen Str. 11; Munster; D-4400; GERMANY
Martiniene, Romulda .A.; NIGRI (Lithuanian Inst. of Geol. Expl.); Ševčenko str. 13; Vilnius; 232600 ; LITHUANIA
Marunteanu, Mariana; Inst. de Geologie si Geofizioca; Str Caransebes 1; Bucharest 1; 78344; RUMANIA
Mathur, K.; KDM Inst. Pet. Exploration; Oil & Natural Gas Commission; Kaulagarh Road; Dehradun (U.P.); INDIA
Matias Sandra, Isabel; C/ Clot 194 at 1a; Barcelona; 08027; SPAIN
Matsuoka, Hiromi; Department of Geology, Faculty of Science; Kochi University; Akebono-Cho; Kochi; 780; JAPAN
Mattioli, Emanuela; Dept. of Earth Science; University of Perugia; Piazza Universita 1; Perugia; 06100; ITALY
Melinte, Mihaela C.; Inst. de Geologie si Geofiziocá; Str Caransebes 1; Bucharest 1; 78344; RUMANIA
Meszáros, Nicolae; Cat. de Geol - Palaeontol; Babes-Bolyai Univ.; Kogalniceanu 1; Cluj - Napoca; R-3400; ROMANIA
Mikkelsen, N.; Geol Survey of Denmark; Thoravej 31; Copenhagen; NV DK-2400; DENMARK
Miller, Peter L.; 371 Castello Road; Lafayette; CA; 94549; U.S.A.
Minashvili, Tsilino D.; Geol. Inst.; Acad. Sci. of Georgia; ul z Rukhadze 1/9; Tbilisi; 380093; GEORGIAN REPUBLIC
Mita, Isao; Nihon Tennen Gas Kogyo Co Ltd; Kyodo Bldg, Shin Muromachi; 2,4,2-Chome; Nihonbashi-muromachi, Chuo-Ku; Tokyo; 103; JAPAN
Mock, Sarah; Geology Dept.; Univ. of N. Carolina; CB-3155 Mitchell Hall; Chapel Hill; NC; 37599; U.S.A.
Monechi, Simoneta; Istituto di Geologia e Paleontologia; Universita di Firenze; Via Lamarmora 4; Firenze; 50121; ITALY
Moran, Michael; Geology Dept.; Box 320; University Post Office; Univ. of P.N.G.; Port Moresby; PAPUA NEW GUINEA
Morin, Ronald W.; Exploration 1404; Mobil; 1250 Poydras; New Orleans; LA; 70113-1892; U.S.A.
Moshkovitz, Shimon; Geol. Survey of Israel; 30 Malkhe Israel Street; Jerusalem; 95 501; ISRAEL
Mostajo, Elena; Museo A rgentino de Cs. Naturales; Ave. Angel Gallardo 470; Buenos Aires; 1405; ARGENTINA
Musbah, Musa; Sarawak Shell Berhad; Miri; 98009; MALAYSIA
Mutterlose, Jorg; Inst. for Geol & Palaeont.; Tech. Univ. Hannover; Callinstrasse 30; Hannover 1; D-3000; GERMANY
Muzilev, N. G.; Geol. Inst. Acad. Sci.; Moscow; 109017; USSR
Nagyvarosy, András; Dept. of Geology; Eötvös University; Muzeum Krt. 4/A; Budapest; H-1088; HUNGARY
Naji, Fawzy; GEOCON; Geowissenschaftliche Consulting; Celler Str. 81; Braunschweig; D-3300; GERMANY
Negri, Alessandra; via Don G Verita 10; Imola BO; 40026; ITALY
Niel, Brigitta E. van; Inst. of Oceanographic Sciences, Deacon Lab.; Brook Road; Wormley; Surrey; GU8 5UB; U.K.
Nikiforova, Z.; VNIGRI; Lab. Micropalaeo. Liteini 39; St. Petersburg; 197104; RUSSIA
Nishida, Shiro; Dept. of Earth Sciences; Nara Univ. of Education; Nara; 630; JAPAN
Noël, Denise; Laboratoire de Géologie; Muséum Nat. d'Hist. Naturel; 43 Rue de Buffon; Paris; 75005; FRANCE
Okada, Hisatake; Dept of Earth Sciences; Faculty of Sciences; Yamagata University; Yamagata; 990; JAPAN
Olafsson, Gunnar; Dept. of Geology; University of Stockholm; Stockholm; S-10691; SWEDEN
Olsen, D.L.; 65 Carlos Court; Anchorage; Alaska; U.S.A.
Ozkan, Sevinc; Dept of Geological Sciences; University College London; Gower Street; London; WC1E 6BT; U.K.
Pavšič, Jernej; Katedra za geologijo in palaeontogijo; Univerza v Ljubljani; Aškerčeva 12; Ljubljana; 61000; SLOVENIA
Pearce, Julie A.; BP Exploration; 5151 San Felipe; PO Box 4587; Houston; Texas; 77210; U.S.A.
Percival Jr, Stephen F.; 326 Suddith Lane; Midlothian; Texas; 76065; U.S.A.
Perez, J.A.M.; Dept de Estratigrafia y Paleontol; Univ. de Granada; Campus du Fuentenuueva; Granada; 18002; SPAIN
Pignatelli Garcia, R.; Avda. Mediterraneo 52; Madrid; 28030; SPAIN
Pirini-Radrizzani, Camilla; Via Europe 28; S Donato Milanese; Milano; 20097; ITALY

Pospichal, Jim J.; Dept. of Geology; Florida State University; Tallahassee; FL; 32306; U.S.A.
Prins, Ben; Beatrixlaan 81; Moerkapelle; 2751 XX; THE NETHERLANDS
Proto-Decima, Franca; Istituto di Geologia; Universita degli Studi Padova; Via Giotto. 1; Padova; 35137; ITALY
Pujos, Annick; Lab de Géologie et d'Océanographie; Univ. de Bordeaux 1; Ave. des Facultés; Talence; 33405; FRANCE
Quidayan, Valentino B.; P.T. Core Labs; Bldg. 303; Cilandak Comm. Est.; Jln. Cilandak K.K.O.; Jakarta; 12560;
INDONESIA
Quintero, P.; US Geological Survey; MS-999 345 Middlefield Road; Menlo Park; CA; 94025; U.S.A.
Rabindranath, Sivaramakrishnan; Dept. of Earth Sciences; Indian Inst. of Technology; Powai; Bombay; 400-076; INDIA
Radford, Sally S.; Dept of Geology; Imperial College; Prince Consort Road; London; SW7 2BP; U.K.
Raffi, Isabella; Istituto di Geologia; Via Kennedy 4; Parma; 43100; ITALY
Rahmon, A.; Geol & Geophys Dept.; 717 W C Browning Bldg; Univ. of Utah; Salt Lake City; Utah; 84112-1183; U.S.A.
Rai, Jyotsana; Birbal Sahni Inst. of Paleobot; 53 University Road; PO Box 106; Lucknow; 226007; INDIA
Raková, Jarmila; Geologický ústav Dionýza Štúra; Mlynská dolina 1; Bratislava; 81404; SLOVAK REPUBLIC
Reale, Viviana; Dipartimento Scienze della Terra; Universita di Firenze; Via G.la Pira 4; Firenze; 50121; ITALY
Reimers, David D.; PO Box 53072; Lafayette; LA; U.S.A.
Resiwati, Purtyasti; Dept. Geology; Gadjali Mata University; Flora Støet; Bulaksumur; Yogyakarta; INDONESIA
Reugger, Lauralee R.; Nanno Investigations; 102 Big Pine Dr.; Covington; LA; 70433; U.S.A.
Rexilius, J.P.; International Stratigraphic; Consultants Pty Ltd.; PO Box 26; Cottesloe; WA 6011; AUSTRALIA
Rio, Domenico; Dip. Geologia e Paleontologia; Universita degli Studi Padova; Via Giotto 1; Padova; 35137; ITALY
Romaniv, Anna M.; Inst. of Geol and Fuel Geochem.; Ukrainian Acad. Sci.; Naukova str. 3a; Lvov; 290053; UKRAINE
Romein, A.J.Ton; LPP Foundation; Heidelberglaan 2; Utrecht; 3584 CS; THE NETHERLANDS
Root, Stephan A.; Mobil Exploration & Prod. Technical Centre; PO Box 650232; Dallas; Texas; 75221-0232; U.S.A.
Rossi, Mariagrazia G.N.E.; Servizio Geologico Nazionale; Largo S. Susanna 13; Roma; 00187; ITALY
Roth, Peter H.; Dept. Geology & Geophysics - WBB 717; University of Utah; Salt Lake City; Utah; 84112-1183; U.S.A.
Russell, E.E.; Department of Geology; Mississippi State University; MS; 39762; U.S.A.
Russell Sr., M.D.; 6507 Donerail Trail; Tallahassee; FL; 32308; U.S.A.
Rutledge, David; Dept. of Geological Sciences; University College London; Gower Street; London; WC1E 6BT; U.K.
Saavedra, Alfredo R.; GIS Océanol. et Géodynam.; Univ. de Bretagne Occid.; 6 Ave le Gorgeu; Brest; 29287; FRANCE
Sadek, Ali; Geology Department; Faculty of Science; Cairo University; Cairo; EGYPT
Saez, Carolos Lancis; Ciencias Ambientales div Geologia; Univ. de Alicante; Apartado 99; Alicante; SPAIN
Salis, Katharina von; Geologisches Inst., ETH-Zentrum; Zürich; CH-8092; SWITZERLAND
Salomon, Ralph A.; W.E.B.G. Paleontology; Amoco Prodn. Co.; PO Box 3092; Houston; Texas; 77253-3092; U.S.A.
Sanchez Rios, Maria Antonieta; Instituto Mexicano del Petroleo; Eje Central Lazaro Cardenas No 152; Delegacion Gustavo A. Madero; D.F.; 07730; MEXICO
Sato, Tokiyuti; Inst. of Applied Earth Sciences; Akita University; Tegata Gakuendo 1-1; Akita; 010; JAPAN
Saxena, Rejesh Kumar; Kali Mandir Road; Opposite Gatta Factory; General Mahadev Singh Road; Kanwali; Dehradun (U.P.); 248001; INDIA
Sblendorio-Levy, J.; Stratigraphic Services; Shell Oil Company; PO Box 481; Houston; Texas; 77001; U.S.A.
Scarpato Cunha, A.A.; PETROBRAS; Av. Ilha do Fundao Q. 7; Cidade Universitaria; Rio de Janeiro; RJ. CEP 21910;
BRAZIL
Shafik, Samir; B of Mineral Resources; PO Box 378; Canberra City; ACT 2601; AUSTRALIA
Shcherbinina, Ekaterina; Inst. of Lithosphere of the Russian Acad. of Sci.; Staromonetny 22; Moscow; 109180; RUSSIA
Shin, Im Chul; Dept. of Geology; University of Nebraska; Lincoln; NE; 68588; U.S.A.
Shrakoma, Minami-Hinata; Chi. Chosei-Gun Chiba; Nihon Tennen Gas Kyogo Co. Ltd.; Tokyo; JAPAN
Shumenko, Stanislav I.; Geological Faculty; State University; Kharkov; 310077; UKRAINE
Siesser, William G.; Department of Geology; Vanderbilt University; Nashville; Tennessee; 37235; U.S.A.
Singh, Pratap; Geoscience Labs.; ONGC 188; Chandra Bhawan; Arya Samaj Lane, Ratanada; Johdhpur; 342001; INDIA
Slezak, Janus M.; Inst. of Geol. Sciences; Jagellonian Univ.; Olenndry 2a; Krakow; 30065; POLAND
Smith, Charles C.; Geol. Survey of Alabama; PO Box D; Tuscaloosa; Alabama; 35486; U.S.A.
Spaulding, Stacia A.; 1929 Brighton Place; Harvey; LA; 70058; U.S.A.
Staerker, T.S.; Dept. of Geology; Florida State University; Tallahassee; FL; 32306; U.S.A.
Starkie, Steve P.; Dept. of Geological Sciences; University College London; Gower Street; London; WC1E 6BT; U.K.
Starratt, Scott W.; U.S. Geological Survey MS-959; 345 Middlefield Road; Menlo Park; CA; 94025; U.S.A.
Stefano, Agata di; Piazza Europa 16; Acireale (CT); 95024; ITALY
Stefano, Enrico di; Istituto di Geologia; Corso Tukory 131; Palermo; 90134; ITALY
Steinmetz, John C.; Marathon Oil; Expl. and Prod. Technology; PO Box 269; Littleton; Colorado; 80160; U.S.A.
Stoykova, Kristallina H.; Geol. Inst. of Bulgarian Acad. of Sci.; Acad G. Boncev Str.; bl 24; Sofia; B-1113; BULGARIA
Stradner, Herbert; Bibliothek der Geol.; Bundesanstalt III; Rasumofskygasse 23; Wien; A-1031; AUSTRIA
Styzen, M.J.; Shell Oil Company; PO Box 61933; New Orleans; LA; 70161; U.S.A.
Su Xin; GEOMAR; Marine Geowissenschaften; Wischhofstrasse 1-3; Gebaude 4; Kiel 14; D-2300; GERMANY
Šutovská, Katarina; Katedra paleontologie; Karlovy Univ.; Albertov 6; Praha 2; 12843; CZECH REPUBLIC
Švábenická, Lilian; Český Geologický ústav; Malostranské náměstí 19; Praha 1; 118.21; CZECHOSLOVAKIA
Swift, Alison M. Merker; Microspira Ltd.; 17 Carrington Cres; Wendover; Aylesbury; Buckinghamshire; HP22 6AW; U.K.
Tabatchnikova, I. P.; VSEGEI; Leningrad; 199026; RUSSIA
Tanaka/Takayanagi, Yuichiro; Inst. of Geol. & Palaeont.; Tohoku University; Sendai; 980; JAPAN
Thierstein, Hans R.; Geological Institute; ETH-Zentrum; Zürich; CH-8092; SWITZERLAND
Toker, Vedia; Ankara Universitesi; Fen Fakultesi Jeoloji Bolumu; Ankara; TURKEY
Triantaphyllou, Maria; Lysippou 7; Athens; GR-11635; GREECE
Ushakova, Maola G.; Inst. Oceanology; Acad. Sci.; Krasikova 23; Moscow; 117210; RUSSIA
Varol, Osman; Varol Research; Biostratigraphical Consultancy; P.O. Box 714, Conwy; Gwynedd; LL32 8QH; U.K.
Verbeek, Joost W.; Netherlands Geol. Surv.; R. Holkade 10; PO Box 157; Haarlem; 2000 AD; THE NETHERLANDS
Verdenius, J.; Inst. for Kontinental; Sokkelundersokelser; Trondheim; 7034; NORWAY

Villa, Giullana; Istituto di Geologia; Via Kennedy 4; Parma; 43100; ITALY
Vzbek, Mohamed Khaled; Embassy of Syrian Republic; 18 Abil Alrhemsabri Street; Cairo-Dokki; EGYPT
Wadsworth, Andrew; 72 Cammel Rd; Ferndown; Dorset; BH22 8SB; U.K.
Waghorn, D.B.; PO Box 1818; Wellington; NEW ZEALAND
Wagreich, Michael; Institute of Geology; University of Vienna; Universitatstr. 7; Wien; A-1010; AUSTRIA
Wang C.; Institute of Geology; Chinese Academy of Geol. Sci.; Baiwanzhuang Road; Beijing; 100037; CHINA
Wang Naiwen; Inst. of Geology; Chinese Academia of Geological Sciences; Beijing; CHINA
Wang Pinxian; Dept. of Marine Geology; Tongji Univ; Shanghai; 200092; CHINA
Waterman, A.S.; Paleo-Data Inc; 6619 Fleur de Lis Drive; New Orleans; LA; 70124-1499; U.S.A.
Watkins, Dave K.; Department of Geology; University of Nebraska; Lincoln; NE; 68588-0340; U.S.A.
Wedlich, Konrad F.; Inst. f. Paläontol und Historische Geologie; Richard-Wagnerstr. 10; Munchen 2; D-8000; GERMANY
Wei, Kuo-Yen; Dept. of Geology & Geophysics; Yale University; New Haven; CT; 06511; U.S.A.
Wei, Wuchang; Scripps Inst. of Oceanography; Univ. California San Diego; La Jolla; CA; 92093-0215; U.S.A.
Westbroek, Peter; Gorlaeus Lab. R.U.L.; Einsteinweg 5; PO Box 9502; Leiden; 2300 RA; THE NETHERLANDS
White, Richard J.; Exploration; Amoco (UK) Exploration Company; Amoco House, West Gate; London; W5 1XL; U.K.
Williams, J.; Dept of Geology; CB#3315 Mitchell Hall; Univ. of North Carolina; Chapel Hill; NC; 37599-3315; U.S.A.
Windley, Dawn E.; Dept. of Geological Sciences; University College London; Gower Street; London; WC1E 6BT; U.K.
Winter, Amos; Dept. of Marine Sci.; Univ of Puerto Rico; PO Box 5000; Mayaguez; PR 007095000; U.S.A.
Wise, Sherwood W.; Dept. of Geology; Florida State University; Tallahassee; FL; 32306; U.S.A.
Wornardt, Walter W.; Micro-Strat. Inc.; 5755 Bonhomme Ste-406; Houston; Texas; 77036-2013; U.S.A.
Wyatt, Antony R.; Institute of Earth Studies; U.C.W. Aberystwyth; Dyfed; SY23 3DB; U.K.
Yan Zhiguang; Dept. of Geology; Hebei College of Geology; Shijiazhuang; Hebei; 050031; CHINA
Young, C.R. (Bob); Phillips Petroleum Company; 256 GB; Bartlesville; Oklahoma; 74004; U.S.A.
Young, Jeremy R.; Palaeontology Dept.; The Natural History Museum; Cromwell Road; London; SW7 5BD; U.K.
Yuan Yong; Institute of Oceanology; Academia Sinica; Qingdao; CHINA
Yulin Xu; Department of Geology; China University of Geosciences; Xueyuan Road 29; Beijing; 100083; CHINA
Zaninetti, L.; Lab de Paléontologie; 13 Rue des Maraichers; Geneva 4; CH-1211; SWITZERLAND
Zhong Bizhen; Nanhai East Oil Co.; Guangzhou; CHINA
Zhong Shilan; Nanjing Inst. of Geology and Palaeontology; Academia Sinica; Nanjing; 210008; CHINA
Zhong Xiaochun; Res. Inst. of Petroleum Exploration and Development; Beijing; CHINA
Ziveri, Patrizia; Dept. di Geol. Paleontologia e Geofisica; Univ degli Studi Padova; Via Giotto 1; Padova; 35137; ITALY
Zucchi, Donata; Stratigraphic Services Int. Ltd.; Surrey Research Park; Guildford; Surrey; GU2 5YL; U.K.
Zylstra, G.; Inst. Syst. Bot.; Heidelberglaan 2; Utrecht; 3584 CS; THE NETHERLANDS

INSTITUTIONAL AND LIBRARY MEMBERS

AGIP SPA; S Donato Milanese; Milano; 20097; ITALY
Australian Geological Survey Organisation; The Librarian; GPO Box 378; Canberra City; ACT 2601; AUSTRALIA
Biosis U.K.; Edit. Manager; Garforth House; 54 Micklegate; York; N. Yorkshire; YO1 1LF; U.K.
Birbal Sahni Inst. of Palaeobotany; The Librarian; 53 University Road; G.P.O. Box 106; Lucknow; 226007; INDIA
Brockhaus Commission; Kreidlerstrasse 9; Postfach 1220; Kornwestheim; D-7014; GERMANY
Chevron USA Inc.; The Librarian; 935 Gravier Street; New Orleans; LA; 70112; U.S.A.
Corelab Indonesia; The Book Manager; PO Box 2307; Jakarta; 10001; INDONESIA
ETH-Zentrum; Geologisches Institut Bibliothek; Sonneggstr 5; Zürich; CH-8092; SWITZERLAND
Field Museum Natural History; The Librarian; Roosevelt Road at Lake Shore Drive; Chicago; IL; 60605-2498; U.S.A.
Geologische Bundesanstalt - Wien; ; Wien; A-1031; AUSTRIA
Gulf of Suez Petroleum Co; Support Services General Manager; New Maadi; PO Box 2400; Cairo; 11511; EGYPT
Hungarian Geological Institute; The Librarian; M Konyvtar; Pf. 106; Budapest; H-1442; HUNGARY
INIST-SIM; Bibliotheque; Centre de Documentation; 26 Rue Boyer; Paris 20; 75971; FRANCE
Inst. of Geol. & Mining Research; Chief of Library; 70 Messoghion Street; Athens; 11527; GREECE
NAM; Bibliotheek; Postbus 28000; Assen; 9400 HH; THE NETHERLANDS
New York State Library; The Librarian; Cultural Education Centre; Empire State Plaza; Albany; New York; 12230; U.S.A.
Niedersächsische Staats & Univ.; Zugand II A - ZSS; Prinzstrasse 1; Gottingen; D-3400; GERMANY
Petronas Library; The Librarian; 23rd Floor Nenara Dayabumi; P J Box 12444; Kuala Lumpur; 50778; MALAYSIA
Sarawak Shell Berhad; XGS/1; 98100 Lutong; Sarawak; MALAYSIA
Scripps Institute of Oceanography; Library C 075 C; La Jolla; CA; 92093; U.S.A.
Shell Oil Company; Stratigraphic SVCS/WCK 5386; PO Box 576; Houston; Texas; 77001-0576; U.S.A.
Shell UK Explor. & Prod.; UEX/43 - Library; Shell Mex House, The Strand; London; WC2R ODX; U.K.
SNEA(P); Service Inform. Docum.; Les Allées/Bureau C/012; 26 Avenue des Lilas; Pau; 64018; FRANCE
Stanford University; Serials Dept., Green Library; Stanford; CA; 94305; U.S.A.
Turkish Petroleum Library; Mustafa Kemal Mahallesi 2; Cad. No. 86/PO Box 209; Ankara; 06520; TURKEY
Universitat Bern; Fachbereichsbibliothek Buhlplatz; Periodical Dept.; Postfach 2649; Bern; CH-3001; SWITZERLAND
University of California; Geology-Geophysics Library; 405 Hilgard Avenue; Los Angeles; CA; 90024; U.S.A.
University of Southampton; Geol. Dept. (Micropalaeontology); Highfield; Southampton; SO9 5NH; U.K.
Utrecht Rijksuniversiteit; Aardw. Fac. Bib.; Postbus 80.021; Budapestlaan 4; Utrecht; 3508 TA; THE NETHERLANDS

NEW ZEALAND
Lower Hutt Edwards
Wellington Waghorn

NORWAY
Bergen Heimdal
Trondheim Verdenius

OMAN
Muscat Kapellos

PAPUA NEW GUINEA
Port Moresby Moran

THE PHILIPPINES
Quezon City Leon

POLAND
Krakow Slezak

PORTUGAL
Lisboa Caçhao

ROMANIA
Bucharest Leu
 Marunteanu
 Melinte
Cluj - Napoca Meszaros

RUSSIA
Moscow Dmitrenko
 Golubev
 Muzilev
 Shcherbinina
 Ushakova
St. Petersburg Nikiforova
 Tabatchnikova

SLOVAK REPUBLIC
Bratislava Bystrická
 Halásová
 Korábová
 Raková

SLOVENIA
Ljubljana Pavšič

SOUTH AFRICA
Cape Town Giraudeau

SPAIN
Alicante Saez
Barcelona Curto
 Matias
Bilbao Gorostidi
Granada Gallego
 Perez
Linares Aguado
Madrid Aguilar
 Bonnemaison
 Pignatelli
Salamanca Flores
Valencia Alcober

SWEDEN
Stockholm Backman
 Gard
 Olafsson
Uppsala Henriksson

SWITZERLAND
Berne Barbin
Geneva Zaninetti
Zürich Hsu
 von Salis
 Thierstein

TAIWAN
Taipei Chen

TANZANIA
Dar-es-Salaam Karega

TURKEY
Ankara Toker

UKRAINE
Dnepropetrov. Bogdanovitch
Kharkov Shumenko
Kiev Kalinitchenko
 Luleva
Lvov Andreeva-Gr.
 Romaniv

UNITED KINGDOM
Aberdeen Harpur
Buckinghamshire Swift
Cambridge Chepstow-L.
Dorset Wadsworth
Dyfed Wyatt
Gwynedd Girgis
 Varol
Kingston Garratt
London Bown
 Burnett
 Houghton
 Jeremiah
 Lord
 Lord
 Ozkan
 Radford
 Rutledge
 Starkie
 White
 Windley
 Young
Nottingham Hine
Surrey Cooper
 Jordan
 van Niel
 Zucchi
Watford Gallagher
 Hulme

UNITED STATES OF AMERICA
Alabama Smith
Alaska Olsen
California Bukry
 Filewicz
 Gring
 Kheradyar
 Kling
 Leffingwall
 Marks
 Miller
 Quintero
 Starratt
 Wei
Colorado Lohman
 Steinmetz
Conneticut Leshner
 Wei
Florida Covington
 de Kaenel
 Liu
 Pospichal
 Russell Sr.
 Staerker
 Wise
Louisiana Boudreaux
 Constans
 Dunn
 Morin
 Reimers
 Reugger
 Spaulding
 Styzen
 Waterman
Massachusetts Beaufort
 Ehrendorfer
Puerto Rico Winter
Mississippi Russell
North Carolina Arfstrom
 Bralower
 Mock
 Williams
Nebraska Beck
 Liu
 Shin
 Watkins
New Mexico Ellis
New York Fisher
Oklahoma Young
Tennessee Siesser
Texas Bergen
 Elliot Jr
 Firth
 Gartner
 Jiang
 Joyce
 Pearce
 Percival Jr
 Root
 Salomon
 Sblendorio-Levy
 Wornardt
Utah Rahmon
 Roth
Virginia Bybell

VENEZUELA
Caracas Duran

NEWSLETTER - ADVICE TO CONTRIBUTORS

TYPES OF CONTRIBUTION

The newsletter is essentially informal and contributions of any type submitted in any form will be considered, if not necessarily accepted. The following notes are a guide to possibilities rather than a set of directions.

A. BIBLIOGRAPHIES: These are produced by the bibliographers. Any suggestions, reprints of articles, and details of omissions should be sent to them directly.

B. ARTICLES: Short articles on any aspect of nanoplankton work are welcomed. Discussion, review, synthesis, and methodology articles are particularly welcome. Any articles with scientific content may be reviewed and should be submitted at least two months before the final copy deadline. The newsletter is a valid publication for taxonomic articles.

C. REVIEWS: Reviews of books, equipment items, or computer software and conference reports are welcome. To avoid duplication the idea may be suggested to the editor in advance of submission.

D. NEWS, & NOTES: Any news items, on forthcoming conferences, research projects, new appointments are welcome.

SUBMISSION PROCEDURE

Two copies should be sent of all submissions. Include Fax number if available, for proof checking. News items and initial drafts of articles can be sent in draft form. Other items should be sent as proof ready copy *or* on computer disc *or* by EMAIL.

PROOF READY COPY: Submit on A4 paper (210x297mm) with 2.5cm left, right and top margins, 3.5cm bottom margin. Single spacing, 10point text. If possible use a laser printer.

SUBMISSION ON DISC: Include print-out and details of system used. I can easily handle the following. *IBM/MS-DOS*, any format, 5.25" or 3.5", discs (ideal 3.5", 1.44Mb). Text in any common word processor format, or ASCII files (ideal WordPerfect 5.1 or DCA-RFT). *MacIntosh*, 3.5" discs, any word processor program or ASCII files. Alterations to the text, other than for spelling or minor mistakes, will be checked with the author

EMAIL SUBMISSION: This is a fine alternative to sending discs, and should be available in most institutions. BUT, in the museum we are still in the process of installing a sensible system. Please use the subject field as a sub-address ("J.YOUNG, 8996") and send a fax to alert me to check the computer. The address is: *PALAEO@NHM.IC.AC.UK*

DIAGRAMS: Should be submitted as very clean computer printouts, photographs or photocopies of final size, do not send large or delicate originals.

REFERENCES: Use standard (World List) abbreviations, and *format of examples below*. ODP & DSDP volumes should be treated as periodicals using the following abbreviations: IRDSDP; Proc. ODP Init. Rep.; Proc ODP Sci. Res.

Spencer S. & Dobb A. 1988: New observations on Upper Cretaceous vomatidae. *J. Wom. Res.*, 25, 35-67.

McCarthy J.J. 1980: Nitrogen. In, Morris I. (ed.) "The Physiological Ecology of Phytoplankton", Blackwell, p.191-234.