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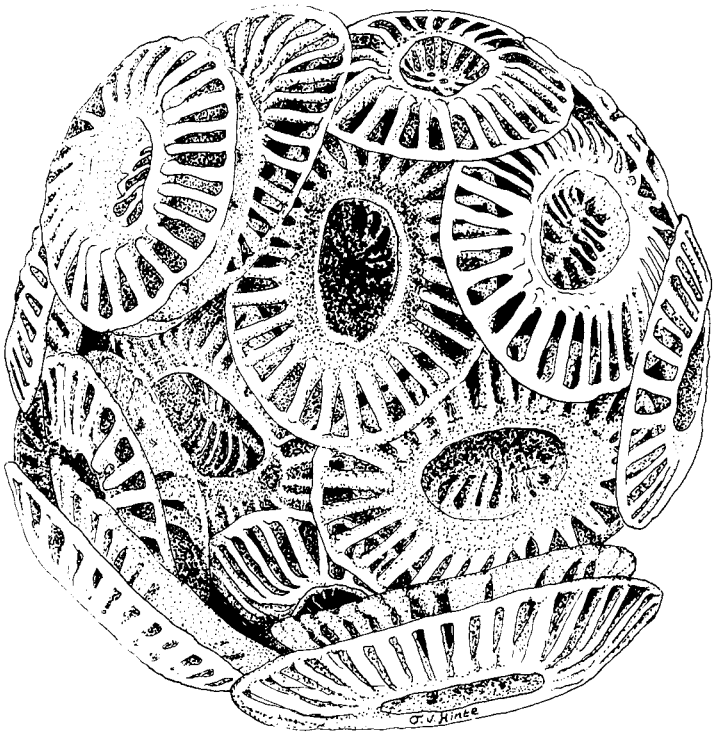

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VOLUME 7 NUMBER 1 1985

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CONTENTS

General information p. 2
Editorial p. 3
Announcement p. 4
Bibliography and taxa of calcareous nannoplankton V p. 5
J.C. Steinmetz
Review: Calcareous nannofossil biozonation of the Miocene and revision of the helicoliths and discoasters. p.29
Review: Biostratigraphie du Paléogène épicontinental de l'Europe du nord-ouest. Etude fondée sur les nannofossiles calcaires. p.30
Crepidolithus pliensbachensis nomen novum pro *Crepidolithus ocellatus* Crux 1984 non (Bramlette and Sullivan) Noel 1965. p.31
J.A. Crux
Archaeozygodiscus gen. nov. and other Triassic coccoliths. p.32
P. Bown
UFO 1: An elegant sphenolith from the Middle Eocene of southern California. P.L. Miller p.37
UFO 2: An Early Cretaceous nannofossil from the Central North Sea. p.38
Calcareous nannofossils from the Qorn Formation, North-Central Iran. F. Hadavi - Samadian p.38
Bibliography and taxa of silicoflagellates I p.39
R. Almekinders
New members, changes of address p.49

!! NOTE !!

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NEXT ISSUE

Contributions for the next issue of the INA Newsletter should be received before October 1985. Please send your contributions to: The editor of the INA Newsletter, S.E. van Heck (Address : see front page).

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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

As announced in the previous edition, we have made some changes in the Newsletter, which we hope are improvements. At the moment I am writing this, I don't know yet what the new cover will look like, or how the plate will come out. We would very much like to get some reactions of you. What do you think of the new cover, and of the idea of including a plate (or should we perhaps do more).

Another new thing in this issue is the introduction of UFOs. If you think you know what they are, or if you have seen them before, write to the Newsletter, so other people can hear about it. And again: let us know what you think of the idea. After all, you are paying for it, and it really is very hard to guess what people want if nobody lets us know!

One thing that came out of the INA Questionnaire in 1981 is the need of an index of silicoflagellates, similar to the nannoplankton index. In our spring issue of last year we announced that we had actually found someone willing to perform this task, and asked you all to send reprints dealing with silicos. Despite the fact that depressingly few people reacted to this request (which unfortunately is also the case for the nannos), the first contribution is now ready and can be found in this Newsletter.

This Newsletter contains yet another novelty: SEM photographs of some undisputed Triassic coccoliths, from classical localities such as Weissloferbach and Fischerwiese. Having heard from some of our American friends that there was some doubt about earlier reports (Moshkovitz, 1982 and Jafar, 1983), I hope they are now convinced and that we can expect an account of Triassic coccoliths from North America or any other continent with Upper Triassic marine deposits.

For the first time, we actually received more contributions than we could place in this issue. In store is a bibliography and index of discoasters, which was compiled by David Reimers (USA). We assume a lot of people will welcome this contribution, as it gives an up-to-date overview of the fast growing number of species. Hopefully we can manage to place it in our fall issue.

To conclude, let me ask you once more to let us know what you think of the Newsletter in general, the recent changes, the format etc. We can only produce a paper according to your wishes if we get some feedback.

See you in Vienna!

S.v.H.

+ + + + + + + + + + + + +

Please send your reprints of publications on calcareous nannoplankton to:

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ANNOUNCEMENT

I have the opportunity to organize a calcareous nannofossil workshop prior to the Second International Conference of Paleoceanography (ICP) which will be held at the Woods Hole Oceanographic Institution in September 1986 (from the 8th to the 12th). Thus we will have the opportunity to meet once again a year after the I.N.A. meeting in Vienna. The topics that we shall focus on in September 86 will no doubt be expressed at the closing of our meeting in Vienna. Tentatively, I propose that we dedicate the workshop to discussions about evolution since by that time much needed data on magneto- and isotope- stratigraphies will be available, and we should have much new information on early Mesozoic calcareous nannofloras. During this workshop, the reference collection that I am preparing little by little, thanks to the kind help of many of you, will be available for study, as well as during and after the conference. At this point, may I ask those of you who have not yet sent me subsamples from your Cenozoic type material to do so. We will all be thankful for that. In order to organize the workshop I need to get an idea of how many of you plan to attend. So, please complete the form below and return it to me before July 30th.

A last note: Because of editorial problems over which I have no control, the publication of the first volumes of the Handbook of Cenozoic Calcareous Nannofossils has been repeatedly delayed. Volumes 1 to 3 have been in press for almost three years... and, as may be expected, are no longer what I would call up-to-date. A number of new species descriptions which should be included in these volumes have recently been published; their insertions in the volumes now in press would only be cause for further delays. Rather, I propose to publish in the newsletters a list of the missing species right after the publication of the volume in which they should have been included. I apologize for any inconvenience, although I am only at the mercy of an editor...

- -

Please Return to: Marie-Pierre Aubry
Woods Hole Oceanographic Institution
Woods Hole, Massachusetts 02543 U.S.A.

1. Do you intend to attend the calcareous nannofossil workshop which will be held September 6, 7, 1986 prior to the 2nd ICP? YES.... NO....

2. Would you be interested in discussions about evolution? YES.... NO....

   If YES, would you like to present data? YES.... NO....
   If YES, will they be concerned with Mesozoic groups? YES.... NO....
   and/or Cenozoic groups? YES.... NO....

3. What other topics would you like to discuss?

4. Would you be interested in studying the reference collection of Cenozoic taxa? YES.... NO....

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2 **SAUNDERS, J.B., BERNOULLI, D., MÜLLER-MERZ, E., OBERHÄNSLI, H., PERCH-NIELSEN, K., RIEDEL, W.R., SANFILIPPO, A., SPEED, R.C., & TORRINI, R.** 1983
Late Eocene to Early Oligocene events in the Bath Cliff section in Barbados.
-First Internatl. Conf. Paleoceanogr., Abstr., p. 52.
abstr. strat. TERT.L. America.C.

3 **SINGH, P.** 1983
Eocene calcareous nannoplankton from the Abhay-1 well, Bengal Basin with paleoceanographic remarks.
-First Internatl. Conf. Paleoceanogr., Abstr., p. 60.
abstr. strat. TERT.L. Indian.Oc.

4 **SINGH, P. & ALI, Q.A.** 1983
Late Paleogene calcareous nannoplankton from the Tarapur well B-1401, Bombay offshore with paleoceanographic remarks.
-First Internatl. Conf. Paleoceanogr., Abstr., p. 56.
abstr. strat. TERT.L. Asia.E. Indian.Oc.

5 **STEINMETZ, J.C., & STRADNER, H.** 1983
Calcareous nannofossils from DSDP Hole 530A, their biostratigraphy and correlation with paleomagnetic reversals.
-First Internatl. Conf. Paleoceanogr., Abstr., p. 59.
abstr. strat. QUAT TERT CRET Atlantic.S.

6 **WILLIAMS, D.F., & THUNELL, R.C.** 1983
Oceanic response across the Cretaceous/Tertiary boundary as deduced from DSDP Leg 72 oxygen and carbon isotope records.
-First Internatl. Conf. Paleoceanogr., Abstr., p. 66.
abstr. strat. CRET-TERT boundary Atlantic.S. ISOT.

B127

Apertius magnus (MEDD 1979) CRUX 1984; p. 177 (ex Staurorhabdus). A220-5

Biscutum finchii CRUX 1984; p. 168, fig. 9 (3,4), fig. 13 (5); Southwest Germany, Late Pliensbachian-Early Toarcian. A220-5

Calcidiscus premacintyrei THEODORIDIS 1984; pp. 81, 82, pl. 2, figs. 1-3; Sicily, Miocene (NN5). A227-7

Calyculus magnus (GOY 1981) CRUX 1984; p. 176 (ex Incerniculum). A220-5

Crepidolithus ocellatus CRUX 1984; p. 181, fig. 11 (3,5), fig. 14 (5,6,7); Southwest Germany, Late Sinemurian-Early Pliensbachian. A220-5 *C-4
Illegitimate ICBN Art. 64.

Darwinilithus WATKINS in WATKINS & BOWDLER 1984; pp. 661,662. Type species: Darwinilithus pentarhethum WATKINS in WATKINS & BOWDLER 1984. A228-2

Darwinilithus pentarhethum WATKINS in WATKINS & BOWDLER 1984; pp. 662-664, pl. 1, figs. 1-6, pl. 2, figs. 1-6, pl. 3, figs. 1-8; southeastern Gulf of Mexico, DSDP Site 540, Middle Cenomanian. Type species of Darwinilithus WATKINS in WATKINS AND BOWDLER 1984. A228-2

Discorhabdus superbus (DEFLANDRE in DEFLANDRE & FERT 1954) CRUX 1984; p. 168 (ex Rhabdolithus). A220-5

Eu-discoaster brouweri (TAN SIN HOK 1927 ex TAN SIN HOK 1931) THEODORIDIS 1983 ssp. brouweri THEODORIDIS 1984; pp. 177, 178, pl. 36, fig. 13; Indian Ocean, DSDP Site 231, Miocene/Pliocene (NN 10-NN 18). A227-7

Eu-discoaster brouweri (TAN SIN HOK 1927 ex TAN SIN HOK 1931) THEODORIDIS 1983 ssp. streptus THEODORIDIS 1984; pp. 178, 179, pl. 36, figs. 11-12; Indian Ocean, DSDP Site 231, Miocene/ Pliocene (NN 11-NN 12). A227-7

Eu-discoaster calyculus (MARTINI & BRAMLETTE 1963) THEODORIDIS 1984; p. 174 (ex Catinaster). A227-7

Eu-discoaster coalitus (MARTINI & BRAMLETTE 1963) THEODORIDIS 1984; p. 173 (ex Catinaster). A227-7

Eu-discoaster giganteus THEODORIDIS 1984; pp. 172, 173, pl. 36, figs. 4-10; Indian Ocean, DSDP Site 231, Miocene (NN 10). A227-7

Eu-discoaster intercalaris (BUKRY 1971) THEODORIDIS 1984; p. 179 (ex Discoaster). A227-7

B128

Eu-discoaster mexicanus (BUKRY 1971) THEODORIDIS 1984; p. 173 (ex Catinaster). A227-7

Eu-discoaster micros THEODORIDIS 1984; pp. 170, 171, pl. 36, figs. 1-3; Atlantic Ocean, DSDP Site 369A, Miocene (NN 7). A227-7

Eu-discoaster misconceptus THEODORIDIS 1984; p. 168, 169, text-figs. A-D, pl. 37, figs. 19-20; Sicily, Miocene (NN 11). A227-7

Eu-discoaster protoexilis THEODORIDIS 1984; p. 162, pl. 33, figs. 1-2; Atlantic Ocean, DSDP Site 369A, Miocene (NN 2). A227-7

Hayella aperta THEODORIDIS 1984; pp. 82, 83, pl. 3, figs. 3-8; North Atlantic, DSDP Site 369A, Miocene (NN 6). A227-7

Hayella challengeri (MÜLLER 1974) THEODORIDIS 1984; p. 83 (ex Nannocorbis). A227-7

Helicosphaera acuta THEODORIDIS 1984; pp. 119, 120, pl. 18, figs. 9-10, pl. 25, fig. 8; Atlantic Ocean, DSDP Site 397, Pleistocene (CN 13). A227-7

Helicosphaera carteri (WALLICH 1877) KAMPTNER 1954 var. burkei (BLACK 1971) THEODORIDIS 1984; p. 133 (ex Helicosphaera burkei). A227-7

Helicosphaera carteri (WALLICH 1877) KAMPTNER 1954 var. carteri THEODORIDIS 1984; pp. 132, 133. A227-7

Helicosphaera carteri (WALLICH 1877) KAMPTNER 1954 var. wallichii (LOHMANN 1902) THEODORIDIS 1984; p. 133 (ex Coccolithophora wallichii). A227-7

Helicosphaera elongata THEODORIDIS 1984; p. 117, pl. 17, figs. 6-9, pl. 25, fig. 3; Atlantic Ocean, DSDP Site 369A, Miocene (NN 6). A227-7

Helicosphaera gartneri THEODORIDIS 1984; pp. 129, 130, pl. 15, figs. 8-12, pl. 27, fig. 1; Egypt, Oligocene. A227-7

Helicosphaera inversa (GARTNER 1980) THEODORIDIS 1984; p. 120 (ex Helicopontosphaera). A227-7 *C-5

Helicosphaera paleocarteri THEODORIDIS 1984; p. 131, pl. 23, figs. 1-4, pl. 27, fig. 6; Sicily, Miocene (NN 6). A227-7

Helicosphaera stalis THEODORIDIS 1984; pp. 127, 128, pl. 13, fig. 6, pl. 20, figs. 10-12, pl. 21, figs. 1-12, pl. 26, figs. 5, 6; Sicily, Miocene (NN 8-NN 10). A227-7

B129

Helicosphaera stalis THEODORIDIS 1984 ssp. ovata THEODORIDIS 1984; p. 128, pl. 13, fig. 6, pl. 20, figs. 10-12, pl. 21, figs. 1-7, pl. 26, fig. 6; Sicily, Miocene (NN 8). A227-7

Helicosphaera stalis THEODORIDIS 1984 ssp. stalis THEODORIDIS 1984; pp. 127, 128, pl. 21, figs. 8-12, pl. 26, fig. 5; Sicily, Miocene (NN 10). A227-7

Helicosphaera waltrans THEODORIDIS 1984; p. 124, pl. 13, fig. 2, pl. 20, figs. 5-9, pl. 26, fig. 2; Gozo, Mediterranean, Miocene (NN 5). A227-7

Helicosphaeroidae THEODORIDIS 1984 (subfamily); p. 104. A227-7

Lithraphidites acutum VERBEEK & MANIVIT 1977 ssp. eccentricum WATKINS in WATKINS & BOWDLER 1984; p. 664, pl. 14, figs. 1-6, pl. 5, figs. 1-4; Southeastern Gulf of Mexico, DSDP Site 540, Middle Cenomanian. A228-2

Nannotetrina nitida (MARTINI 1961) AUBRY 1984; pp. 149, 150 (ex Tetralithus). A215-4

Perchnielsenella WATKINS in WATKINS & BOWDLER 1984; p. 664. Type species: Perchnielsenella stradneri (PERCH-NIELSEN 1973) WATKINS in WATKINS & BOWDLER 1984. A228-8

Perchnielsenella stradneri (PERCH-NIELSEN 1973) WATKINS in WATKINS & BOWDLER 1984; pp. 664, 665 (ex Lithastrinus?). Type species of Perchnielsenella WATKINS in WATKINS & BOWDLER 1984. A228-2

Reticulofenestra ampliumbilicus THEODORIDIS 1984; p. 84, pl. 5, figs. 5-7; Sicily, Miocene (NN 6). A227-7

Reticulofenestra floridana (ROTH & HAY 1967) THEODORIDIS 1984; p. 85 (ex Coccolithus). A227-7

Reticulofenestra prebisecta AUBRY 1984; p. 151, pl. 5, figs. 5-6, pl. 8, fig. 15; France, Middle Eocene (NP 14). A215-4

Reticulofenestra rotaria THEODORIDIS 1984; p. 85, pl. 5, figs. 1-4; Indian Ocean, DSDP Site 219, Miocene (NN 11). A227-7

Rhagodiscus reightonensis (TAYLOR 1978) WATKINS in WATKINS & BOWDLER 1984; p. 665 (ex Parhabdolithus). A228-2

Solidopons THEODORIDIS 1984; p. 86. Type species: Solidopons petrae THEODORIDIS 1984. A227-7

Solidopons petrae THEODORIDIS 1984; p. 86, pl. 6, figs. 1-7; Indian Ocean, DSDP Site 219, Miocene (NN 4). Type species of Solidopons THEODORIDIS 1984. A227-7

B130

Syracosphaera? fragilis THEODORIDIS 1984; pp. 87, 88, pl. 9, figs. 1-4; Sicily, Miocene (NN 6). A227-7

Tetralithoides THEODORIDIS 1984; p. 88. Type species: Tetralithoides symeonidesii THEODORIDIS 1984. A227-7

Tetralithoides symeonidesii THEODORIDIS 1984; p. 88, pl. 9, figs. 5-12; Mediterranean Sea, DSDP Site 372, Miocene (NN 4). Type species of Tetralithoides THEODORIDIS 1984. A227-7

Triquetrorhabdulus extensus THEODORIDIS 1984; p. 89, pl. 11, 4-6; Indian Ocean, DSDP Site 219, Miocene (NN 11 & NN 12). A227-7

Triquetrorhabdulus finifer THEODORIDIS 1984; p. 89, pl. 11, figs. 7-10; Indian Ocean, DSDP Site 219, Miocene (NN 12). A227-7

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Calcispheres

Bicarinellum cristatum KEUPP 1982; pp. 335-337, pl. 6/2-9, figs. 7-12; Northwest Germany, Upper Aptian to Lower Albian. A229-2

Pithonella compsa KEUPP 1982; pp. 318-319, pl. 6.2-3, figs. 5-8; Northwest Germany, Upper Middle Aptian to highest Campanian. A229-2

Pithonella echinosa KEUPP 1982; pp. 331-332, pl. 6.2-7, figs. 10-12, pl. 6.2-8, figs. 1-2; Northwest Germany, Lower Albian. A229-2

Pithonella lepidota KEUPP 1982; pp. 330-331, pl. 6/2-7, figs. 2-7; Northwest Germany, Upper Aptian to Lower Albian. A229-2

Pithonella porata KEUPP 1982; pp. 316-318, pl. 6.2-2, fig. 12, pl. 6.2-3, figs. 1-4, 10; Northwest Germany, Lower Barremian to Lower Albian. A229-2

Pithonella sliteri (BOLLI 1980) KEUPP 1982; pp. 334-335 (ex Pirumella). A229-2

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COMMENTS

1 - A215-4: See also review.
This volume is dated 1983, but did not appear until 1984.

2 - A220-5: As the reproduction of the plates in this publication is rather poor, the author let us know that he is willing to lend photographic copies of the plates to anyone who is studying Early Jurassic nannofossils.

3 - A227-7: See also review.

4 - B127: Homonym of Crepidolithus ocellatus (BRAMLETTE & SULLIVAN 1961) NOEL 1965; see validation with new name in this issue of the Newsletter.

5 - B128: This combination had been introduced by Haq & Berggren 1978, but was invalid because the basionym was invalid at the moment of publication (INA Newsletter, 1(2), p.C3). The basionym was validated in 1980 (INA Newsletter, 2(1), p. 35). Although Theodoridis cites Gartner 1977 as the basionym, the wrong citation does not invalidate this new combination (ICBN Art. 33.2).

Species names in alphebetical order.

acuta, Helicosphaera
acutum ssp. eccentricum, Lithraphidites
ampliumbilicus, Reticulofenestra
aperta, Hayella
brouweri ssp. brouweri, Eu-discoaster
brouweri ssp. streptus, Eu-discoaster
calyculus, Eu-discoaster
carteri var. burkei, Helicosphaera
carteri var. carteri, Helicosphaera
carteri var. wallichii, Helicosphaera
challengeri, Hayella
coalitus, Eu-discoaster
compsa, Pithonella (C)
cristatum, Bicarinellum (C)
echinosa, Pithonella (C)
elongata, Helicosphaera
extensus, Triquetrorhabdulus
finifer, Triquetrorhabdulus
finchii, Biscutum
floridana, Reticulofenestra
fragilis, Syracosphaera?
gartneri, Helicosphaera
giganteus, Eu-discoaster
intercalaris, Eu-discoaster
inversa, Helicosphaera
lepidota, Pithonella (C)
magnus, Apertius
magnus, Calyculus
mexicanus, Eu-discoaster
micros, Eu-discoaster
misconceptus, Eu-discoaster
nitida, Nannotetrina
ocellatus, Crepidolithus*
paleocarteri, Helicosphaera
pentarhethum, Darwinilithus
petrae, Solidopons
porata, Pithonella (C)
prebisecta, Reticulofenestra
premacintyrei, Calcidiscus
protoexilis, Eu-discoaster
reightonensis, Rhagodiscus
rotaria, Reticulofenestra
sliteri, Pithonella (C)
stalis, Helicosphaera
stalis ssp. ovata, Helicosphaera
stalis ssp. stalis, Helicosphaera
stradneri, Perchnielsenella
superbus, Discorhabdus
symeonidesii, Tetralithoides
waltrans, Helicosphaera

New genus names.

Darwinilithus
Perchnielsenella
Solidopons
Tetralithoides

New super-generic names.

Helicosphaeroidae (subfamily)

* = Invalid.
(C) = Calcisphere.

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I would like to acknowledge the contributions of all authors who sent me reprints and items for inclusion in the current issue. Of particular note, I am grateful to K. Perch-Nielsen and S. E. van Heck for their comments.

Please continue to send reprints, comments, and corrections to me so that the Newlsetter can remain informative, current, and correct. Thank you.

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REVIEW

THEODORIDIS,S., 1984; Calcareous nannofossil biozonation of the Miocene and revision of the helicoliths and discoasters. -Utrecht Micropal. Bull., vol.32, 271 pp., 37 pls.; Dfl. 68,-.
Sales office: Singel 105, 3984 NX Odijk, The Netherlands.

As the title suggests, this thesis deals with Miocene nannofossils. Though the accent is on the Mediterranean, material from other areas such as the Atlantic and Indian Oceans, Java and Trinidad, has been included.Twenty-seven sections and several spot-samples form the basis for two new zonal schemes and for a reconstruction of the lineages of *Helicosphaera* and the discoasters.

The book consists of five chapters , the first of which is an introduction. Chapter 2 contains the stratigraphical information, with distribution charts of all sections. Unfortunately, no (semi)quantitative data are given.

Two new zonations are presented in chapter 3. One was developed as an alternative for the Mediterranean Miocene, because most of the conventional zonal markers are lacking there. Combination of this new zonation with the conventional criteria results in an 'integrated Miocene zonation'. A confusing aspect of this chapter is the number of correlation schemes of previous zonations, being compared with each other and with the new zonation.A figure in which both the Mediterranean and the integrated zonation are shown side by side, is lacking, thus making comparison difficult.Very useful are the rangecharts in this chapter.

The taxonomy is split up in a rather curious manner. Part of it is treated in chapter 3, in which two new genera, nine new species and two new combinations are introduced. The rest of the taxonomy is treated in chapter 4 *(Helicosphaera)* and chapter 5 (discoasters).

In chapter 4, the author presents a new view on the morphology and phylogeny of *Helicosphaera*.Two morphological groups are distinguished, of which group I is thought to be intermediate between ancestor *Pontosphaera* and group II. The author proposes two independant developments from *Pontosphaera,* thus making *Helicosphaera* polyphyletic. However, no nomenclatural consequences are drawn: a single generic name is retained. Of the two lineages originating from *Pontosphaera*,one is short, comprising only four species. The other splits up in three lineages. In this evolutionary scheme, the morphology of group II can be seen to develop independantly three times. This lack of correlation between phylogeny and morphology is not commented upon in the text. The rest of the chapter is devoted to taxonomy. One new subfamily is introduced (as the only subfamily in the family, containing this single genus), seven new species and three new combinations.

Chapter 5 contains a new look on the morphology of the discoasters, and the justification for the (re)creation of the generic names *Helio-discoaster* and *Eu-discoaster* (see INA Newsl. vol.5(1)). Each new genus now represents a different morphotype, occurring in a separate lineage, in a different period. The phylogeny of both genera is presented. Four new species, one new subspecies, and four new combinations are introduced.

The 37 plates (some of which contain excellent drawings by the author) combined with the species descriptions form a practical reference.

For the price of Dfl. 68.- this volume is certainly interesting for anyone working on Miocene material. Even if some of the ideas are perhaps somewhat controversial, the biostratigraphical data and the systematic overview make this thesis a useful buy.

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REVIEW

AUBRY,M.-P., 1984 : Biostratigraphie du Paléogène épicontinental de l'Europe du nord-ouest. Etude fondée sur les nannofossiles calcaires. -Docum. Lab.Géol. Lyon, no.89, 317 pp., 8 pls., 38 figs., 7 tbs.; 90 FF., Sales office: B.R.G.M., Departement Promotion et Vente; B.P. 6009; 45018 Orléans Cedex; France.

This thesis deals with the Paleogene nannofossils of the London-Paris Basin, and as such with many of the Paleogene type localities. The book is subdivided in four parts, each subdivided in several chapters.

The first chapter of part one mentions virtually all work done on the Paleogene nannofossils of northwestern Europe, and gives a summary of all work on the London-Paris Basin in particular. The second chapter gives an overview of the studied material (in total about 3000 samples), while drawings of 33 of the sections are presented in an appendix. After an chapter on techniques, the first part is concluded with a chapter on the applied zonation, which is basically that of Martini 1971.

Part two of this thesis is the most important, in that it contains the actual data. Nannofossil contents of the localities are here discussed in stratigraphical order, and illustrated with 19 distribution charts.

Part three contains seven chapters. Each of the first six chapters deals with a stage of which the type locality is situated in the London-Paris Basin (Thanetian, Cuisian, Lutetian, Bartonian, Ludian and Stampian). Of these stages, the nannofosil contents, stratigraphical position and important outcrops are discussed. Chapter seven is more or less a summary of the first six.

Part four consists of four chapters. Chapter one starts with an overview of each biozone, and the localities where it is developed. This is therefore more or less a recapitulation of the previous part. The chapter then continues with a discussion on the correlation between the stratigraphical succession in the London-Paris Basin and the eustatic sealevel curves of Vail et al.(1977). However, it takes some imagination to see all the correlations as described (though some are clear enough). Chapter two discusses the correlation between the biostratigraphy and the magnetostratigraphic timescale. The title of chapter 3 is: "Evolution paléobiogéographique des nannoflores paléogènes du Bassin Anglo-Parisien", suggesting it deals with the paleobiogeographic evolution of the Paleogene nannoflora. Rather disappointingly, it only explains why the subject is not treated (low frequencies, poor preservation). Chapter four finally, contains the taxonomic part. Most of the taxonomy, however, will be dealt with in the "Handbook", which we are still eagerly awaiting. One new species and one new combination are introduced. Part four concludes with a range chart (fig. 36) and an alphabethical species list.

This part of the book is followed by eight plates with light microscopic pictures, and concludes with several appendices. The first appendix contains the drawings of 33 sections, with the positions of the samples indicated. The other appendices contain 59 figures presenting the correlations between what seem to be all the previous zonations, showing the ranges of the marker species.

The great value of this work lies undoubtedly in the vast amount of data, and the very convenient summary of virtually all previous publications on the subject. The use of the French language will make this thesis inaccessable to many people, though its numerous distribution charts and correlation schemes can be used by everyone. Concluding, this book is certainly worth buying, specially as it comes for the really moderate price of 90 FF.

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Crepidolithus pliensbachensis nomen novum pro *Crepidolithus ocellatus* Crux 1984 non (Bramlette and Sullivan) Noel 1965.

By Jason A. Crux *

Crux (1984) introduced the name *Crepidolithus ocellatus* p.181, fig. 11(3,5); fig. 14(5,6,7). Miss S.E. van Heck has brought it to my attention that this name is a homonym of *Crepidolithus ocellatus* (Bramlette & Sullivan 1961) Noel 1965 and is thus illegitimate. Therefore *Crepidolithus pliensbachensis* is hereby introduced as a nomen novum for this species.

References:

Crux, J.A., 1984; Biostratigraphy of Early Jurassic Calcareous Nannofossils from Southwest Germany. N. Jb. Geol. Palaeont. Abh., 169, 160-186; Stuttgart.

Noel, D., 1965; Sur les coccolithes du Jurassique européen et d'Afrique du Nord. Essai de classification des coccolithes fossiles. Ed. C.N.R.S. Paris, 1-209.

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Archaeozygodiscus gen. nov. and other Triassic coccoliths.

Paul Bown, University College London

Pre-Jurassic calcareous nannofossils have been reported by at least 14 authors since 1961 in rocks ranging in age from Cambrian to Triassic. Despite these reports most workers remained skeptical about the existence of pre-Jurassic nannofossils, especially coccoliths, until recent papers by Moshkovitz (1982) and Jafar (1983) described and illustrated abundant and convincing material from the Upper Triassic of the Northern Calcareous Alps. The aim of this note is to described the genus Archaeozygodiscus and finally dispel any doubt that may remain over the presence of calcareous nannofossils and more importantly coccoliths in the Triassic by means of detailed scanning electron micrographs illustrating coccolith morphology and ultrastructure.

The samples studied were personally collected from 7 published field sections within the Northern Calcareous Alps of Austria ranging in age from Ladinian to Rhaetian. Additional material was provided by Dr M Urlichs. From these 7 sections only samples from Kendelbachgraben, Weissloferbach and Fischerwiese yielded nannofossils, with coccoliths from the latter two: Weissloferbach and Fischerwiese expose rocks of Norian-Rhaetian (Hauptdolomit facies) and Rhaetian (Halstatt facies) age respectively.

At least two species of coccolith have been observed by both light and scanning electron microscopy. Both forms are relatively common (1 coccolith per 10 fields of view) in the two sections and always occur associated with an abundant and enigmatic assemblage of calcispheres and Conusphaera zlambachensis Moshkovitz.

Taxonomy:

GENUS Archaeozygodiscus gen. nov.

Type species: Archaeozygodiscus koesseni sp. nov.

Diagnosis: Elliptical coccoliths possessing a loxolith structured rim imbricating in an anticlockwise direction with an inner cycle of tangential and overlapping calcite laths.

Known Range: Norian-Rhaetian

Archaeozygodiscus koesseni sp. nov.

Plate 1, figs. 1-3.

Diagnosis: A species of Archaeozygodiscus with the short axis of the ellipse spanned by a bar constructed from a number of calcite elements. The centre of the bar has a circular hole which may or may not be a spine base.

Remarks/Differentiation: Superficially similar to the younger form Zygodiscus erectus (Deflandre) Lezaud but a number of features are thought to warrant the recognition of a new genus and species. The elliptical rim of A. koesseni possesses a typical loxolith structure as do the coccoliths of Zygodiscus, however, the elements are imbricating in the opposite direction and the rim includes an additional inner cycle of tangential elements. Archaeozygodiscus is also distinctive in its diminutive size of 1.9 to 3.2 microns.

Holotype: Neg. no. UCL - 2040-33; plate 1, fig. 1.

Paratypes: Neg. no. UCL - 2040-29; plate 1, fig. 2.
Neg. no. UCL - 2028-10; plate 1, fig, 3.

Dimensions: Length holotype 1.9 microns, width 1.4 microns.

Type locality: Weissloferbach, near Kossen, Austria.

Type level: Kossener Schichten; Ch. marshi ammonite Zone, Rhaetian.

Range: Upper suessi Zone, Norian to marshi Zone, Rhaetian.

GENUS Crucirhabdus Prins, 1969 ex Rood, Hay and Barnard, 1973.

Crucirhabdus minutus Jafar 1983
Plate 1, figs. 4-7.

1983 Crucirhabdus minutus-Jafar, p. 247, fig. 12: 6a, 6b, 7, 8, 9, 10a, 10b, 18.

Remarks: First described by Jafar (1983) from light microscope observations alone. Further detailed examination by scanning electron microscope reveals C. minutus to be a small coccolith approximately 2 microns in length possessing a high elliptical rim composed of non-imbricating elements and a central area spanned by a cross which is orientated along the long and short axes of the ellipse. The cross supports a tall central spine.

Range: Upper suessi Zone, Norian to marshi Zone, Rhaetian.

References:

Jafar, S A 1983 (INA code A172-3)
Moshkovitz, S 1982 (INA code A165-4)
Urlichs, M & Hagn, H (1981) Site C2: Weissloferbach. Pages 135-141 in Hagn, H. Die Bayerischen Alpen und ihr Vorland in Mickropalaontologischer Sicht. Geologica Bavarica 82: 1-408.

Acknowledgements: This work is part of a project funded by the Natural Environment Research Council and supervised by Dr A R Lord. I am greatly indebted to Dr Max Urlichs (Staatliches Museum fur Naturkunde Stuttgart) for advice and sample material.

PLATE 1

Figs. 1-3: *Archaeozygodiscus koesseni* gen. et sp. nov.
Fig. 1: Holotype, UCL - 2040-33; distal view, x 16,300; sample E136.
Fig. 2: Paratype, UCL - 2040-29; distal view, x 15,800; sample E136
Fig. 3: Paratype, UCL - 2036-25; proximal view, x 15,000; sample E136.

Figs. 4-7: *Crucirhabdus minutus* Jafar
Fig. 4: UCL - 2025-23; distal view, x 14,300; sample W(e)39.
Fig. 5: enlargement of central area of Fig. 4, x 22,000.
Fig. 6: UCL - 2040-13; distal view, x 15,000; sample E136.
Fig. 7: UCL - 2025-9; distal view, x 16,500; sample W(e)39.

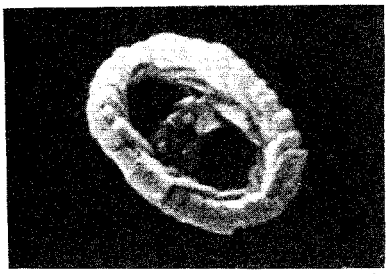
Figs. 8,9: *'Crepidolithus'* sp.
Fig. 8: UCL - 2036-32; distal view, x 13,000; sample E136.
Fig. 9: UCL - 2036-33; distal view, x 15,000; sample E136.

All specimens above from *marshi* Zone, Rhaetian, Weissloferbach, Austria. Specimen numbers refer to negatives stored in the Micropalaeontology Unit, University College London.

Figs. 10a-10d: UFO 1, *Sphenolithus* sp.
Fig. 10a: nomarski
Fig. 10b: oriented 60° to x-nicols
Fig. 10c: oriented 10° to x-nicols
Fig. 10d: oriented 27° to x-nicols

Figs. 11-13: UFO 2
magnification: 2000 x

Plate 1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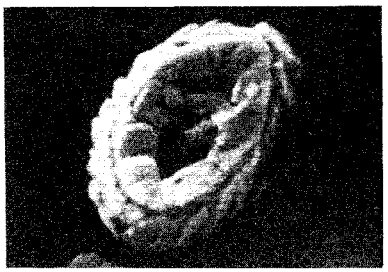
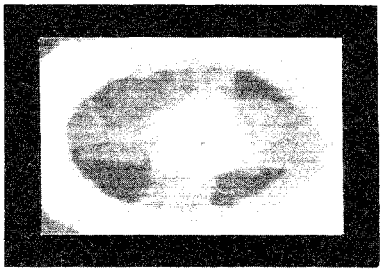

3


4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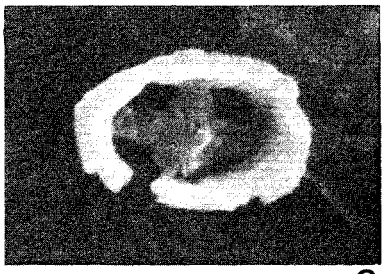
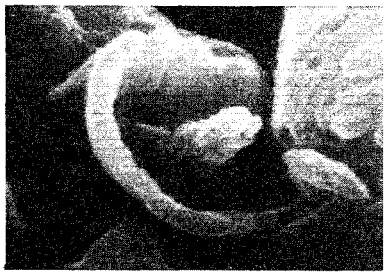
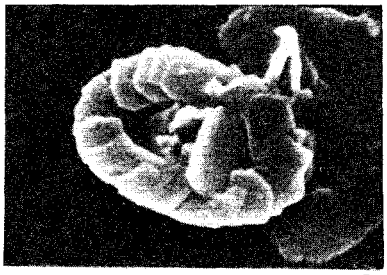
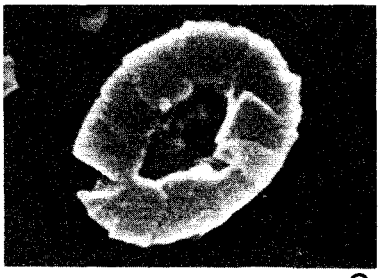
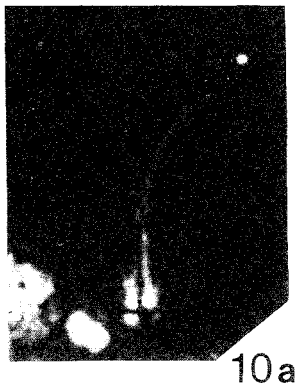
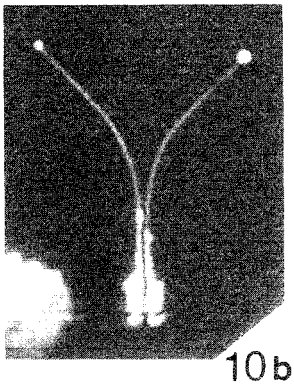

6


7

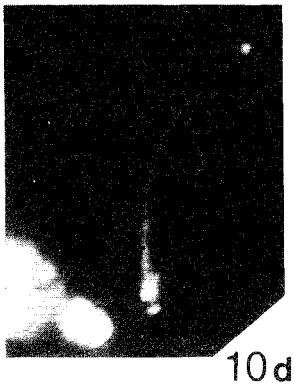

8


9


10a


10b


10c


10d


11


12


13

UFO 1

An elegant sphenolith from the Middle Eocene of southern California

By Peter L. Miller *

I am pleased to present "UFO #1" for your inspection. This short contribution is dedicated to the late Jackson Wong, long time Chevron nannofossil worker, who in 1977, first showed me the beautifully preserved sphenolith pictured here (pl. 1, fig. 10) from the west coast of southern California. Several additional preparations from the holotype material and shale horizons immediately above and below were eagerly searched. Unfortunately, this specimen is the lone survivor found to date.

Sphenolithus sp. (pl. 1, figs. 10a-10d)

Description: A sphenolith with a small, flat proximal shield and a long, bifurcate apical spine the body of which is divided by a median suture forming two vertically matched halves. The base of the apical spine is evenly matched with the proximal shield elements and protrudes in its lower third forming a distinct shoulder. The upper two thirds of the apical spine abruptly narrows and becomes slightly rugose while gradually tapering to the point of bifurcation into long curving equal branches, each of which terminates at a small bulbous structure. In cross-polarized light, the entire specimen is bright when the median axis is oriented at 60° to the polarization directions. Each body segment and corresponding branch of the apical spine become alternately dark and light at 10° and 27°, respectively. Optical orientation of the proximal shield elements is not clearly defined.

Remarks: A direct phylogenetic relationship of this species to other Paleogene taxa is unclear. Extinction of one whole side of the spine may relate to *Sphenolithus obtusus* Bukry. Morphological features show similarities to *S. tribulosus* Roth, *S. furcatolithoides* Locker and possibly the *S. predistentus / S. distentus / S. ciperoensis* succession. The bulbous spine terminations are unique. Did other sphenoliths have that structure?

Occurrence: *Sphenolithus* sp. occurs with *S. radians* Deflandre, *S. spiniger* Bukry and *Discoaster bifax* Bukry in a core sample from a well located near the Point Arguello headland, western Santa Barbara County, California. Shale horizons immediately above and below the holotype material also contain *D. bifax*. *Sphenolithus furcatolithoides* occurs about 180 meters stratigraphically lower in the well.

Age: *Discoaster bifax* Subzone of Bukry (1973) - Middle Eocene.

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UFO 2

An Early Cretaceous nannofossil from the Central North Sea

By Cees P. Kok *

During routine biostratigraphic investigations of sidewall sample material from several Central North Sea wells in Shell / Esso's acreage a nannofossil probably belonging to the genus *Lithastrinus* was observed in fair numbers. So far no appropriate references have been found and suggestions are therefore most welcome.

Description (pl. 1, figs. 11 - 13): A star to rosette shaped nannofossil made up of eight petal to rhomboidal shaped segments which are arranged in two, possibly superimposed, cycles. The outline of the elements is variable but is sharply pointed in well preserved specimens. A narrow axial depression has been observed.
Dimensions: ca. 14 µm - 22µm in diameter, very variable
Distribution: Central North Sea
Known range: Berriasian - Valanginian
Remarks: Differs from *Lithastrinus* sp. Stover by having eight rather then nine segments and by being much larger in diameter. Also its stratigraphic occurrence is different.

* C.P. Kok, Shell U.K. Expro, UEE/312, Shell-Mex House, Strand, London WC 2R 0DX, England.

+ +

Calcareous nannofossils from the Qorn Formation, North-Central Iran.

By F. Hadavi - Samadian, Geological Survey of Iran

The Qorn Formation in its type area in North Central Iran has been investigated to determine its age by use of calcareous nannofossils. The formation has nine members; twelve samples from the "e" members (Stocklin, J., 1971) have been studied. They contain abundant nannofossils which are poorly preserved, and not very diverse. *Coccolithus pelagicus* (Wallich) Schiller and *Cyclocargolithus floridanus* (Roth and Hay) Bukry, are the most common species and were found throughout the sections. The presence of *Discoaster deflandrei* Bramlette and Wilcoxon, and *Sphenolithus heteromorphus* Deflandre indicate a Burdigalian age for this section and possibly Zone NN4 of Martini's (1971) Standard Zonation.

Reference:

STOCKLIN, J., 1971., Stratigraphic Lexicon of Iran (part 1: Central North and East Iran). Geol. Surv. Iran, Rep.18, 338 pp.

Bibliography and taxa of silicoflagellates I
by: Rene Almekinders

1. -Introduction

During the last 15 years silicoflagellate research has been stimulated by the Deep Sea Drilling Project. As a result a large amount of new taxa was published in an ever increasing number of publications. Unfortunately the "annotated index of fossil and Recent silicoflagellates" by Loeblich et al. (1968) was not continued.

To fill up the gap the INA-Newsletter is now starting a bibliography and a list of taxa which will eventually contain all the data on silicoflagellates from 1968 on.

We will follow the same procedure as the one which is used for calcareous nannoplankton (INA-Newsletter, v. 1, no. 1).

2. -Bibliography.

References of papers dealing with silicoflagellates have been listed on pages which are subdivided into three columns.

2.1-first column: The Publication Reference Number.

The letter E indicates that all pages of the INA-Newsletter with this letter contain titles of publications on silicoflagellates. It is directly followed by the page number and the number of the title. This combined number is the publication reference number.

2.2-second column: The Complete Reference.

2.3-third column: The Subject Code.

Each reference has been provided with a code indicating the main subjects treated in the publication. For silicoflagellates the same code is used as for calcareous nannoplankton.

3. -Taxa.

3.1-first column. The Taxon Page Number.

The letter F indicates that pages of the INA-Newsletter with this letter contain names of taxa. It is followed by the number of the page.

3.2-second column: The Name of the Taxon.

In this column the name of the taxon, reference, type locality and age of the holotype are given. In case of new combinations the basionym is given.

3.3-third column: The Publication Reference Number.

This column contains the number referring to the complete reference of the publication in which the new taxon or the new combination has been introduced (the E pages).

In order to make this work possible you are urgently asked to send all your reprints of publications concerning silicoflagellates to: RENE ALMEKINDERS.

E1

1	BARRON, J.A., BUKRY, D. & POORE, R.Z. Correlation of the middle Eocene Kellog Shale of northern California. -Micropal, v. 30, no. 2: pp. 138-70, 2 textfigs., 11 tbs., 9 pls.	1984	(strat) syst. TERT.L. America. N.
2	BUKRY, D. Phytoplankton stratigraphy, Central Pacific Ocean. DSDP Leg 17. -In: Winterer, E.L., Ewing, J.L., et al. Init. Rep. DSDP., v. 17: pp. 871-89, 4 figs., 1 tb., 5 pls.	1973	strat. TERT. Pacific. C.
3	BUKRY, D. Coccolith and silicoflagellate stratigraphy, DSDP Leg 18, eastern North Pacific. -In: Kulm, L.D., von Huene, R., et al. Init. Rep. DSDP., v. 18: pp. 817-31, 5 figs., 3 pls.	1973	strat. TERT. Pacific. N.
4	BUKRY, D. Coccoliths and silicoflagellates from DSDP Leg 19, North Pacific Ocean and Bering Sea. -In: Creager, J.S., Scholl, D.W., et al. Init. Rep. DSDP, v. 19: pp. 857-67, 1 fig., 5 tbs., 2 pls.	1973	(strat.) TERT. Pacific. N.
5	BUKRY, D. Coccolith and silicoflagellate stratigraphy, Tasman Sea and southwestern Pacific Ocean, DSDP Leg 21. -In: Burns, R.E., Andrews, J.E., et al. Init. Rep. DSDP, v. 21: pp. 885-93, 5 figs., 1 pl.	1973	strat. CRET.U. TERT. Pacific. S.
6	BUKRY, D. Coccolith and silicoflagellate stratigraphy, eastern Indian Ocean, DSDP Leg 22. -In: von der Borch, C.C., Sclater, J.G. et al. Init. Rep. DSDP, v. 22: pp. 601-7, 3 figs., 1 pl.	1974	strat. CRET.U. Indian. Oc.
7	BUKRY, D. Stratigraphic value of silicoflagellates in non-tropical regions. -Bull. Geol. Soc. Am., v. 85: pp. 1905-6, 3 figs.	1974	strat. CRET.U. TERT.
8	BUKRY ,D. Coccolith and silicoflagellate stratigraphy near Antarctica, DSDP Leg 28. -In: Hayes, D.E., Frakes, L.A., et al. Init. Rep. DSDP., v. 28: pp. 709-23, 3 figs., 4 pls.	1975	strat. TERT.L. Pacific. S.

E2

1 BUKRY, D. 1975 strat.
Silicoflagellate and coccolith stratigraphy, DSDP Leg 29. syst.
-In: Kennett, J.P., Houtz, R.E., et al. CRET.U.
Init. Rep. DSDP., v. 29: pp. 845-72, 9 figs., 7 pls. TERT.
Pacific.S.

2 BUKRY, D. 1975 strat.
Coccolith and silicoflagellate stratigraphy, northwestern Pacific Ocean, DSDP Leg 32. syst.
-In: Larson, R.L., Moberly, R., et al. TERT.U.
Init. Rep. DSDP., v. 32: pp. 677-701, 5 figs., 4 tbs., 4 pls. QUAT.
Pacific. N.

3 BUKRY, D. 1975 strat.
Phytoplankton stratigraphy, southwest Pacific, DSDP Leg 30. TERT.U.
-In: Andrews, J.E., Parkham, G., et al. Pacific. S.
Init. Rep. DSDP, v. 30: pp. 539-47, 5 figs., 1 pl.

4 BUKRY, D. 1976 strat.
Silicoflagellate and coccolith stratigraphy, southeastern Pacific Ocean, DSDP Leg 34. syst.
-In: Yeats, R.S., Hart, S.R., et al. TERT.U
Init. Rep. DSDP., v. 34: pp. 715-35, 8 figs., 4 pls. QUAT.
MORPH.
Pacific. S.

5 BUKRY, D. 1976 strat.
Comments on some coccoliths and silicoflagellates from DSDP Leg 35. TERT.
-In: Hollister, C.D., Craddock, C., et al. Atlantic. S.
Init. Rep. DSDP v. 35: pp. 693-9, 1 fig., 2 pls.

6 BUKRY, D. 1976 strat.
Cenozoic silicoflagellate and coccolith stratigraphy, South Atlantic Ocean, DSDP Leg 36. syst.
-In: Hollister, C.D., Craddock, C., et al. TERT.
Init. Rep. DSDP.. v. 36: pp. 885-917, 2 figs., 5 tbs., 9 pls. QUAT.
Atlantic. S.

7 BUKRY, D. 1976 strat.
Silicoflagellate and coccolith stratigraphy, Norwegian-Greenland Sea, DSDP Leg 38. syst.
-In: Talwani, M., Udintsev, G., et al. TERT.
Init. Rep. DSDP., v. 38: pp. 843-55, 4 tbs., 2 pls. Atlantic. N.

8 BUKRY, D. 1977 strat.
Coccolith and silicoflagellate stratigraphy, central North Atlantic Ocean. DSDP Leg 37. syst.
-In: Aumento, F., Melson, W.G., et al. TERT.U.
Init. Rep. DSDP, v. 37: pp. 917-27, 4 figs., 2 tbs. 1 pl. QUAT.
Atlantic. N.

E3

1 BUKRY, D. 1977 strat.
Coccolith and silicoflagellate stratigraphy, South Atlantic Ocean. DSDP Leg 39. syst.
-In: Supko, P.R., Perch-Nielsen, K., et al. TERT.L.
Init. Rep. DSDP, v. 39: pp. 825-39, 4 figs., 1 tb. Atlantic. C.
3 pls. Atlantic. S.

2 BUKRY, D. 1978 strat.
Cenozoic silicoflagellate and coccolith stratigraphy, southeastern Atlantic Ocean. DSDP Leg 40. syst.
-In: Bolli, H.M., Ryan, W.B.F., et al. TERT.U.
Init. Rep. DSDP, v. 40: pp. 635-49, 5 figs., 3 pls. QUAT.
Atlantic. S.

3 BUKRY, D. 1978 strat.
Cenozoic coccolith and silicoflagellate stratigraphy, offshore northwest Africa. DSDP Leg 41. syst.
-In: Lancelot, Y., Seibold, E., et al. TERT.
Init. Rep. DSDP, v. 41: pp. 689-707, 6 figs., 3 Atlantic. C.
pls.

4 BUKRY, D. 1978 strat.
Cenozoic silicoflagellate and coccolith stratigraphy, northwestern Atlantic Ocean. DSDP Leg 43. syst.
-In: Benson, W.E., Sheridan, R.E., et al. TERT.L.
Init. Rep. DSDP, v. 44: pp. 775-805, 6 figs. 3 Atlantic. N.
tbs., 7 pls.

5 BUKRY, D. 1978 strat.
Cenozoic coccolith, silicoflagellate and diatom stratigraphy. DSDP Leg 44. syst.
-In: Benson, W.E., Sheridan, R.E., et al. TERT.L.
Init. Rep. DSDP, v. 44: pp. 807-63, 6 figs., 19 Atlantic. N.
pls.

6 BUKRY, D. 1979 strat.
Comments on opal phytoliths and stratigraphy of Neogene silicoflagellates and coccoliths at DSDP Site 397 off northwest Africa. syst.
-In: Luyendyk, B.P., Cann, J.R., et al. TERT.U.
Init. Rep. DSDP, v. 49: pp. 977-1009, 5 figs., 10 QUAT.
pls. Atlantic. C.

7 BUKRY, D. 1979 strat.
Coccolith and silicoflagellate stratigraphy, northern Mid-Atlantic Ridge and Reykjanes Ridge. DSDP Leg 49. syst.
-In: Luyendyk, B.P., Cann, J.R., et al. TERT.
Init. Rep. DSDP, v. 49: pp. 551-81, 8 figs., 8 pls. QUAT.
Atlantic. C.

E4

1	Bukry, D. Miocene Corbisema triacantha Zone phytoplankton from Sites 415 and 416 off northwest Africa. DSDP Leg 50. -In: Lancelot, Y., Winterer, E.L., et al. Init. Rep. DSDP, v. 50: pp. 507-23, 3 figs., 6 pls.	1980	strat. TERT.U. Atlantic. N.
2	BUKRY, D. Silicoflagellate biostratigraphy and paleoecology in the eastern equatorial Pacific. DSDP Leg 54. -In: Rosendahl, B.R., Hekinian, R., et al. Init. Rep. DSDP, v. 54: pp. 545-73, 8 figs., 9 pls.	1980	strat. syst. TERT.U. QUAT. Pacific. C.
3	BUKRY, D. Synthesis of silicoflagellate stratigraphy for Maestrichtian to Quaternary marine sediment. -Spec. Publ. S.E.P.M., no. 32; pp. 433-44, 2 figs., 1 tb.	1981	strat. syst. CRET.U. TERT. QUAT. Worldwide
4	BUKRY, D. Silicoflagellate stratigraphy of offshore California and Baja California. DSDP Leg 63. -In: Yeats, R.S., Haq, B.U., et al. Init. Rep. DSDP, v. 63: pp. 539-57, 9 figs., 5 pls.	1981	strat. syst. TERT.U Pacific. N. ECOL.
5	BUKRY, D. Cretaceous Arctic silicoflagellates. -Geo-marine Letters, v. 1: pp. 57-63, 8 figs., 3 tbs.	1981	syst. CRET.U. Arctic. Oc.
6	BUKRY, D. Cenozoic silicoflagellates from offshore Guatemala. DSDP Site 495. -In: Aubouin, J., von Huene, et al. Init. Rep. DSDP, v. 67: pp. 425-45, 3 figs., 9 pls.	1982	strat. syst. TERT.U. QUAT. Pacific. C.
7	BUKRY, D. Neogene silicoflagellates of the eastern Equatorial Pacific, DSDP Hole 503A. -In: Prell, W.L., Gardner, J.V., et al. Init. Rep. DSDP, v. 68: pp. 311-23, 2 figs., 6 pls.	1982	strat. syst. TERT.U. QUAT. Pacific. C.
8	BUKRY, D. Upper Cenozoic silicoflagellates from offshore Ecuador. DSDP Site 504. -In: Cann, J.R., Langseth, M.G., et al. Init. Rep. DSDP, v. 69: pp. 321-42, 2 figs., 9 pls.	1983	strat. syst. TERT.U. QUAT. Pacific. C.
9	BUKRY, D. Neogene silicoflagellates from DSDP Site 543, western tropical Atlantic Ocean. -In: Biju-Duval, B., Moore, J.C., et al. Init. Rep. DSDP, v. 78: pp. 463-8, 1 tb., 3 pls.	1984	strat. TERT.U. Atlantic. C.

E5

1	Bukry, D. Paleogene paleoceanography of the Arctic Ocean is constrained by the middle or late Eocene age of USGS Core F1-422: Evidence from silicoflagellates. -Geology, v. 12: pp. 199-201, 1 tb., 1 fig.	1984	strat. TERT.L. Arctic. Oc. paleocean.
2	BUKRY, D. & FOSTER, J.H. Silicoflagellate and diatom stratigraphy, Leg 16, DSDP. -In: van Andel, T.H., Heath, G.R., et al. Init. Rep. DSDP, v. 16: pp. 815-73, 1 fig. 12 tbs., 17 pls.	1973	strat. syst. TERT.U. QUAT. Pacific. C. ECOL.
3	BUKRY, D. & FOSTER, J.H. Silicoflagellate zonation of Upper Cretaceous to lower Miocene deep-sea sediment. -J. Res. U.S. geol. Surv., v. 2: pp. 303-10, 2 figs., 2 tbs.	1974	strat. CRET.U. TERT. Worldwide.
4	GRADSTEIN, F.M. et al. Biostratigraphic summary of DSDP Leg 44: Western North Atlantic Ocean. -In: Benson, W.E., Sheridan, R.E., et al. Init. Rep. DSDP, v. 44: pp. 657-62, 6 figs.	1978	(strat). TERT. Atlantic. N.

F1 Taxa

Of all taxa the information about the holotype (page, plates and figures, location and age) is given first, additional information on localities, ages and zones is placed between brackets.

Corbisema angularis Bukry, 1984; p. 149, pl. 1, figs. 2,3; California, M. Eocene. E1-1

Corbisema exilis Bukry, 1984; p. 149,150, pl. 1, fig. 9; California, M. Eocene. E1-1

Corbisema hastata (Lemmermann) Perch-Nielsen, 1975 ssp. miranda Bukry, 1984; p. 150. Holotype pl. 1, fig. 10 of Bukry 1975 (E2-1); Tasman Sea (DSDP site 283), U. Eocene. E1-1

Corbisema inermis (Lemmermann) Bukry, 1977 ssp. ballantina Bukry, 1984; p. 150, pl. 1, fig.13; California, M. Eocene (South Atlantic (DSDP site 356) M. Eocene). E1-1

Corbisema regina Bukry, 1984; p. 150, pl. 2, fig. 6; California, M. Eocene. E1-1

Dictyocha byronalis Bukry, 1984; p.151, pl. 3, fig. 3; California, M. Eocene (Atlantic Ocean (DSDP sites 356,385,386), M. Eocene). E1-1

Naviculopsis americana Bukry, 1984; p. 151, pl. 5, fig. 2; California, M. Eocene. E1-1

Naviculopsis constricta (Schulz, 1928) Bukry, 1984; p. 151, 152. (ex Dictyocha navicula var. biapiculata fa. constricta) E1-1

Naviculopsis minor (Schulz, 1928) Bukry, 1984; p. 152 (ex Dictyocha navicula var. minor) E1-1

Dictyocha concinna Bukry, 1983; p. 327, pl. 2, fig. 5; Eastern tropical Pacific (DSDP site 504), U. Pliocene. E4-8

Dictyocha helix Bukry, 1983; p. 327, pl. 3, figs. 5,6; Eastern tropical Pacific (DSDP site 504), U. Pliocene. E4-8

Dictyocha tamarae Bukry, 1983; p. 328, pl. 5, figs. 7,8; Eastern tropical Pacific (DSDP site 504), U. Pliocene. E4-8

Dictyocha arbutusensis Bukry, 1982; p. 315, pl. 1, fig. 5; Eastern equatorial Pacific (DSDP site 503A), U. Pliocene. E4-7

F2	Dictyocha perfecta Bukry, 1982; p. 315, pl. 3, fig. 5; Eastern equatorial Pacific (DSDP site 503A), Pliocene.	E4-7
	Dictyocha transenna Bukry, 1982; p. 315, pl. 4, fig. 6; Eastern equatorial Pacific (DSDP site 503A), U. Miocene.	E4-7
	Distephanus crux (Ehrenberg) Haeckel ssp. carolae Bukry, 1982; p. 315, pl. 5, fig. 6; Eastern equatorial Pacific (DSDP site 503A), U. Miocene.	E4-7
	Distephanus speculum (Ehrenberg) Haeckel ssp. bispicatus Bukry, 1982; p. 315,316, pl. 6, fig. 2; Eastern equatorial Pacific (DSDP site 503A), U. Miocene to U. Pliocene.	E4-7
	Distephanus speculum (Ehrenberg) Haeckel ssp. tenuis Bukry, 1982; p. 316, pl. 6, figs. 5-11; Eastern equatorial Pacific (DSDP site 503A), U. Miocene.	E4-7
	Corbisema triacantha (Ehrenberg) Hanna var. nuda Bukry, 1982; p. 431, pl. 1, fig. 1; Eastern North Pacific Ocean (DSDP site 495), M. Miocene.	E4-6
	Dictyocha angulata Bukry, 1982; p. 431,432, pl. 1, fig. 9; Eastern North Pacific Ocean (DSDP site 495), L. Pliocene.	E4-6
	Dictyocha delicata (Bukry 1976) Bukry, 1982; p. 432, pl. 2, fig. 7. (ex Dictyocha perlaevis delicata).	E4-6
	Dictyocha delicata (Bukry 1976) Bukry var. bisecta Bukry, 1982; p. 432, pl. 2, fig. 3; Eastern North Pacific Ocean (DSDP site 495), Pliocene.	E4-6
	Dictyocha longa Bukry, 1982; p. 432, pl. 2, fig. 8; Eastern North Pacific Ocean (DSDP site 495), U. Miocene to L. Quaternary.	E4-6
	Dictyocha longa Bukry, 1982; var. paxilla Bukry, 1982; p. 432, pl. 3, fig. 3; Eastern North Pacific Ocean (DSDP site 495), Pliocene.	E4-6
	Dictyocha ornata ornata (Bukry, 1977) Bukry, 1982; p. 432. (ex Dictyocha perlaevis ornata)	E4-6

F3 Dictyocha ornata (Bukry) Bukry, 1982; ssp. africana Bukry, 1982; p. 432,433; holotype pl.3, fig. 5 of Bukry 1979 (E3-6); Western North Atlantic Ocean (DSDP site 397), U. Pliocene. E4-6

Dictyocha subaculeata (Bukry, 1980) Bukry, 1982; p. 433. (ex Dictyocha aculeata subaculeata) E4-6

Distephanus crux (Ehrenberg) Haeckel ssp. parvus (Bachmann, 1967) Bukry, 1982; p. 433. (ex Dictyocha crux forma parva) E4-6

Distephanus crux (Ehrenberg) Haeckel ssp. scutulatus Bukry, 1982; p. 433, pl. 4, fig. 9; Eastern North Pacific Ocean (DSDP site 495), L. and M. Miocene. E4-6

Distephanus polyactis (Ehrenberg) Deflandre var. literatus Bukry, 1982; p. 433, pl.5, fig. 4; Eastern North Pacific Ocean (DSDP site 495), U. Miocene. E4-6

Distephanus speculum (Ehrenberg), Haeckel ssp.patulus Bukry, 1982; p. 433,434, pl.5, fig. 7; Eastern North Pacific Ocean (DSDP site 495), Oligocene to M. Miocene. E4-6

Naviculopsis contraria Bukry, 1982, p. 434, pl. 6, fig. 5; Eastern North Pacific Ocean (DSDP site 495), L. Miocene (Naviculopsis ponticula Zone). E4-6

Naviculopsis lacrima Bukry, 1982; p. 434, pl. 7, fig. 3; Eastern North Pacific Ocean (DSDP site 495), L. Miocene. E4-6

Naviculopsis lata (Deflandre) Frenguelli var. obliqua Bukry, 1982; p. 434; holotype fig. 2 (13) of Sawamura and Otowa (1979); North Pacific, L. Miocene. E4-6

Naviculopsis ponticula (Ehrenberg) Bukry, 1980 ssp. spinosa Bukry, 1982; p. 434,435, pl. 9, fig. 2; Eastern North Pacific Ocean (DSDP site 495), L. Miocene. E4-6

Lyramula arctica Bukry, 1981; p. 60, fig. 2; Arctic Ocean, Maastrichtian. E4-5

Lyramula burchardae Bukry, 1981; p. 61, fig. 4; Arctic Ocean, Maastrichtian. E4-5

Lyramula porta Bukry, 1981, p. 61, fig. 6; Arctic Ocean, Maastrichtian. E4-5

F4	Vallacerta siderea (Schulz 1928) Bukry, 1981; p. 62. (ex Dictyocha siderea)	E4-5
	Dictyocha subclinata Bukry, 1981; p. 546, pl. 1, fig. 4; northeastern Pacific Ocean (DSDP site 470), U. Miocene (Distephanus longispinus Zone).	E4-4
	Mesocena diodon Bukry, 1978 ssp. borderlandensis Bukry, 1981; p.547, pl. 4, fig. 8; northeastern Pacific Ocean (DSDP site 469), U. Miocene (Distephanus pseudofibula Zone).	E4-4
	Mesocena hexalitha Bukry, 1981; p. 547,548, pl. 5, fig. 5; northeastern Pacific Ocean (DSDP site 470), U. Miocene (Distephanus longispinus Zone).	E4-4
	Dictyocha neonautica Bukry, 1981; p. 442; holotype pl. 3, fig. 6 of Bukry and Foster 1973 (E5-2); Pacific Ocean, Carnegie Ridge, U. Miocene (Dictyocha fibula Zone).	E4-3
	Dictyocha neonautica Bukry var. cocosensis Bukry, 1981; p. 442; holotype pl. 3, fig. 8 of Bukry and Foster, 1973 (E5-2); Pacific Ocean, (Cocos Ridge), U. Miocene (Dictyocha fibula Zone).	E4-3

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