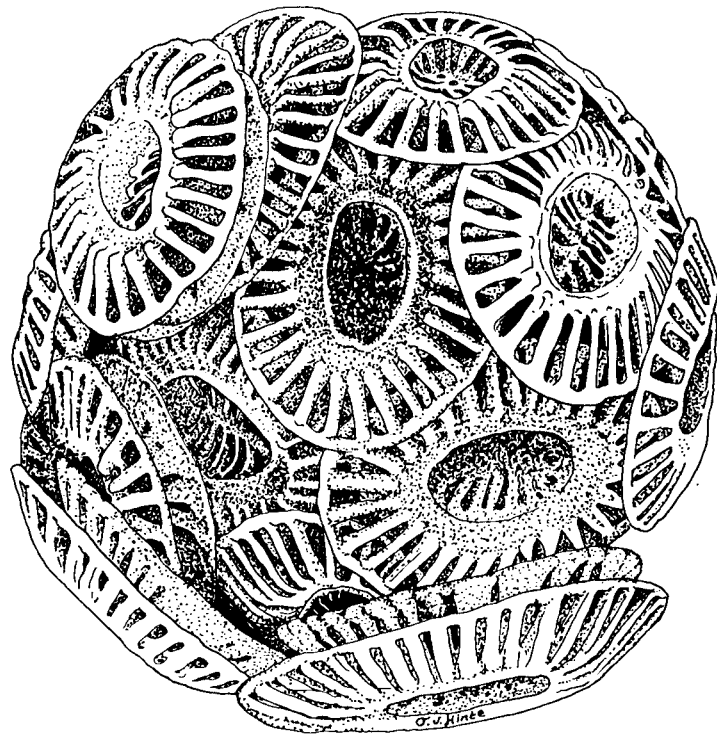


INA

NEWSLETTER



INTERNATIONAL NANNOPLANKTON ASSOCIATION

VOLUME 10

NUMBER 2

1988

INTERNATIONAL NANNOPLANKTON ASSOCIATION

President

K. Perch-Nielsen
17 Orchard Rise
RICHMOND
Surrey TW10 5BX
United Kingdom

Secretary / Treasurer

M. Jakubowski
Robertson Research International Ltd
Ty'n-y-coed
Llanrhos, LLANDUDNO
N. Wales
United Kingdom

Editor

S.E. van Heck
Shell Internationale Petroleum Mij.
EPX/36
PO Box 162
2501 AN Den Haag
The Netherlands

Bibliographer

J.C. Steinmetz
Expl. & Prod. Technology
Marathon Oil Company
P.O. Box 269
LITTLETON
Colorado 80160
U.S.A.

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!! NOTE !!

SALES OFFICE

Separate issues of the INA Newsletter can be obtained from the Secretary/
Treasurer. Price per issue is: - for non-members £ 10.- (\$18.-)
 - for members £ 5.- (\$ 9.-)
 - for student members £ 2.50 (\$4.50)

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MAILING POLICY

Recent issues will be mailed by surface mail for countries inside Europe,
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Applications for membership of the International Nannoplankton Association
should be directed to the Secretary/Treasurer. Annual dues: £ 10.-/US\$ 18.-
Those who pay their dues in U.S. dollars are urged to send them to John
Steinmetz (Marathon Oil, Expl. & Prod. Technology, P.O. 269, Littleton,
Col., U.S.A.). Checks or money orders should be made out to INA; no
account- or banknumber is necessary. Students can become a member for a
reduced price (£ 5.-/US\$ 9.--); please send a confirmation of your
student-status when applying for membership.

+++++

NEXT ISSUE

Contributions for the next issue of the INA Newsletter should be received
before March 1989. Please send your contributions to: The editor of the
INA Newsletter, S.E. van Heck (Address : see inside cover).

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Manuscripts should not exceed four pages, although it is at the editor's
discretion to accept longer papers. They will be reproduced in the INA
Newsletter without being re-typed. Hence the authors are entirely
responsible for the contents and quality of their contributions.
Manuscripts of poor quality can be refused by the editor. Format:
Manuscripts should be typed on A4 (this format); a blank margin of 2.5 cm
(1 inch) should border the upper, the left and the right side of each page,
and the margin on the lower side should be 3.5 cm (1.5 inch). DO NOT USE
DOUBLE SPACING, as this takes up too much space !

EDITORIAL

Your attention please for a few organisational matters. First of all, please notice the change of address of your editor. I have moved back to Holland, where my current address is:

Shell International Petroleum Mij. (or S.I.P.M.)
EPX/36
Postbus 162
2501 AN Den Haag
The Netherlands

Secondly, and in connection with the first, we are now looking for serious candidates to take over this Newsletter. I don't know how long I will stay in Holland, or where I will be posted next. But in case I move to some exotic place that lacks the facilities I have in this part of the world, someone will have to take over, or at least be able to handle the printing and mailing of the Newsletter. We are also looking for someone to take up the job of compiling the bibliography and taxonomic index, as John Steinmetz has been doing this for quite some years now and would like to redirect his energy to other matters. Candidates should have access to all major journals and a well-stocked library, for unfortunately very few authors take the trouble of sending their reprints. A sound knowledge of the ICBN is necessary as well, to spot nomenclatural mistakes. Another requirement is stability, as this job takes up quite some time, which you won't have if you spend half the year on DSDP cruises or conference trips.

PROCEEDINGS - The proceedings of the London Conference are now nearing completion. The galley proofs have been returned to the publishers, and they hope to have the book out before Christmas. We will then hear the final price. We have been promised the possibility to buy some books for a reduced price, so if you are interested, please let us know, for INA is not rich enough to invest a lot of money in a large stock. Contributors, sponsors and referees will receive a copy either free of charge, or at least for a minimal price. Don't expect any reprints though, for we have not been able to persuade the publishers to provide them, and they will charge a lot to the authors if they want to order them anyway.

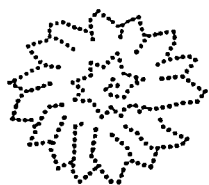
THIS ISSUE - In this issue you will find an update on the Florence Conference 1989, and an application form should be enclosed. We have not received any opinions on the 1991 meeting (see previous Newsletter), so if you want any influence on that decision, and you can't come to Florence, drop us a line.

Further in this issue you will find a report on the China (CH-INA) Meeting, two reviews, an overview of all Jurassic nannofossil literature compiled by Elisabetta Erba, a contribution by Ben Driever on *Dictyococcites perplexa* and a contribution by Wuchang Wei on a new species of *Heliolithus*.

Finally, I would like to remind you to pay your subscription so that we can continue in the next year.

Have a wonderful Christmas, and a very happy New Year !!!!

SvH



International Micropaleontology Association FLORENCE MEETING 1989

Second circular INA Florence Meeting 18-20 September, 1989

Registration fees: LI (lire italiane) 80.000 or US \$60 for INA members
LI 100.000 or US \$80 for nonmembers
LI 60.000 or US \$45 for students

Registration and payment of the registration fees, must be sent before **May 30, 1989**. Payment of the registration fees should be done by money order to Dr. Simonetta Monechi (address above in the application form), or by cheque (bonifico bancario) payable to:
Simonetta Monechi
Credito Italiano (sede) - Bank account no. 70641/00
50121 Firenze
Italia

Registration, Lectures and Departure for Field-Trips:

Dipartimento Scienze della Terra
Via La Pira, 4
50121 Firenze
Italia

Abstracts

Participants are invited to submit abstracts for contributions. Abstracts must be in English and should not exceed 2 pages, including figures (no photographs) and references. The abstracts will be reproduced in a volume using the author typed text exactly as submitted. Use standard A4 paper with 30 lines per page and 3 cm margins. The Courier 12 should be used as character, spacing 1. Type title, author(s) and address as in the following example:

COCCOLITH ZONATION FOR PALEOGENE STRATA IN THE OREGON COAST RANGE

D. Bukry (Scripps Institution of Oceanography, La Jolla, California 92093)
P.D. SNAVELY (U.S. Geological Survey, Menlo Park, California 94025)

Paleogene transoceanic coccolith zones have been identified from the marine volcanic and sedimentary rock sequence of the Oregon Coast Range. Our studies indicate that the lower Eocene Zone

The deadline for submission of abstracts is **May 15, 1989**.

Posters

The size of individual posters is 1.50x1.10 m.

Proceedings

Proceedings may be published in the "Rivista Italiana di Paleontologia e Stratigrafia", but we are in contact also with "Marine Micropaleontology" and "Palaeo-3".

Accommodation

For hotel accommodation the Travel Agency Giubbi Jet, Via S. Jacopino 34, Firenze, will send you details.

Cheap accommodation is possible for students. Please, let me know, if interested, when returning the application form.

Excursion

Excursion A: Gubbio area on September 21-22, cost ca. LI 100.000 or US \$ 80

Excursion B: Excursion B is from September 23 to September 30. It includes the visit of the classical Late Miocene-Plio-Pleistocene sections in Caltanissetta, Agrigento Basin (Capo Rossello, Eraclea Minoa, Falconara, Gela-S. Nicola - Sicily); furthermore the visit to sections in Calabria (Milankovich cycles in the Trubi, laminated and sapropelic sediments, Plio-Pleistocene boundary stratotype). The approximate cost of this excursion is about US \$1000 inclusive of air and ground transportation, hotels and meals. To keep prices as low as possible we need to be sure of the number of participants in short time, and we will request as a guarantee the pre-payment of this excursion fees.

Deadlines

February 28, 1989 - Deadline for the application form

May 15, 1989 - Deadline for the Abstracts

May 30, 1989 - Payment of registration fees

June 15, 1989 - Mailing of the third circular with details to participants

Deadlines must be respected by the applicants to allow an efficient organization of the Meeting.

52 members of INA have shown their interest in the Florence Meeting of September 1989. These people come from 17 countries, and it has been suggested to change the proposed date September 11-16 because of the XXI European Micropaleontological Colloquium and the III Paleoceanographic Conference occurring in the same period. Therefore it has been decided to postpone the meeting to September 18-20, 1989.

The requests for the topics of the workshops have been the following:

Living and ecology of coccoliths	(17 requests)
Morphology	(15 ")
Reliability of biostratigraphic data	(38 ")
High latitude biostratigraphy	(19 ")
Paleoecology-paleoceanography	(5 ")

We will therefore tentatively ask for talks and posters mainly on these 5 topics.

We will soon send details on the organization and the program of the meeting.

CALL FOR NANNO-MONOGRAPHS

On occasion of the INA Florence Meeting, 1989 the Editorial Board of *Paleontographica Italica* (the first established Italian paleontological journal) offered to prepare a special issue dedicated to monographic works on calcareous nannofossils. The publication of these monographs is totally free of charge for the Authors.

CH-INA MEETING 8-10 September 1988

The first INA-Meeting in Asia was held as a workshop during the first international conference on Asian Marine Geology at Tongji University in Shanghai, China. Three half days of formal and less formal talks and discussions by up to 20 Chinese colleagues and a few "foreigners" (M.-P. Aubry, K. Perch-Nielsen, A. Romein and J. Young - sadly no colleagues from nearby Taiwan, Japan or eastern Russia, nor from Australia or India) and a poster session were held. The topics ranged from the evolution of coccoliths across the Cretaceous - Tertiary boundary over the problems of zonations in the Neogene of the area to investigations of the coccoliths in the sediments of the seas around China and morphological variation in *E. huxleyi*. A microscope was available for the study of slides, but little use was made of this facility.

During the meeting we compiled a list of calcareous nannofossil workers in China, including their addresses (Table 1) and the topics on which they work (Table 2). X. Cheng was elected chairman of this CH-INA group. He will copy the INA-Newsletter and send it out to the members of CH-INA. This saves us both printing and mailing costs which can not be recovered by members fees.

The next INA-Meeting in Asia could take place in connection with the II International Conference on Asian Marine Geology, which will be held during the 29th International Geological Congress in Tokyo, 1992. There is enough time to find out whether it should be before, during or after the IGC in Tokio or somewhere else in Japan.

In the name of INA I would like to thank Wang Pinxian for the perfect organisation of this meeting - it is certainly not easier to organise a gathering of scientists in Chiana than it is in Europe or the USA!

Katharina Perch-Nielsen

TABLE 1

Name	Address
Cai Chongyang	Nanjing Institute of Geology and Palaeontology, Academia Sinica, Nanjing 210008, China
Cheng Xinrong	Dept. of Marine Geology, Tongji University, Shanghai 200092, China
Duan Weiwu	South China Sea Geological Investigation, Ministry of Geology, P.O. Box 850, Guangzhou, China
Hao Yichun *	China University of Geosciences, Beijing, China
Huang Lushen	China Corelab No.1 Shang Yie Ware House, Unit D Tai Zi Road, CMSN Shekou Industrial Zone, Shekou 1696, China
Huang Yongyang	South China Sea Geological Investigation, Ministry of Geology, P.O. Box 850, Guangzhou, China
Jiang Yanwen	Dept. of Geology, Jiangnan Petroleum College, Shashi, Hubei, China
Li Wenqin	First Institute of Oceanography, SOA, Qingdao, China
Lin Meihua	Institute of Oceanology, Academia Sinica, Qingdao, China
Liu Chuanlian	Dept. of Marine Geology, Tongji University, Shanghai 200092, China
Su Xin *	China University of Geosciences, Beijing, China
Wang Congyou	Institute of Geology, Chinese Academia of Geological Sciences, Beijing, China
Wang Naiwen	Institute of Geology, Chinese Academia of Geological Sciences, Beijing, China

TABLE 1 (cont)

Wang Pinxian	Dept. of Marine Geology, Tongji University, Shanghai 200092, China
Wei Wuchang	Dept. of Geology, Florida State University, USA
Xu Liying *	Laboratory of Marine Geology, Bureau of Marine Geology of Shanghai, Dugao Road 627, Coaqliao, Shanghai, China
Xu Yulin	China University of Geosciences, Beijing, China
Yan Zhiguang	Dept. of Geology, Hebei College of Geology, Shi Ja Zhuang, Chian
Zhong Bizhen *	Nanhai East Oil Company, Guangzhou, China
Zhong Shilan	Nanjing Institute of Geology and Palaeontology, Academia Sinica, Nanjing 210008, China
Zhong Xiaochun *	Research Institute of Petroleum Exploration and Development, Beijing, China

* Female

TABLE 2

	Holocene	Pleistocene	Pliocene	Miocene	Paleocene	Cretaceous	Other	A R E A S
	offshore land	offshore land	offshore land	offshore land	offshore land	offshore land		
Cai Chongyang	X							Huang(Yellow) Sea
Cheng Xinrong	X	X	X	X				South China Sea, East China Sea
Duan Weiwu		X	X	X	X			South China Sea, Central Pacific
Hao Yichun	X	X	X	X	X	X		South & East China Sea, W. & E. China
Huang Lushen	X	X	X	X				Pearl River Basin
Huang Yongyang	X	X	X	X				South China Sea, Centre-West Pacific
Jiang Yanwen					X	X		Western China, Tarim Basin
Li Wenqin	X	X	X					Southern Huanghai Sea, Bohai Sea
Lin Meihua	X							West Pacific
Liu Chuanlian	X	X	X	X				South China Sea
Su Xin	X	X	X	X	X	X		South & East China Sea, W. & E. China
Wang Congyou	X	X	X	X	X			East China Sea
Wang Naiwen		X	X					Beijing Plain
Wang Pinxian	X	X	X	X	X			South China Sea, East China Sea
Wei Wuchang	X	X	X	X	X	X	X	Southern Ocean
Xu Liying	X	X	X	X	X			East China Sea
Xu Yulin	X	X	X	X	X			South China Sea, East China Sea
Yan Zhiguang	X	X	X	X		X		South China Sea
Zhong Bizhen		X	X	X				South China Sea
Zhong Shilan	X	X	X	X		X		Western China, South & East China Sea
Zhong Xiaochun			X	X				Eastern China
Ton Romein	X	X	X	X				Pearl River Basin

REVIEW

DRIEVER, B.W.M., 1988. Calcareous nannofossil biostratigraphy and paleoenvironmental interpretation of the Mediterranean Pliocene. *Utrecht Micropaleontological Bulletins*, 36, 245 pp, 55 Figs., 32 Tables, 13 Plates. Sold for f 63.- by U.M.B., Budapestlaan 4, 3584 CD Utrecht, The Netherlands

This is the fourth of the now familiar "green books" from Utrecht to be dedicated to calcareous nannofossils. The first, by J.W. Verbeek, dealt with the Middle and Upper Cretaceous; the second, by A.J.T. Romein, treated the Early Paleogene and the third, by S. Theodoridis, concentrated on the Miocene. The present one deals mainly with the Pliocene, but also ventures into the Lower Pleistocene. Will the next make the connection between the Upper Pleistocene and the living forms?

While Verbeek described and illustrated most species he could find and registered their distribution in time, introduced a new zonation and measured a few parameters thought to be related to evolution of a few selected species, Romein's emphasis was mainly biostratigraphy and the lineages in most Paleocene genera. Theodoridis concentrated on the revision of two genera in the framework of their evolution and of a refined zonation. In the present volume, DRIEVER continues the trend of looking in some detail at both the species concepts used in biostratigraphy and the quantitative distribution of morphotypes. There is no chapter entitled "evolution" or "lineages" among the 14 chapters including: INTRODUCTION; BIOZONATION OF THE MEDITERRANEAN PLIOCENE; MATERIAL & METHODS; MOELAERHABDACEAE IN BIOSTRATIGRAPHY, THE MORPHOLOGY OF THEIR COCCOLITHS, THE PRESENT STATE OF THEIR TAXONOMY, THE QUANTITATIVE COMPOSITION OF THEIR ASSOCIATIONS IN THE PLIOCENE OF CRETE AND ITALY; THE ROLE OF *EU-DISCOASTER* IN BIOSTRATIGRAPHY, THE COUNTING METHOD, MATERIAL AND TAXONOMY USED IN THEIR ANALYSES, THE FREQUENCY DISTRIBUTION OF IT'S SPECIES IN THE MEDITERRANEAN PLIOCENE; BIOSTRATIGRAPHY AND CHRONOLOGY and THE PALEOENVIRONMENTAL SIGNIFICANCE OF THE CALCAREOUS NANNOFOSSILS IN THE MEDITERRANEAN PLIOCENE. Have we given up on evolution? Maybe not- but it is left out here in order to concentrate on I.G.C.P. project no 74/I/1: Accuracy in time.

In one way or another, most of our work benefits biostratigraphic resolution. The amount of data collected and presented in this paper is staggering and will not only be useful for the finer subdivision of the Mediterranean Pliocene. Here, the author distinguished 12 biohorizons with the help of the Noelaerhabdaceae in the Pliocene and the lowermost Pleistocene alone. He further subdivides NN12 to NN19 into 15 subzones.

Personally, I do not like the family name Noelaerhabdaceae, because it is based on *Noelaerhabdus*, the only genus of the family with a central process. While the other genera of the family are generally common and widespread, *Noelaerhabdus* was only found in the Miocene of Yugoslavia; it is thus not an important genus. To call the whole family after this form may be "legally" right, but it goes against my common sense. In his list of "parameters used in the taxonomy of the Noelaerhabdaceae", no central process is mentioned and the type genus is not included in the list of genera of the family

I have long felt that it was not satisfactory to disregard what we often lump into "small *Reticulofenstra*" or "small *Prinsiaceae*" for biostratigraphic purposes. With the work of Backman, Pujos, Samtleben and others it has become possible to use them, and this possibility has been further explored and applied in the present work.

Somehow I was fascinated by the approach to the quantitative analysis of the Noelaerhabdaceae, which is based on morphotypes labeled with numbers and letters rather than on species. But then, some 50 pages later, "for practical reasons, we assign our categories to currently used genera". Yes - it is easier for most of us to communicate names rather than combinations of numbers and letters. An exception seems to be when we communicate with paleomagneticians, who prefer zone numbers to sometimes changing names.

The use of "we" when meaning "I" - I know it has been the custom for years - but it made me smile, when I read "we did not write down individual observations, but we spoke them into a microphone/cassette recorder". Was there a choir - or just an echo?

The figures are numerous and well composed and drawn. The text is often on the small side, but just readable without (my first ever) spectacles. The SEM and LM pictures on the plates are of good quality, but I regret that the names of the fossils are not set just below the illustrations. Since Cambridge University Press could print such plates in Bolli et al's "Plankton Stratigraphy" back in 1985 and the INA-Newsletter could produce one earlier this year, I see no reason why Dutch printers could not be persuaded to do the same.

I would like to congratulate the author for this massive contribution to our knowledge about the calcareous nannofossils in the Pliocene of the Mediterranean area - his results will greatly influence future work towards the understanding of the global Pliocene and the rest of the Tertiary.

KPN

REVIEW

BOWN, P.R., 1987. Taxonomy, evolution, and biostratigraphy of Late Triassic-Early Jurassic calcareous nannofossils. *Special papers in Palaeontology no.38*, Palaeontological Association London, November 1987. ISBN 0901702358, 118 pp., 15 pls., 19 figs, 1 app. Price: £ 30.- ; Orders should be sent with payment to the Journal Subscription Manager at: Basil Blackwell, 108 Cowley Road, Oxford OX4 1JF, Great Britain.

The last few years have seen some well-documented studies on the earliest coccoliths, and this work gives a synthesis of, and elaborates on these findings. Frankly, I expected a complete overview and analysis of all the taxonomic and biostratigraphic data available so far, but the book is concerned only with the observations by the author with some references to other work. Having said that, the amount of material studied is so extensive, that very little is missed out and many new data have been added. The book covers virtually everything one would like to know about these nannofossils: systematics, morphology, evolution, biostratigraphy,

and even a section on provincialism. As such, it certainly is the most complete work on early nannofossils that exists so far, and for that alone this is a must for anyone interested in this period.

Introductory sections consist of a general introduction, a section on material and techniques, one on coccolith morphology and descriptive terminology and one on taxonomy. Interesting features here are that material was studied from Tunisia, off-shore Morocco, Timor, Argentina and Canada, as well as from traditional and new localities in Europe. This makes the work less 'eurocentric' (as the author calls it) than most other papers on this period. I was really curious to know just how many samples were studied from these areas, and whether they were isolated samples or complete sections, but unfortunately, for such information the reader is referred to a 67-page report deposited with the British Library. Whether that is freely available upon request is not clear, but seems doubtful as the work is not cited in the references. Two distribution charts are included in this section, but the occurrences are only plotted against the (Jurassic) timescale, and no sample indications are given. The section on terminology made me wonder whether we will ever reach a general terminology as other fossil groups seem to have, or whether we will for ever have a new chapter on terminology in each paper. The taxonomy section deals with the familiar problems caused by dimorphism and such, and the validity of a morphological classification. Although most nanno-specialists are familiar with these problems, opinions on their importance vary, and as such this section gave a useful statement of the principles applied by this author.

The statistics for the systematic section are as follows: The coccoliths are divided into 3 orders, Eifellithales, Podorhabdales and Watznaueriales, of which the latter is new. Within these orders 8 families are described (Mazaganellaceae is new), 3 subfamilies, 22 genera (of which 3 are new) and 50 species and subspecies, amongst which are several new species and new combinations. The remaining 5 species are assigned to 5 genera. The treatment of the taxa is thorough and comprehensive, and all taxa are illustrated, usually both in excellent SEM pictures and in LM. The sequence in which the taxa are described seems to be roughly in order of appearance, but not quite, which makes it difficult to find certain taxa. The index in the back helps, for although the taxa there are arranged systematically rather than alphabetically, there are not too many of them to make it difficult.

I hesitate to say much about the systematic classification, as this is rather subjective. But I did not like the use of *Thoracosphaera* for Triassic forms, I did not like the elimination of *Ellipsagelosphaera* which I find a useful genus, and I felt too much splitting had occurred at the supra-generic level. However, I stumbled over a few points. One is the use of the name Zygodiscaceae, 'based on the assumption that Mesozoic loxolith coccoliths gave rise to the similarly structured Tertiary forms which typify the Zygodiscaceae.', while in his discussion of the genus *Zeugrhabdotus* the author states that the name is used in preference to *Zygodiscus* because it 'is unlikely to be closely, if at all, related to them.' This is a contradiction. The other point is the treatment of *Parhabdololithus liassicus*, where assumed dimorphism results in the creation of two subspecies. First of all, if two coccoliths are supposed to have occurred on the same cell, they can't be assigned to two subspecies, as these are biological entities. Secondly, when a species is subdivided into two subspecies, the one containing the original type is automatically

established when the other is introduced, and should be assigned to the original author, so that the addition 'ssp. nov.' is incorrect. A third point is the new combination *Biscutum depravatum*, which should be *Biscutum depravatum*. This is mere sloppiness, as is a typo p.49, where reference to plate 6 should be plate 7. Another typo occurs on p.63, where reference is made to 'another species of *Lotharingius imprimus*', and the consistent citation of '*Retacapsa*' instead of '*Retecapsa*' further on in the book. I shall refrain from mentioning other typos, which on the whole occurred rarely.

The next chapter is entitled: Early evolutionary history of calcareous nannofossils. Attention is paid to general trends in changing morphology before describing the actual lineages. The latter are treated in great detail, and are well illustrated. The interesting feature here, of course, is that we start with the earliest known coccoliths, from which all the later forms are derived. A correct interpretation therefore has farbearing consequences. However, the limited number of forms available to build a hypothesis on does not make the task that much easier when we realise how little material is known from this period, and how many gaps necessarily exist. Reference to one such gaps ('lack of information from the Tethyan Hettangian') did not make clear whether this was due to a lack of the right sample material, or due to a general scarcity of nannofossils in that period, as appears to be the case with dinoflagellates. After all, another interesting correlation with the dinoflagellates the the timing of their origin, which must have occurred in the same period. I feel any speculation on this point should take the other major phytoplankton group into account. The last few sections on causes and processes seemed a bit too speculative in view of the very limited database.

The section on biostratigraphy is simple and straight-forward: a zonation is proposed for the Lower Jurassic (Hettangian to Toarcian) containing 8 zones numbered from JL1 to JL 8, some of which are divided into subzones. A rangechart is presented showing the correlation with the ammonite zonation.

The section on provincialism, finally, points out the differences between a Tethyan Realm and a Boreal Realm, and indicates a possible Pacific Realm.

On the whole, I found this an excellent piece of work, putting together all this information on the Triassic to Lower Jurassic coccoliths in a clear and concise way. Moreover, I thought it was very readable, which is quite an achievement for such a descriptive work. I therefore heartily recommend it to anyone interested in these early nannofloras, and indeed to anyone interested in nannofossil systematics, of which the foundations were laid in this period.

SvH

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Compiled by John C. Steinmetz

A354

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QUAT
TERT
CRET.U.
CRET-TERT
boundary
Atlantic.S. |

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QUAT
TERT.U.
CRET.L.
Atlantic.S.
Antarctic |
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Atlantic.S.
Antarctic |
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TERT.U.
Atlantic.S. |
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QUAT
TERT.U.
Atlantic.C. |
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[Nannofossils by J. Backman and H. Manivit.] | | |
| 2 | RUDDIMAN, W., SARNTHEIN, M., & SHIPBOARD SCIENTIFIC PARTY. | 1988 | strat.
QUAT
TERT.U.
CRET.U.
Atlantic.C. |
| | Site 661. [East of the northern end of the Kane Gap in the Sierra Leone Rise.]
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[Nannofossils by J. Backman and H. Manivit.] | | |
| 3 | RUDDIMAN, W., SARNTHEIN, M., & SHIPBOARD SCIENTIFIC PARTY. | 1988 | strat.
QUAT
TERT.U.
Atlantic.C. |
| | Site 662. [Eastern equatorial Atlantic.]
-In: Ruddiman, W., Sarnthein, M., et al., Proc. Init. Rep. (Pt.A) ODP, vol. 108, pp. 487-556, 20 figs., 8 tbs.
[Nannofossils by J. Backman and H. Manivit.] | | |
| 4 | RUDDIMAN, W., SARNTHEIN, M., & SHIPBOARD SCIENTIFIC PARTY. | 1988 | strat.
QUAT
TERT.U.
Atlantic.C. |
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-In: Ruddiman, W., Sarnthein, M., et al., Proc. Init. Rep. (Pt.A) ODP, vol. 108, pp. 557-617, 20 figs., 8 tbs.
[Nannofossils by J. Backman and H. Manivit.] | | |
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QUAT
TERT.U.
Atlantic.C. |
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[Nannofossils by J. Backman and H. Manivit.] | | |
| 6 | RUDDIMAN, W., SARNTHEIN, M., & SHIPBOARD SCIENTIFIC PARTY. | 1988 | strat.
QUAT
TERT.U.
Atlantic.C. |
| | Site 665. [Central equatorial Atlantic, southeastern margin of Sierra Leone Rise.]
-In: Ruddiman, W., Sarnthein, M., et al., Proc. Init. Rep. (Pt.A) ODP, vol. 108, pp. 714-789, 23 figs., 11 tbs.
[Nannofossils by J. Backman and H. Manivit.] | | |
| 7 | RUDDIMAN, W., SARNTHEIN, M., & SHIPBOARD SCIENTIFIC PARTY. | 1988 | strat.
QUAT
TERT.U.
Atlantic.C. |
| | Site 666. [Central equatorial Atlantic, southeastern margin of Sierra Leone Rise.]
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[Nannofossils by J. Backman and H. Manivit.] | | |
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QUAT
TERT
Atlantic.C. |
| | Site 667. [Central equatorial Atlantic, western margin of Sierra Leone Rise.]
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[Nannofossils by J. Backman and H. Manivit.] | | |

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1988
Site 668. [Central equatorial Atlantic, crest of Sierra Leone Rise.]
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JURA
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Atlantic.N. |
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QUAT
TERT
Atlantic.S.
ISOT. |
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Atlantic.N. |
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QUAT
TERT
Pacific.C. |
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QUAT
TERT
Pacific.C. |
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QUAT
TERT.U.
Pacific.C. |
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QUAT
TERT.U.
Pacific.C. |
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QUAT
TERT.U.
Pacific.C. |
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QUAT
TERT
Pacific.C. |
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QUAT
TERT
Pacific.C. |
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QUAT
TERT.U.
Pacific.C. |
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QUAT
TERT.U.
Pacific.C. |

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[Nannofossils by E. Martini.] | 1988 | strat.
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<u>Fu-discoaster quintatus</u> (BUKRY & BRAMLETTE 1969) DRIEVER 1988; p. 137; (ex <u>Discoaster</u>).	A358-7
<u>Fu-discoaster triradiatus</u> (TAN SIN HOK 1927) DRIEVER 1988; pp. 138-139; (ex <u>Discoaster</u>).	A358-7
<u>Kokia</u> PERCH-NIELSEN 1988; p. 31. Type species: <u>Kokia borealis</u> PERCH-NIELSEN 1988.	A366-6
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<u>Nannoconus alvus</u> PERCH-NIELSEN 1988; p. 33, pl. 1, figs. 19-20. Central North Sea, Upper Berriasian, NLK 19A, <u>Sollasites arcuatus</u> Subzone.	A366-6
<u>Nannoconus concavus</u> PERCH-NIELSEN 1988; pp. 33-34, pl. 1, figs. 21-24. Central North Sea, Upper Berriasian, NLK 19, <u>Nannoconus steinmannii</u> Zone.	A366-6
<u>Nannoconus dislocatus</u> PERCH-NIELSEN 1988; p. 34, pl. 1, figs. 26-27. Northern North Sea, Lower Hauterivian, NLK 17, upper part of <u>Corollithion silvaradion</u> Zone.	A366-6
<u>Nannoconus longus</u> PERCH-NIELSEN 1988; p. 34, pl. 1, figs. 34-35. Central North Sea, Upper Barremian, NLK 11, <u>Nannoconus borealis</u> Zone.	A366-6
<u>Nannoconus oviformis</u> PERCH-NIELSEN 1988; pp. 34-35, pl. 1, figs. 32-33. Central North Sea, Upper Berriasian, NLK 19A, <u>Sollasites arcuatus</u> Subzone.	A366-6
<u>Nannoconus sabinae</u> PERCH-NIELSEN 1988; p. 35, pl. 1, figs. 28-31. Central North Sea, Upper Berriasian; <u>Nannoconus</u> sp. (discs) Zone of CRUX 1987.	A366-6
<u>Pontosphaera amphora</u> (DEFLANDRE 1942) JANIN 1987; p. 106; (ex <u>Scyphosphaera</u>).	A361-3
<u>Pontosphaera ampla</u> (KAMPTNER 1955) JANIN 1987; p. 105; (ex <u>Scyphosphaera</u>).	A361-3
<u>Pontosphaera antilleana</u> (BOUDREAUX & HAY 1969) JANIN 1987; p. 105; (ex <u>Scyphosphaera</u>).	A361-3
<u>Pontosphaera apsteinii</u> (LOHMANN 1912) JANIN 1987; p. 105; (ex <u>Scyphosphaera</u>).	A361-3

<u>Pontosphaera apsteinii dilatata</u> (GAARDER 1970) JANIN 1987; p. 105; (ex <u>Scyphosphaera</u>).	A361-3
<u>Pontosphaera apsteinii recta</u> (DEFLANDRE 1942) JANIN 1987; p. 105; (ex <u>Scyphosphaera</u>).	A361-3
<u>Pontosphaera brevis</u> (VAROL 1984) JANIN 1987; p. 105; (ex <u>Scyphosphaera</u>).	A361-3
<u>Pontosphaera campanula</u> (DEFLANDRE 1942) JANIN 1987; p. 106; (ex <u>Scyphosphaera</u>).	A361-3
<u>Pontosphaera cohenii</u> (BOUDREAUX & HAY 1969) JANIN 1987; p. 105; (ex <u>Scyphosphaera</u>).	A361-3
<u>Pontosphaera darraghii</u> (RADE 1975) JANIN 1987; p. 106; (ex <u>Scyphosphaera</u>).	A361-3
<u>Pontosphaera halldalii</u> (DEFLANDRE in DEFLANDRE & FERT 1954) JANIN 1987; p. 106; (ex <u>Scyphosphaera</u>).	A361-3
<u>Pontosphaera intermedia</u> (DEFLANDRE 1942) JANIN 1987; p. 106; (ex <u>Scyphosphaera</u>).	A361-3
<u>Pontosphaera procera</u> (KAMPTNER 1955) JANIN 1987; p. 105; (ex <u>Scyphosphaera</u>).	A361-3
<u>Pontosphaera pulcherrima</u> (DEFLANDRE 1942) JANIN 1987; p.106; (ex <u>Scyphosphaera</u>).	A361-3
<u>Pontosphaera ventriosa</u> (MARTINI 1968) JANIN 1987; p. 106; (ex <u>Scyphosphaera</u>).	A361-3
<u>Reticulofenestra antarctica</u> (HAQ 1976) DRIEVER 1988; p. 117; (ex <u>Dictyococcites</u>).	A358-7
<u>Syracosphaera anthos</u> (LOHMANN 1912) JANIN 1987; p.113; (ex <u>Deutschlandia</u>).	A361-3
<u>Syracosphaera cinera</u> (LECAL-SCHLAUDER 1951) JANIN 1987; p. 113; (ex <u>Deutschlandia</u>).	A361-3
<u>Syracosphaera gaarderae</u> (PERCH-NIELSEN 1980) JANIN 1987; p. 113; (ex <u>Deutschlandia</u>).	A361-3
<u>Syracosphaera stenophylla</u> (SCHILLER 1930) JANIN 1987; p. 113; (ex <u>Deutschlandia</u>).	A361-3
<u>Tegumentum tripes</u> (KÖTHE 1981) MUTTERLOSE 1988; p. 198; (ex <u>Chiastozygus</u>).	A365-9 *C-2
<u>Triquetrorhabdulus ? shetlandensis</u> PERCH-NIELSEN 1988; pp. 35-36, pl. 1, figs. 15-16. Northern North Sea, Lower Valanginian, NLK 18, <u>Micrantholithus</u> <u>speetonensis</u> Zone.	A366-6
<u>Zeugrhabdotus elegans</u> (GARTNER 1968) MUTTERLOSE 1988; p. 198 ; (ex <u>Zygodiscus</u>).	A365-9 *C-3

+++++Calcispheres+++++	
<u>Bicarinellum eulineatum</u> KEUPP 1987; p. 47, pl. 10, figs. 1-5. Southern England, Folkstone coastal profile, upper middle Albian.	A372-10
<u>Calcigonellum minutum</u> KEUPP 1987; pp. 40-41, pl. 6, figs. 1-7. Northern France, Escalles/Boulonnais, late Albian-early Cenomanian.	A372-10
<u>Carinellum hyalinum</u> KEUPP 1987; p. 49, pl. 13, figs. 1-5; pl. 14, figs. 10-11. Northern France, Escalles/Boulonnais, late Albian: (<u>pricei</u> -Zone).	A372-10
<u>Carinellum lenticularis</u> KEUPP 1987; pp. 48-49, pl. 12, figs. 1-12; pl. 14, fig. 9. Northern France, Escalles/Boulonnais, late Albian (<u>pricei</u> -Zone).	A372-10
<u>Carinellum vimineum</u> KEUPP 1987; pp. 49-50, pl. 13, figs. 7-12; pl. 9, figs. 1-8. Northern France, Escalles/Boulonnais, middle Albian (<u>niobe</u> -Zone).	A372-10
<u>Cubodinellum</u> KEUPP 1987; p. 48. Type species: <u>Cubodinellum renei</u> KEUPP 1987.	A372-10
<u>Cubodinellum renei</u> KEUPP 1987; p. 48, pl. 9, figs. 5-10. Type species of <u>Cubodinellum</u> KEUPP 1987. Northern France, Escalles/Boulonnais, early Cenomanian.	A372-10
<u>Gonellum</u> KEUPP 1987; p. 45. Type species: <u>Gonellum kurti</u> KEUPP 1987.	A372-10
<u>Gonellum calcipterelloides</u> KEUPP 1987; p. 46, pl. 11, figs. 11-15. Northern France, Escalles/Boulonnais, middle Albian (<u>intermedius</u> -Zone).	A372-10
<u>Gonellum kurti</u> KEUPP 1987; pp. 45-46, pl. 11, figs. 1-10. Type species of <u>Gonellum</u> KEUPP 1987. Northern France, Escalles/Boulonnais, middle Albian (<u>intermedius</u> -Zone).	A372-10
<u>Heptasphaera paulaworstellae</u> (BOLLI 1978) KEUPP 1981; p. 57. (ex <u>Bonetocardiella</u>).	A141-6 *C-4
<u>Heptasphaera paulaworstellae</u> (BOLLI 1978) LENTIN & WILLIAMS 1985; p. 379. (ex <u>Bonetocardiella</u>).	A373-1
<u>Hexasphaera</u> KEUPP 1987; p. 41. Orthographic error for <u>Hexasphaera</u> KEUPP 1987. Type species: <u>Hexasphaera radiata</u> KEUPP 1987.	A372-10
<u>Hexasphaera radiata</u> KEUPP 1987; p. 41, pl. 6, figs. 8-12. Type species of <u>Hexasphaera</u> KEUPP 1987. Northern France, Escalles/Boulonnais, late Albian (<u>pricei</u> - Zone).	A372-10
<u>Obliquipithonella ampicrySTALLINA</u> (PFLAUMANN & KRASHENINNIKOV 1978) LENTIN & WILLIAMS 1985; p. 380; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella bassriverensis</u> (OLSSSEN & YOUSSEFNIA 1979) LENTIN & WILLIAMS 1985; p. 380; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella bilamellata</u> (PFLAUMANN & KRASHENINNIKOV 1978) LENTIN & WILLIAMS 1985; p. 380; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella carteri</u> (BOLLI 1974) LENTIN & WILLIAMS 1985; p. 380; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella cookii</u> (BOLLI 1974) LENTIN & WILLIAMS 1985; p. 380; (ex <u>Pithonella</u>).	A373-1

<u>Obliquipithonella cylindrica</u> (PFLAUMANN & KRASHENINNIKOV 1978) LENTIN & WILLIAMS 1985; p. 380; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella echinosa</u> (KEUPP 1982) LENTIN & WILLIAMS 1985; p. 380; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella edgarii</u> (BOLLI 1974) LENTIN & WILLIAMS 1985; p. 380; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella fusiformis</u> (RÖGL 1976) LENTIN & WILLIAMS 1985; p. 380; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella guttula</u> (PFLAUMANN & KRASHENINNIKOV 1978) LENTIN & WILLIAMS 1985; p. 380; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella heitzleri</u> (BOLLI 1974) LENTIN & WILLIAMS 1985; p. 380; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella johnstonei</u> (BOLLI 1974) LENTIN & WILLIAMS 1985; p. 380; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella krasheninnikovii</u> (BOLLI 1974) LENTIN & WILLIAMS 1985; p. 381; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella lepidota</u> (KEUPP 1982) LENTIN & WILLIAMS 1985; p. 381; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella loeblichii</u> (BOLLI 1974) LENTIN & WILLIAMS 1985; p. 381; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella longiporosa</u> (PFLAUMANN & KRASHENINNIKOV 1978) LENTIN & WILLIAMS 1985; p. 381; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella loricata</u> (KRASHENINNIKOV & BASOV 1983) LENTIN & WILLIAMS 1985; p. 381; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella mcnightii</u> (BOLLI 1974) LENTIN & WILLIAMS 1985; p. 381; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella miniaperta</u> (KRASHENINNIKOV & BASOV 1983) LENTIN & WILLIAMS 1985; p. 381; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella multistrata</u> (PFLAUMANN & KRASHENINNIKOV 1978) LENTIN & WILLIAMS 1985; p. 381; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella parva</u> (FÜTTERER 1984) LENTIN & WILLIAMS 1985; p. 381; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella patriciagreeleyae</u> (BOLLI 1974) LENTIN & WILLIAMS 1985; p. 381; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella patriciagreeleyae</u> subsp. <u>ovata</u> (KEUPP 1979) LENTIN & WILLIAMS 1985; p. 382; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella piriformis</u> (KEUPP 1977) LENTIN & WILLIAMS 1985; p. 382; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella porosa</u> (PFLAUMANN & KRASHENINNIKOV 1978) LENTIN & WILLIAMS 1985; p. 382; (ex <u>Pithonella</u>).	A373-1

<u>Obliquipithonella porosa</u> forma <u>obturata</u> (PFLAUMANN & KRASHENINNIKOV 1978) LENTIN & WILLIAMS 1985; p. 382; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella quityi</u> (BOLLI 1974) LENTIN & WILLIAMS 1985; p. 382; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella robinsonii</u> (BOLLI 1974) LENTIN & WILLIAMS 1985; p. 382; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella robinsonii</u> subsp. <u>coalita</u> (KEUPP 1979) LENTIN & WILLIAMS 1985; p. 382; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella rockeri</u> (BOLLI 1974) LENTIN & WILLIAMS 1985; p. 382; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella sheilasantawae</u> (BOLLI 1974) LENTIN & WILLIAMS 1985; p. 382; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella sliteri</u> (BOLLI 1980) LENTIN & WILLIAMS 1985; p. 382; (ex <u>Pirumella</u>).	A373-1
<u>Obliquipithonella sphenifera</u> KEUPP 1987; p. 52, pl. 19, figs. 7-12. Northern France, Escalles/Boulonnais, late Albian (<u>inflata</u> -Zone).	A372-10
<u>Obliquipithonella spinosa</u> (KEUPP 1979) LENTIN & WILLIAMS 1985; p. 382; (ex <u>Thoracosphaera</u>).	A373-1
<u>Obliquipithonella squalida</u> (KRASHENINNIKOV & BASOV 1983) LENTIN & WILLIAMS 1985; p. 383; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella squamosa</u> (KRASHENINNIKOV & BASOV 1983) LENTIN & WILLIAMS 1985; p. 383; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella strobila</u> (KEUPP 1979) LENTIN & WILLIAMS 1985; p. 383; (ex <u>Thoracosphaera</u>).	A373-1
<u>Obliquipithonella tanyphloia</u> (KEUPP 1979) LENTIN & WILLIAMS 1985; p. 383; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella thayeri</u> (BOLLI 1974) LENTIN & WILLIAMS 1985; p. 383; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella transitoria</u> (KRASHENINNIKOV & BASOV 1983) LENTIN & WILLIAMS 1985; p. 383; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella trilamellata</u> (PFLAUMANN & KRASHENINNIKOV 1978) LENTIN & WILLIAMS 1985; p. 383; (ex <u>Pithonella</u>).	A373-1
<u>Obliquipithonella williamsenii</u> (BOLLI 1978) LENTIN & WILLIAMS 1985; p. 383; (ex <u>Bonetocardiella</u>).	A373-1
Obliquipithonelloideae KEUPP 1987; p. 39. New subfamily.	A372-10
<u>Orthocarinellum</u> KEUPP 1987; p. 41. Type species: <u>Orthocarinellum galerum</u> KEUPP 1987.	A372-10
<u>Orthocarinellum galerum</u> KEUPP 1987; p. 43, pl. 7, figs. 1-6. Type species of <u>Orthocarinellum</u> KEUPP 1987. Northern France, Escalles/Boulonnais, late Albian (<u>pricei</u> -Zone).	A372-10

<u>Orthopithonella albatrosiana</u> (KAMPTNER 1963) LENTIN & WILLIAMS 1985; p. 383; (ex <u>Thoracosphaera</u>).	A373-1 *C-5
<u>Orthopithonella compta</u> (KEUPP 1982) LENTIN & WILLIAMS 1985; p. 384; (ex <u>Pithonella</u>).	A373-1
<u>Orthopithonella globosa</u> (FÜTTERER 1984) LENTIN & WILLIAMS 1985; p. 384; (ex <u>Pithonella</u>).	A373-1
<u>Orthopithonella gustafsonii</u> (BOLLI 1974) LENTIN & WILLIAMS 1985; p. 384; (ex <u>Pithonella</u>).	A373-1
<u>Orthopithonella porata</u> (KEUPP 1982) LENTIN & WILLIAMS 1985; p. 384; (ex <u>Pithonella</u>).	A373-1
<u>Orthopithonella pycnotheca</u> (KEUPP 1978) LENTIN & WILLIAMS 1985; p. 384; (ex <u>Pithonella</u>).	A373-1
<u>Orthopithonella tithonica</u> (KEUPP 1978) LENTIN & WILLIAMS 1985; p. 384; (ex <u>Pithonella</u>).	A373-1
<u>Orthopithonella veeversii</u> (BOLLI 1974) LENTIN & WILLIAMS 1985; p. 384; (ex <u>Pithonella</u>).	A373-1
Orthopithonelloideae KEUPP 1987; p. 38. New subfamily.	A372-10
<u>Pithonella amplicrystallina</u> PFLAUMANN & KRASHENINNIKOV 1978; p. 820, pl. 3, figs. 4-7. Eastern North Atlantic, DSDP Site 369, Maastrichtian.	A373-2
<u>Pithonella bilamellata</u> PFLAUMANN & KRASHENINNIKOV 1978; p. 822, pl. 5, figs. 5-6; pl. 6, figs. 1-2. Eastern North Atlantic, DSDP Site 369, Campanian to Maastrichtian.	A373-2
<u>Pithonella cylindrica</u> PFLAUMANN & KRASHENINNIKOV 1978; p. 822, pl. 5, figs. 1-4. Eastern North Atlantic, DSDP Site 369, Campanian to Maastrichtian.	A373-2
<u>Pithonella guttula</u> PFLAUMANN & KRASHENINNIKOV 1978; pp. 821-822, pl. 8, figs. 1-4. Eastern North Atlantic, DSDP Site 370, Valanginian to Hauterivian.	A373-2
<u>Pithonella longiporosa</u> PFLAUMANN & KRASHENINNIKOV 1978; p. 820, pl. 2, figs. 1-3. Eastern North Atlantic, DSDP Site 370, uppermost Albian to Cenomanian/Turonian.	A373-2
<u>Pithonella multistrata</u> PFLAUMANN & KRASHENINNIKOV 1978; p. 821, pl. 7, figs. 3-6. Eastern North Atlantic, DSDP Site 370, Valanginian to Barremian.	A373-2
<u>Pithonella porosa</u> PFLAUMANN & KRASHENINNIKOV 1978; p. 820, pl. 2, figs. 3, 5; pl. 3, figs. 1-2. Eastern North Atlantic, DSDP Site 370, latest Albian to Cenomanian/Turonian.	A373-2
<u>Pithonella porosa</u> forma <u>obturata</u> PFLAUMANN & KRASHENINNIKOV 1978; p. 820, pl. 3, figs. 1-3. Eastern North Atlantic, DSDP Site 370, Barremian to Cenomanian/Turonian.	A373-2
<u>Pithonella trilamellata</u> PFLAUMANN & KRASHENINNIKOV 1978; p. 821, pl. 6, figs. 3-5, 7; pl. 7, figs. 1-2. Eastern North Atlantic, DSDP Site 370, Valanginian to Barremian, and possibly ? Aptian - Albian.	A373-2

Pithonella tuberculata PFLAUMANN & KRASHENINNIKOV 1978; pp. 820-821, pl. 1, figs. 7-8. Eastern North Atlantic, DSDP Site 370, late Valanginian - early Hauterivian.

A373-2

Pithonelloideae KEUPP 1987; p. 39. New subfamily.

A372-10

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Calcareous nannoplankton species names in alphabetical order.

- | | |
|--|---|
| adriaticus, <i>Michaelsarsia</i> * | darraghii, <i>Pontosphaera</i> |
| alvus, <i>Nannoconus</i> | dislocatus, <i>Nannoconus</i> |
| amphora, <i>Pontosphaera</i> | elegans, <i>Zeugrhabdotus</i> * |
| ampla, <i>Pontosphaera</i> | fuscus, <i>Calcidiscus</i> |
| antarctica, <i>Reticulofenestra</i> | gaarderae, <i>Syracosphaera</i> |
| anthos, <i>Syracosphaera</i> | halldalii, <i>Pontosphaera</i> |
| antilleana, <i>Pontosphaera</i> | intermedia, <i>Pontosphaera</i> |
| apsteinii, <i>Pontosphaera</i> | lambertii, <i>Micrantholithus</i> |
| apsteinii ssp. dilatata, <i>Pontosphaera</i> | longus, <i>Nannoconus</i> |
| apsteinii ssp. recta, <i>Pontosphaera</i> | oviformis, <i>Nannoconus</i> |
| bicornuta, <i>Ceratolithina</i> | procera, <i>Pontosphaera</i> |
| borealis, <i>Kokia</i> | pulcherrima, <i>Pontosphaera</i> |
| brevis, <i>Pontosphaera</i> | quintatus, <i>Eu-discoaster</i> |
| campanula, <i>Pontosphaera</i> | sabinae, <i>Nannoconus</i> |
| cinera, <i>Syracosphaera</i> | shetlandensis, <i>Triquetrorhabdulus?</i> |
| cohenii, <i>Pontosphaera</i> | stenophylla, <i>Syracosphaera</i> |
| concavus, <i>Nannoconus</i> | tripes, <i>Tegumentum</i> * |
| cruxii, <i>Ceratolithina</i> | triradiatus, <i>Eu-discoaster</i> |
| curvata, <i>Kokia</i> | ventriosa, <i>Pontosphaera</i> |

New calcareous nannoplankton genus names.

Kokia

Calcsphere species names in alphabetical order.

- | | |
|--|--|
| albatrosiana, <i>Orthopithonella</i> * | multistrata, <i>Pithonella</i> |
| amplicrystallina, <i>Obliquipithonella</i> | parva, <i>Obliquipithonella</i> |
| amplicrystallina, <i>Pithonella</i> | patriciagreeleyae, <i>Obliquipithonella</i> |
| bassriverensis, <i>Obliquipithonella</i> | patriciagreeleyae ssp. ovata, <i>Obliquipithonella</i> |
| bilamellata, <i>Obliquipithonella</i> | paulaworstellae KEUPP, <i>Heptasphaera</i> * |
| bilamellata, <i>Pithonella</i> | paulaworstellae LENTIN & WILLIAMS, |
| calcipterelloides, <i>Gonellum</i> | <i>Heptasphaera</i> |
| carteri, <i>Obliquipithonella</i> | piriformis, <i>Obliquipithonella</i> |
| compsa, <i>Orthopithonella</i> | porata, <i>Orthopithonella</i> |
| cookii, <i>Obliquipithonella</i> | porosa, <i>Obliquipithonella</i> |
| cylindrica, <i>Obliquipithonella</i> | porosa, <i>Pithonella</i> |
| cylindrica, <i>Pithonella</i> | porosa forma obturata, <i>Obliquipithonella</i> |
| echinosa, <i>Obliquipithonella</i> | porosa forma obturata, <i>Pithonella</i> |
| edgarii, <i>Obliquipithonella</i> | pycnotheca, <i>Orthopithonella</i> |
| eulineatum, <i>Bicarinellum</i> | quiltyi, <i>Obliquipithonella</i> |
| fusiformis, <i>Obliquipithonella</i> | radiata, <i>Hexasphaera</i> |
| galerum, <i>Orthocarinellum</i> | renei, <i>Cubodinellum</i> |
| globosa, <i>Orthopithonella</i> | robinsonii, <i>Obliquipithonella</i> |
| gustafsonii, <i>Orthopithonella</i> | robinsonii ssp. coalita, <i>Obliquipithonella</i> |
| guttula, <i>Obliquipithonella</i> | rockeri, <i>Obliquipithonella</i> |
| guttula, <i>Pithonella</i> | sheilasantawae, <i>Obliquipithonella</i> |
| heitzleri, <i>Obliquipithonella</i> | sliterae, <i>Obliquipithonella</i> |

+++[list continued on next page]+++

hyalinum, Carinellum
johnstonei, Obliquipithonella
krasheninnikovii, Obliquipithonella
kurti, Gonellum
lenticularis, Carinellum
lepidota, Obliquipithonella
loeblichii, Obliquipithonella
longiporosa, Obliquipithonella
longiporosa, Pithonella
loricata, Obliquipithonella
mcnightii, Obliquipithonella
miniaperta, Obliquipithonella
minutum, Calcigonellum
multistrata, Obliquipithonella

sphenifera, Obliquipithonella
spinosa, Obliquipithonella
squalida, Obliquipithonella
squamosa, Obliquipithonella
strobila, Obliquipithonella
tanyphloia, Obliquipithonella
thayeri, Obliquipithonella
tithonica, Orthopithonella
transitoria, Obliquipithonella
trilamellata, Obliquipithonella
trilamellata, Pithonella
tuberculata, Pithonella
veeversii, Orthopithonella
vimineum, Carinellum
williamsenii, Obliquipithonella

New calcisphere genus names.

Cubodinellum
Gonellum

Hexasphaera
Orthocarinnellum

New calcisphere subfamily names.

Obliquipithonelloideae Orthopithonelloideae Pithonelloideae

* = Invalid

++++
Comments

- 1 - B145 : Invalid new combination; no complete reference given for basionym [ICBN Art. 33.2].
- 2 - B146 : Invalid new combination; no complete reference given for basionym [ICBN Art. 33.2].
- 3 - B146 : Invalid new combination; no complete reference given for basionym [ICBN Art. 33.2].
- 4 - B147 : Invalid new combination; no complete reference given for basionym [ICBN Art. 33.2].
- 5 - B150 : This combination was introduced by KEUPP 1984 [A214-3] which has priority.

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The constant reminder: Your reprints, comments, and corrections add currency and value to this list of references and taxa. Please continue to send them to me at the following address:

John C. Steinmetz
Exploration and Production Technology
Marathon Oil Company
P. O. Box 269
Littleton, Colorado 80160 USA

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THE SIZE OF THE COCCOLITHS OF *DICTYOCOCCITES PERPLEXA* BURNS

By B. Driever

Dictyococcites perplexa Burns (1975) is a reticulofenestrid species which was first described from the Miocene of DSDP Site 265 in the south-east Indian Ocean. There is contradictory information concerning coccolith size in the species' protologue. The description refers to a "medium-sized" placolith; the long diameter of the coccoliths (distal surface) is mentioned to be 18-20 μm ; using the stated magnification factors of the SEM-photographs (oblique views), I measured apparent distal surface lengths of about 1.50 μm (holotype) and 2.35 μm (paratype). In a comment in the INA Newsletter (1981, vol.3(1), p.40), Backman was of the opinion that *Dictyococcites perplexa* Burns is a senior synonym of *Dictyococcites antarcticus* Haq, the latter species showing coccolith lengths between 4 and 8 μm (Haq, 1976).

I wrote to Dr. Burns about the discrepancy. The contents of Dr. Burns' letter of reply (25th November 1981) are reproduced here with his permission. It appears that, due to an editorial error, the stated magnification factors of the photographs of *D. perplexa* are incorrect. Quote: "The corrected magnification for Fig. 20 therefore is X1662 which gives the specimen in the figure an apparent length of 19.85 μm (? B.D.). However, due to the arched form of the coccolith and the angle involved in SEM work, it is impossible to take accurate measurements from SEM pictures. The size range quoted for the species was therefore taken from specimens viewed in the light-microscope."

In summary, *Dictyococcites perplexa* is a species with very large coccoliths (18-20 μm). As to coccolith size, the species clearly differs from *Dictyococcites antarcticus* Haq.

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HELIOLITHUS BUKRYI
A NEW UPPER PALEOCENE CALCAREOUS NANNOFOSSIL

Wuchang Wei
Department of Geology, Florida State University,
Tallahassee, FL32306, USA

INTRODUCTION

A new species of Heliolithus was found during a detailed nannofossil study of the Paleogene core samples from the Rio Grande Rise in the southwest Atlantic Ocean. Most species of this genus described previously have biostratigraphic utility, i.e., H. kleinpellii is used in the zonations of both Martini (1971) and Okada and Bukry (1980); H. riedelii is used in Martini's (1971) zonation; and H. universality is used in Wise's (1983) zonation. The new species, described below as Heliolithus bukryi, has been found in two closely spaced samples from DSDP Site 516 on the Rio Grande Rise in the upper Paleocene sediments and has been figured by Bukry (1971) from an upper Paleocene sample from the northwest Atlantic Ocean. It was also found in one upper Paleocene sample (LB 821, see Hay and Mohler, 1967) from Pont Labau (France) when the present author reexamined these middle to upper Paleocene samples. The erection of the new species will facilitate the correct application of other index species of Heliolithus to stratigraphy and may be useful for refining stratigraphy and providing paleoenvironmental information.

SAMPLES AND METHODS

Samples were taken from DSDP Hole 516F in the southwest Atlantic Ocean (30°16.59'S, 35°17.10'W). Detailed information on the geologic setting, stratigraphic framework, lithology and paleoenvironment of the site can be found in Barker and Johnson (1983).

In addition to the conventional method of examination, the new species has been studied using a slightly modified technique of Moshkovitz (1978). This technique facilitates the observation of the same nannofossil specimens under the light microscope and in the SEM, and is the best among all those proposed to date for the light microscope-SEM correlation study of the same nannofossil specimens (see Shafik, 1983 and the references cited there).

SYSTEMATIC PALEONTOLOGY

Genus HELIOLITHUS Bramlette and Sullivan 1961

Heliolithus bukryi Wei, n. sp.

Plate 1, Figures 1,3-11.

Heliolithus sp. Bukry, 1971, p. 1002, pl. 8, fig. 5.

Diagnosis: Relatively large and compressed heliolithid with a small and low cycle.

Description: This species has two cycles of elements. The larger cycle (presumably the distal cycle, see Romein, 1979) has 23-36 elements (most commonly around 30). The smaller cycle

(presumably the proximal cycle) is about one third the size of the larger cycle. Under cross nicols, both cycles are birefringent.

Remarks: A morphometric study of 22 random specimens of Heliolithus bukryi from DSDP Sample 516F-85-2, 35-36 cm showed that the diameter of the distal cycle ranges from 10 to 17 μm (mean=14, standard deviation=1.86), the diameter of the proximal cycle ranges from 4 to 6 μm (mean=5.1, standard deviation=0.8), and the number of elements in the distal cycle varies from 23 to 36 (mean=31.2, standard deviation=3.3). Heliolithus bukryi differs from H. kleinpellii by that the former has a smaller cycle and has fewer elements and the latter (see Plate 1, Figure 12) has a proximal cycle which is over 1/2 the diameter of the distal cycle and usually has more than 40 elements (the holotype showing 45). No transitional form between the two species has been observed. The new species can be distinguished easily from H. cantabriae, H. riedelii, or H. universus by its compressed cycles and the large difference in the diameters between the two cycles. The latter species all have thick columns, and the proximal and distal cycles have similar diameters. Though the outline of Heliolithus bukryi resembles that of Biantholithus conicus, the distal cycle of the latter species does not birefringe under cross-polarized light and thus it is easy to differentiate it from heliolithids. Similarly, the distal side of Heliolithus bukryi looks identical to Discoaster multiradiatus in SEM micrographs (see Plate 1, Figures 3 and 4), but the former species birefringes under cross-polarized light whereas the latter does not.

Occurrence: Few to rare near the bottom of Heliolithus kleinpellii Zone (Zone CP5 of Okada and Bukry, 1980) in Rio Grande Rise upper Paleocene sediments. It was reported from the bottom of Heliolithus kleinpellii Zone (Zone CP5) in the northwest Pacific sediment at DSDP Site 47 (Bukry, 1971, p. 1002). The present author also found it common in one sample (LB 821) from Discoaster mohleri Zone (CP6) in Pont Labau (France) section.

Size: Holotype: 13 μm in diameter; isotypes: 10-15 μm in diameters.

Holotype: Plate 1, Figures 1, 5, 6 (Negatives FSU PN88317-88319).

Isotypes: Plate 1, Figures 3, 4, 7-11 (Negatives FSU PN88320-88326).

Type locality: Deep Sea Drilling Project Site 516 (Rio Grande Rise, southwest Atlantic Ocean), Sample 516F-85-2, 35-36cm.

ACKNOWLEDGEMENTS

The samples examined in this study were provided by the Deep Sea Drilling Project. Shimon Moshkovitz (Geological Survey of Israel) kindly provided the gridded glass for light microscope-SEM correlation study. Kim Riddle is thanked for help in the SEM photography. I also wish to thank John Firth for helpful discussion on the species. Laboratory facilities were provided in part by NSF grant DPP 8414268 to S. W. Wise.

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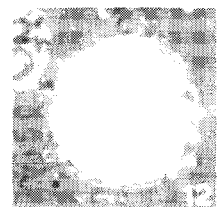
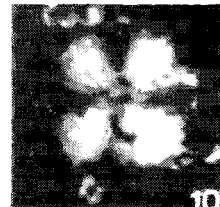
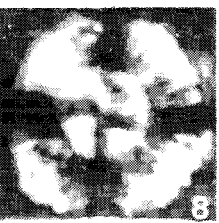
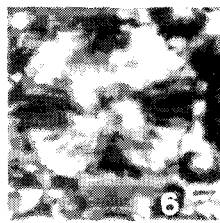
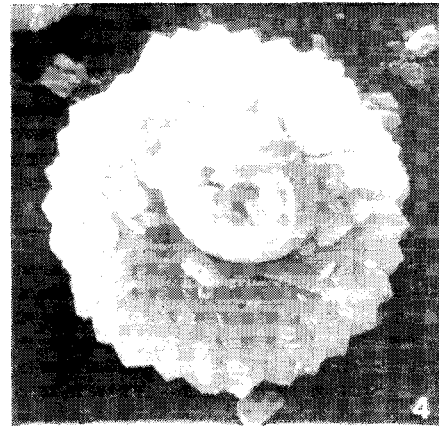
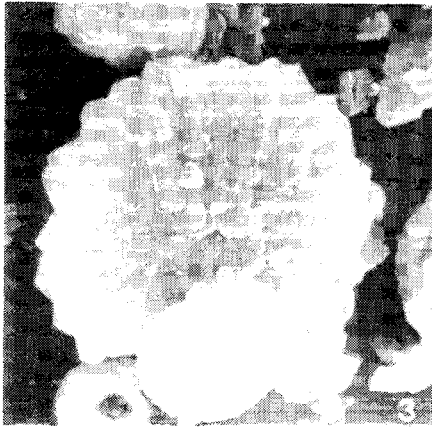
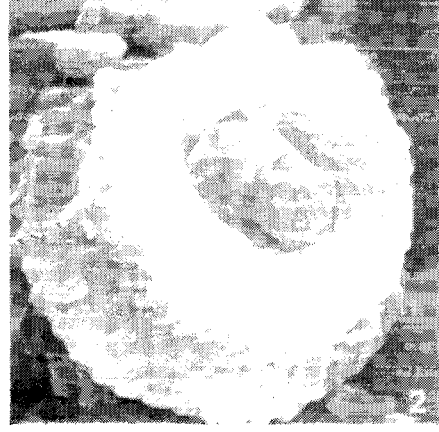
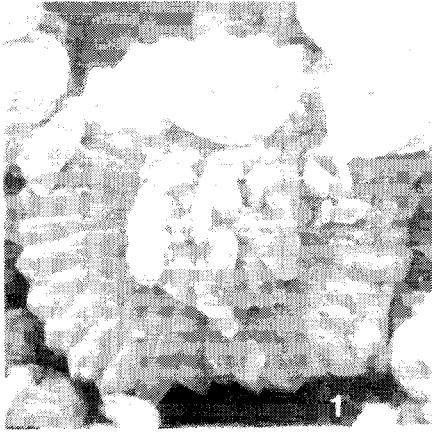
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PLATE 1

Figures

- 1,3-11 Heliolithus bukryi Wei, n. sp.
 DSDP Sample 516F-85-2, 35-36 cm. 1, 5, 6, Holotype. 1, SEM, proximal view, X4,000; 5, same specimen as 1, phase-contrast light, proximal view, X1,770; 6, same specimen as 1, cross-polarized light, proximal view; X1,770; 3, 4, 7-11, isotypes. 3, SEM, distal view, X4,000; 4, SEM, distal view, X3,300; 7, 8, 11, cross-polarized light, X1,770; 9, same specimen as 3, phase-contrast light, distal view, X1,770; 10, same specimen as 3, cross-polarized light, distal view, X1,770.
- 2, 12 Heliolithus kleinpellii Sullivan
 DSDP Sample 516F-85-2, 35-36 cm; 2, SEM, oblique view, X4,000; 12, phase-contrast light, distal view, X1,350.

PLATE 1



PRAE-JURASSIC AND JURASSIC CALCAREOUS NANNOFOSSIL BIBLIOGRAPHY: AN UPDATE.

ELISABETTA ERBA
Dipartimento di Scienze della Terra
Via Mangiagalli 34. 20133 Milano. Italy.

A compilation of the literature regarding prae-Jurassic and Jurassic calcareous nannofossils was performed. Purposes of this work are:

- 1) to compile an up-to-date report of the available literature
- 2) to summarize the "state of the art" of our knowledge (taxonomy, biostratigraphy, evolution, paleoecology) on the prae-Jurassic and Jurassic nannofossils
- 3) to provide a framework for future research.

119 papers were considered. They deal with various localities from all over the world and are focused on various time intervals. Most of the papers deal with European localities. Particularly sections from France, Germany, and England have been extensively studied so far. In general, the most studied localities are medium to high latitude sites from the northern hemisphere and few papers deal with low latitude sections. Finally only two papers regard high latitude sites from the southern hemisphere (Falkland Plateau).

For what the age of the sediments is concerned, the Late Jurassic was the most studied interval. Several papers deal with the Early Jurassic; the Middle Jurassic was overlooked mainly because good Middle Jurassic sections are very rare.

Most nannofossil workers focused their studies on taxonomy and biostratigraphy. Very little attention was paid to the evolution and paleoecology of Jurassic nannofossils. Despite the large number of taxonomic papers, the Jurassic nannofossil taxonomy is still poorly established. Little agreement exists about the classification at ranks higher than the specific level. The proliferation of species is often an artifact due to different investigation techniques, to the preservation, and to a very restrictive taxonomic concept which overlooked the intraspecific variability.

The unclear taxonomy is also reflected in the Jurassic biostratigraphy. Twelve biozonations were proposed but none of them has been generally accepted. The nannobiostratigraphy was calibrated usually to the ammonite biostratigraphy and more rarely to the calpionellid zonation and/or the magnetostratigraphy.

Stratigraphic ranges of only few taxa were established but further investigations are required in order to determine the stratigraphical range of numerous species including several "markers". Recent works on the evolution of the oldest nannofossils seem to be promising for future improvement on biostratigraphy.

Moreover it must be noticed that a correlation between the boreal and the tethyan realms has never been attempted.

Illustrations of the papers generally comprise SEM and/or LM photographs. However, no papers report both SEM and LM photographs of the same specimens. Only few papers are illustrated with drawings or with TEM photographs.

All the informations are summarized in a scheme as follows: 1) author; 2) stratigraphic interval according to legend: "X" indicates that the entire interval is considered, "O" that the interval is partially studied; 3) area; 4) topics: "T" indicates that the paper includes taxonomic notes, "R" indicates that stratigraphic ranges are reported, and "B" indicates the presence of a biostratigraphic scheme as biozones and/or biohorizons; 5) the type of correlation used: "A" indicates that the ammonite biostratigraphy is considered, "P" indicates that the nannofossil data are calibrated to the paleomagnetic stratigraphy, and "C" indicates that the nannobiostratigraphy is integrated with the calpionellid zonation; 6) some general remarks; and finally 7) the type of illustrations (=ILL): "SEM" indicates that scanning electron microscope photographs are reported, "TEM" indicates the presence of transmission electron microscope pictures, "LM" indicates that light polarizing microscope photographs are shown, "DR" indicates that the illustrations consist of drawings, and "-" indicates that no illustrations are reported.

LEGEND

AGE: X = TOTAL O = PARTIAL

RHAETIAN	TOARCIAN	CALLOVIAN	BERRIASIAN
CARNIAN	PLIENSBACHIAN	BATHONIAN	TITHONIAN
NORIAN	SINEMURIAN	BAJOCIAN	KIMMERIDGIAN
PALEOZOIC	HETTANGIAN	AALENIAN	OXFORDIAN

AUTHOR	AGE	AREA	T	R	B	CORR A/P/C	REMARKS	ILL
ALLEMANN et al. 1975	X O	SE Spain	X	X	X	X		
AMEZIEUX 1972	X X X X X	France	X	X	X			SEM LM
AUBRY & DEPECHE 1974	X O	France	X				<i>Schizosphaerella</i>	SEM LM
BALDI-BEKE 1965	X O	Hungary	X	X	X			LM
BARNARD & HAY 1974	X X X X X	S England N France	X	X	X			SEM
BOWN 1987 a	X X X X	Austria England	X				evolution	
BOWN 1987 b	X X						abstract	

AUTHOR	AGE	AREA	T	R	B	CORR A/P/C	REMARKS	ILL	AUTHOR	AGE	AREA	T	R	B	CORR A/P/C	REMARKS	ILL
BOWN 1987 c	X X X	Europe N Africa C Atlantic Ocean	X	X	X	X	evolution	SEM LM	COOPER & SHAFFER 1976	X O	Louisiana	X	X				SEM
BOWN & COOPER 1987	X X						abstract		CRUX 1984	X X X O	SW Germany	X	X	X	X		LM
BRONNIMANN 1955	X O	Cuba	X	X	X			DR LM	CRUX 1987 a	X X O O		X				dimorphism evolution	SEM LM
BUKRY 1974	X X O	E Indian Ocean DSDP LEG 27							CRUX 1987 b	X X X X	SW England	X	X	X	X		LM
BUKRY 1975	X X O	NW Pacific Ocean DSDP LEG 32	X					LM	DEFLANDRE 1939	X X X	France	X		X		<i>Stephanolithon</i>	DR
BUKRY & BRAMLETTE 1969	X O	C Atlantic Ocean DSDP LEG 1	X					TEM	DEFLANDRE 1970	X X X	N Africa	X					LM
CANUTI & MARCUCCI 1969	X X	C Italy	X				nannofacies	TEM	DEFLANDRE & DANGEARC 1938	X X X	France	X				<i>Schizosphaerella</i> <i>Stephanolithon</i>	DR
CEPEK 1978	X O	C N Atlantic Ocean DSDP LEG 41	X					SEM	DERES & ACHERITEGUY 1980	X O	world-wide	X	X	X			LM
CEPEK et al. 1980	X O	C Atlantic Ocean DSDP LEG 50	X						DI NOCERA 1971	X X X	S Italy	X					SEM
CHANNELL et al. 1987	X X X	N Italy	X	X	X	X			DI NOCERA 1973	X X X	C Italy	X					SEM
CITA & PASQUARE 1959	X O	N Italy	X					DR	DI NOCERA & SCANDONE 1977	X X X	Tethys	X					SEM
COOPER 1984	X X	Tethys	X	X	X	X	quantitative analyses		DOCKERILL 1987	X X X X	England N France Germany	X					SEM LM
COOPER 1987 a	X X						abstract		DOCKERILL & DOCKERILL 1987 a	X X X X X						abstract evolution	
COOPER 1987 b	X X	Russia	X					SEM LM	DOCKERILL & DOCKERILL 1987 b	X X X X X						abstract systematic	

AUTHOR	AGE	AREA	T	R	B	CORR A P C	REMARKS	ILL	AUTHOR	AGE	AREA	T	R	B	CORR A P C	REMARKS	ILL	AUTHOR	AGE	AREA	T	R	B	CORR A P C	REMARKS	ILL
ERBA & QUADRIO 1987	X O	N Italy	X	X		X		SEM LM	GRUN & ALLEMANN 1975	X O	Spain		X	X	X			LEZAUD 1967	O X	France		X	X	X		DR
FANTINI SESTINI et al. 1981	O	N Italy			X		nannofacies	SEM	GRUN & ZWEILI 1980	X X	Switzerland	X	X				SEM DR	LORD et al. 1987	X	Russia		X			correlation with S England	SEM
FLUGEL & FRANZ 1967 a	X X X	Switzerland					nannofacies	TEM	GRUN et al. 1974	X	S Germany	X					SEM DR	MEDD 1971	X X X	England France	X	X	X		TEM SEM	
FLUGEL & FRANZ 1967 b	X X X	Germany France					nannofacies	TEM	HAMILTON 1977	X X	Portugal	X	X	X	X		SEM LM	MEDD 1979	O X X	SE England	X	X	X		SEM LM	
FLUGEL & KEUPP 1979	X	S Germany					diagenesis	SEM	HAMILTON 1978	O X	Scotland	X	X			SEM	MEDD 1982	X X X	England	X	X	X		overview		
GAETANI & POLIANI 1978	X X X	N Italy			X			SEM	HAMILTON 1979	X O X X	Portugal	X	X	X	X		SEM	MONECHI & VIVIANA 1987	X O X X	C Italy					abstract biostratigraphy	
GALLOIS 1976	O	S England			X		coccolith blooms		HAMILTON 1982	X X X X	S England	X	X			SEM LM	MOSHKOVITZ 1972	X O	Israel	X	X	X		biometry	LM DR	
GALLOIS & MEDD 1979	O	S England	X		X		coccolith blooms	SEM	HAO 1983	X X X X	world-wide		X	X		overview		MOSHKOVITZ 1979	X X X	England	X	X	X		<i>Schizosphaerella</i>	SEM LM
GARTNER & GENTILE 1972	X	Missouri	X					TEM	KALIN 1980	X	Italy					<i>Schizosphaerella</i>	SEM	MOSHKOVITZ 1982	X	Austria	X				<i>C. ziambachiensis</i>	SEM LM
GASPARKOVA 1982	X X	W Carpathian	X	X				SEM	KALIN & BERNOULLI 1984	X X X X	C Atlantic Ocean DSDP LEG 79					<i>Schizosphaerella</i>	SEM LM	MOSHKOVITZ & EHRLICH 1976 a	X X X	Israel N Sinai	X	X	X	X	paleoecology	SEM LM
GEEL 1966	X O	SE Spain	X			X		LM	KEUPP 1976	X	S Germany	X				+Pithonella	SEM	MOSHKOVITZ & EHRLICH 1976 b	O X X X	Israel N Sinai	X		X		<i>Schizosphaerella</i> <i>C. crassus</i>	SEM LM
GOY 1981	O	France	X		X			SEM	KEUPP 1977	X	S Germany	X				diagenesis + Pithonella	SEM	MOSHKOVITZ & EHRLICH 1981	X X X	Israel	X	X			SEM LM	
GOY et al. 1978	O	France					abstract		KEUPP 1978	O	S Germany	X				morphometry	SEM	MOSHKOVITZ & EHRLICH 1987	X X X	world-wide	X	X			<i>W. manvatae</i>	SEM LM
GOY et al. 1979	O	France	X				nannofacies	SEM	JAFAR 1983	X X	Austria S Germany	X	X	X		overview	SEM LM	NICOSIA & PALLINI 1977	X	Italy			X		TEM	

AUTHOR	AGE	AREA	T	R	B	CORR	A	P	C	REMARKS	ILL	AUTHOR	AGE	AREA	T	R	B	CORR	A	P	C	REMARKS	ILL	AUTHOR	AGE	AREA	T	R	B	CORR	A	P	C	REMARKS	ILL
NOEL 1957	X X X X	Algeria	X	X	X						DR	ROOD et al. 1971	X X X	England	X		X						SEM	THIERSTEIN 1973	X X X	Tethys	X	X	X	X					SEM LM
NOEL 1958	X X X	Algeria	X		X						DR	ROOD et al. 1973	X X X	England N France	X		X						SEM	THIERSTEIN 1975	X X X	SE France N Atlantic Ocean W Pacific Ocean	X	X	X	X					
NOEL 1961	X X X	Morocco Tunisia Algeria Oklahoma	X								DR	ROTH 1973	X X X	C Pacific Ocean DSDP LEG 17	X	X							LM	THIERSTEIN 1976	X X X X	world-wide	X	X	X	X	X				LM
NOEL 1965	X X X	Europe Algeria	X								TEM	ROTH 1978	X X X	N Atlantic Ocean DSDP LEG 44			X						SEM LM	TREJO 1960	X X	America	X	X			X			LM	
NOEL 1972	X X X	France England	X							nannofacies	SEM	ROTH 1983	X X X	C Atlantic Ocean DSDP LEG 76	X	X	X	X					LM	TREJO 1969	X X	Mexico	X						<i>C.mexicana</i>	LM	
NOEL 1978	X X X	France								nannofacies	SEM	ROTH 1986	X X X X X	world-wide							evolution paleoceanography	-	WIEGAND 1984 a	X X X	NW Africa	X								SEM LM	
PERCH-NIELSEN 1985	X X X X	world-wide	X	X	X					overview	SEM LM	ROTH in press	X X X X	world-wide							evolution	-	WIEGAND 1984 b	X X X X	C Atlantic Ocean DSDP LEG 79	X	X							SEM LM	
PIRINI 1971	X X X	Turkey	X								TEM	ROTH et al. 1983	X X X	C Atlantic Ocean DSDP LEG 76	X	X	X	X					-	WILCOXON 1972 a	X X X	N Atlantic Ocean DSDP LEG 11	X	X						TEM	
POSCH & STRADNER 1987	X X X	Austria	X	X							LM	SCHMIDT 1978	X X	N Atlantic Ocean DSDP LEG 44	X	X							SEM	WILCOXON 1972 b	X X	N Atlantic Ocean DSDP LEG 11	X								
PRINS 1969	X X X	England France W Germany	X	X	X	X					DR	SINGH 1975	X X	India	X								LM	WIND 1978	X X	NW Atlantic Ocean DSDP LEG 44	X	X	X						LM
PRINS & DRIEL 1987	X X X	England France Germany								abstract evolution paleoceanography	-	SISSINGH 1977	X X X	world-wide			X						DR	WIND & WISE 1976	X X	Falkland Plateau			O					SEM	
PROTO DECIMA 1974	X X X	E Indian Ocean DSDP LEG 27			X						LM	SISSINGH 1978	X X	stratotypes			X						-	WISE & WIND 1976	X X	Falkland Plateau DSDP LEG 36	X	X							SEM LM
REINHARDT 1966	X X X	Central Europe	X								TEM LM	STRADNER 1963	X X X X	world-wide	X	X							DR	WORSLEY 1971	X X	W Atlantic Ocean	X	X						LM	
ROOD & BARNARD 1972	X X X	England N France	X	X	X					evolution of <i>Stephanolithon</i>	TEM LM	THIERSTEIN 1971	X X	SE France W Atlantic Ocean	X	X	X	X					SEM LM	YOUNG et al. 1986	X X	S Italy	X	X	X						SEM LM

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900 EXECUTIVE PLAZA WEST
4635 SOUTHWEST FREEWAY
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