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New Mesozoic and Paleogene calcareous nannofossils

By KATHARINA PERCH-NIELSEN[1])

ABSTRACT

Five new Mesozoic and Paleogene calcareous nannofossils species and one new genus are described: *Cruciplacolithus vanheckae, Lithraphidites kennethii, Lucianorhabdus inflatus, Quadrum sissinghii, Stoverius, Truncatoscaphus intermedius.*

ZUSAMMENFASSUNG

Fünf neue kalkige Nannofossilarten und eine neue Gattung aus dem Mesozoikum und dem Paläogen werden beschrieben: *Cruciplacolithus vanheckae, Lithraphidites kennethii, Lucianorhabdus inflatus, Quadrum sissinghii, Stoverius, Truncatoscaphus intermedius.*

Introduction

During the compilation of two chapters on Mesozoic and Cenozoic calcareous nannofossils for a textbook on Plankton Stratigraphy edited by BOLLI, SAUNDERS & PERCH-NIELSEN (1985), many new combinations, a few new species and one new genus were used. The new combinations were validated in PERCH-NIELSEN (1984) in the INA Newsletter and the new taxa are described herein.

Systematic descriptions

The genera are here treated in alphabetical order for easy reference. The rules of the International Code of Botanical Nomenclature are followed in the description of the taxa.

Cruciplacolithus HAY & MOHLER in HAY et al. 1967

Type species: Cruciplacolithus tenuis (STRADNER 1961) HAY & MOHLER in HAY et al. 1967

Cruciplacolithus vanheckae n. sp.

Pl. 1, Fig. 1–8

1985b *Cruciplacolithus vanheckae* in PERCH-NIELSEN, p. 461, Fig. 19/41, 42; 21.

Holotype. – Plate 1, Figures 1, 2 (negatives 6-2282/11, 12, ETH SEM Archive, Hönggerberg, Zürich).

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Derivation of name. – To honour SHIRLEY VAN HECK, editor and producer of the INA Newsletter, who took it upon her to continue the "Bibliography and taxa of calcareous nannoplankton" when AL LOEBLICH and HELEN TAPPAN discontinued it.

Type locality. – DSDP Site 356, São Paulo Plateau, South Atlantic (sample 356-9-2, 70 cm).

Type level. – Middle Eocene, NP 15.

Diagnosis. – Large, elongate form of *Cruciplacolithus* with a central cross aligned with the axis of the ellipse and nearly filling the central area.

Description. – *C. vanheckae* has an elongate elliptical outline. The distal shield is relatively narrow, leaving a wide central area which is nearly filled by the massive central cross. Elements protruding from the wall fill the rest of the central opening. The proximal shield is smaller than the distal shield, which does not show birefringence when viewed between crossed nicols.

Remarks. – *C. vanheckae* is larger than *C. cribellum* (Pl. 1, Fig. 9–11) from which it might have evolved. It also has an elongate shape, while *C. cribellum* has an oval outline.

Occurrence. – *C. vanheckae* was found in the Middle Eocene zones NP 15 and NP 16 of DSDP Site 356.

Lithraphidites DEFLANDRE 1963

Type species: Lithraphidites carniolensis DEFLANDRE 1963

Lithraphidites kennethii n. sp.

Pl. 2, Fig. 1–4

1968 *Lithraphidites* sp. cf. *L. quadratus* in GARTNER, p. 43, Pl. 6, Fig. 9a, b.
1977 *Lithraphidites quadratus* in PERCH-NIELSEN, Pl. 48, Fig. 4.
1985a *Lithraphidites kennethii* in PERCH-NIELSEN, p. 374, Fig. 41, 42.11.

Holotype. – Plate 2, Figure 1 (negative 6-1813/3, ETH SEM Archive, Hönggerberg, Zürich).

Derivation of name. – To honour Prof. Kenneth Hsü, Geologic Institute Zürich.

Type locality: DSDP Site 356, São Paulo Plateau, South Atlantic (sample 356-31-3, 69 cm).

Type level. – Late Maastrichtian, *Nephrolithus frequens* Zone, CC 26 of SISSINGH (1977).

Diagnosis. – Species of *Lithraphidites* with 4 short, broad double blades with two spikes at the extremeties. The blades are broad in the middle third of the rod.

Description. – The rod is about 10 microns long and built of 8 narrow blades and 8 blades which broaden in the middle third of the rod. The latter form 4 double blades of about one third or less of the length of the rod. Two spikes at the ends of the double blades are typical of this species.

Remarks. – *L. kennethii* differs from *L. quadratus* by shorter and broader blades and the two spikes at their extremeties. *L. grossopectinatus* and *L. serratus* have serrate blades. *L. kennethii* might have evolved from *L. grossopectinatus* or *L. quadratus* in the *L. quadratus* Zone.

Occurrence. – *L. kennethii* has been found in the "Middle" Maastrichtian Corsicana Marl of Texas (GARTNER 1968), CC 26 of DSDP Site 356 in the South Atlantic (PERCH-NIELSEN 1977) and (reworked?) in the basal Danian of Bidart, southwestern France.

Lucianorhabdus DEFLANDRE 1959

Type species: Lucianorhabdus cayeuxii DEFLANDRE 1959

Lucianorhabdus inflatus PERCH-NIELSEN & FEINBERG, n. sp.

Pl. 2, Fig. 6–9

1985a *Lucianorhabdus inflatus* in PERCH-NIELSEN, p. 362, Fig. 27.

Holotype. – Plate 2, Figure 6 (negative 6-3805/8, ETH SEM Archive, Hönggerberg, Zürich).

Derivation of name. – From the inflated distal part of the coccolith.

Type locality. – Kabylie, Algeria (sample G 454b of H. Feinberg, Lab. de Micropaléontologie, Tour 15, 4e, 4, place Jussieu, Paris).

Type level. – Late Campanian, *Quadrum trifidum* Zone, CC 22 of SISSINGH (1977).

Diagnosis. – Species of the holococcolithic genus *Lucianorhabdus* with an inflated stem.

Description. – *L. inflatus* has a more or less well developed proximal plate which is best visible in side view between crossed nicols. The stem is usually widest in the lower third or half of its length and tapers towards its distal end.

Remarks. – HATTNER & WISE (1980) have stated that "the large population of *L. cayeuxii* encountered in our samples shows enough transitional forms between previously distinguished taxa to indicate that most of these can be grouped under a single species definition". They then proceeded to describe a new species, *L. windii*, which differs from *L. cayeuxii* by its "strongly involute surface". While I agree that it can be difficult to distinguish between poorly preserved specimens of the species of *Lucianorhabdus*, the species themselves can not be confounded, especially when the specimens are studied with the light microscope.

L. inflatus differs from other species of the genus by the inflated stem which is widest usually in the lower half of its length. Such forms were not illustrated by HATTNER & WISE (1980) nor by DEFLANDRE (1959).

Occurrence. – *L. inflatus* was only found in a Late Campanian sample from Algeria. The assemblage of this sample also includes very rare *Quadrum trifidum, Aspidolithus parcus, Eiffellithus eximius, Arkhangelskiella cymbiformis, Reinhardtites anthophorus* and *R. levis* and thus can be assigned to SISSINGH's (1977) Zone CC 22.

Pseudomicula PERCH-NIELSEN in PERCH-NIELSEN et al. 1978

Type species: Pseudomicula quadrata

Pseudomicula quadrata PERCH-NIELSEN in PERCH-NIELSEN et al. 1978

Pl. 2, Fig. 10–14

1978 *Pseudomicula quadrata* PERCH-NIELSEN in PERCH-NIELSEN et al., p. 350, 351; Pl. 1, Fig. 43, 44; Pl. 7, Fig. 3, 6, 9.
1985a *Pseudomicula quadrata* in PERCH-NIELSEN, p. 374, Fig. 41, 42/23–25.

Remarks. – When *P. quadrata* was described, only the cubic, *Micula*-like form had been observed (Pl. 2, Fig. 13). Since then, forms with rod-like extensions were found (Pl. 2,

Fig. 10–12, 14) and it became probable, that *P. quadrata* evolved from *Lithraphidites*. The double blades split in the middle and extend to form inverted pyramids.

Occurrence. – *P. quadrata* was described from the Upper Maastrichtian (CC 26) of Egypt ad was also found (reworked?) in the basal Danian (NP 1) of DSDP Site 356 in the South Atlantic and in the Danian (NP 3) of El Kef in Tunisia.

Quadrum PRINS & PERCH-NIELSEN in MANIVIT et al. 1977

Type species: Quadrum gartneri PRINS & PERCH-NIELSEN in MANIVIT et al. 1977

Quadrum sissinghii n. sp.

Pl. 3, Fig. 3–5

Non 1961 *Tetralithus nitidus* MARTINI, p. 4, Pl. 1, Fig. 5; Pl. 4, Fig. 41 (Middle Eocene form).
1968 *Tetralithus nitidus* MARTINI in GARTNER, p. 42, 43, Pl. 13, Fig. 3, non Pl. 9, Fig. 14; Pl. 13, Fig. 4 (3-armed forms); Late Cretaceous.
1977 *Quadrum nitidum* (MARTINI) PRINS & PERCH-NIELSEN in MANIVIT et al., p. 178.

Holotype. – Plate 3, Figure 3 (from Pl. 41, Fig. 6 in MOHAMED 1982).

Derivation of name. – To honour WILLIAM SISSINGH, geologist with Shell who first formalised the Cretaceous coccolith zonation.

Type locality. – Ain Amur, NW of oasis Kharga, Egypt (sample Ain Amur 36 of MOHAMED 1982).

Type level. – Late Campanian (Early Maastrichtian?), *Tranolithus phacelosus* Zone, CC 23.

Diagnosis. – Calcareous nannofossil with 4 long, tapering rays separated by 4 sutures and a central, much smaller, quadratic structure of 4 curved elements.

Description. – The 4 regularily arranged, tapering rays ar more or less of equal length and join along 4 sutures. These do not join in the centre on both sides of the body, but leave room for a quadratic structure consisting of 4 curved elements. This structure can hardly be seen with the LM and is invisible in overgrown specimens also with the electron microscope (EM).

Remarks. – It has long been assumed that the 4-rayed forms of Late Cretaceous age were the same as MARTINI's *T. nitidus*, which was described from the Middle Eocene of France. Recently AUBRY (1983) has shown that the Eocene specimens can be assigned the typical Middle Eocene genus *Nannotetrina* (Pl. 3, Fig. 1, 2) and that they are in no way related to the Campanian/Maastrichtian 4-rayed forms. These have been listed and illustrated as *Tetralithus, Quadrum* or *Uniplanarius gothicus* or *nitidus*. Whereas some authors used *gothicus* for forms with long and also such with short rays, others distinguished between *gothicus* with a quadratic outline or only short rays and *nitidus* with long rays. In the absence of biometric studies the boundary between the two species can be drawn at the point where the length of the free rays exceeds the width of the rays.

Micula swastica (Pl. 3, Fig. 9) is more or less cubic and has 8 relatively short free arms, whereas *M. concava* (Pl. 3, Fig. 12) has 8 long arms in place of the 4 of *O. sissinghii*. The small central structure of *Q. sissinghii* suggests this form to have a common ancestor with *Micula*.

Occurrence. – The first occurrence of *Q. sissinghii* was used by SISSINGH (1977) to define the base of his zone 21 in the Late Campanian. *Q. gothicum* appears earlier, around the base of the Campanian. They both had their last occurrence in the Early Maastrichtian around the top of CC 23. *Q. sissinghii* is most common in low latitudes and is missing in high latitudes as in the North Sea area.

Stoverius n. gen.

Type species: Stoverius achylosus (STOVER 1966) n. comb.

Derivation of name. – To honour L. E. STOVER, geologist with Exxon who gave the first LM overview of Cretaceous coccoliths.

Diagnosis. – Round to broadly elliptical coccoliths with a wall of more or less vertical elements, a cycle of proximal elements and a central cross.

Remarks. – *Stoverius* differs from the other genera of the family Stephanolithiaceae, to which it can be assigned, by its round to broadly elliptical outline and by the central cross. *Cylindralithus* (Pl. 3, Fig. 6) has a higher wall and has an empty, open central area. *Corollithion* (Pl. 3, Fig. 8) has a hexagonal outline. *Rotelapillus* (Pl. 3, Fig. 10) also has a more or less round outline, but the central area is consistently bridged by 8 bars. *Cribrocorona* (Pl. 3, Fig. 11) has a cribrate central area and was assigned to the family Podorhabdaceae, since it probably evolved from *Cribrosphaera ehrenbergii.*

The oldest species assignable to *Stoverius* is *S. helotatus* (basionym: *Corollithion helotatus* WIND & WISE in WISE & WIND 1977, p. 299, 300, Pl. 85, Fig. 1–5), a form with a broadly elliptical outline and with an asymmetrical central cross supporting a long stem. It has been described from Kimmeridgian sediments. The type species *S. achylosus* (Pl. 3, Fig. 7, basionym: *Chiphragmalithus achylosus* STOVER 1966, p. 137, Pl. 6, Fig. 26; Pl. 7, Fig. 1, non Pl. 7, Fig. 2, 3) has a central cross with bars meeting at right angles and was described from the Albian. Also from the Albian stems *S. baldiae* (basionym: *Zygolithus baldiae* STRADNER & ADAMIKER 1966, p. 388, Pl. 2, Fig. 2, Textfig. 3, non Textfig. 4). The bars do not meet at right angles in *S. baldiae,* which still has a relatively low wall.

Forms with a higher wall and differing shapes of the central cross are *S. asymmetricus* (basionym: *Cylindralithus asymmetricus* BUKRY 1969, p. 42, Pl. 19, Fig. 9–12), *S. biarcus* (basionym: *Cylindralithus biarcus* BUKRY 1969, p. 42, Pl. 20, Fig. 1–3) and *S. coronatus* (basionym: *Cylindralithus coronatus* BUKRY 1969, p. 42, Pl. 20, Fig. 4–6).

Truncatoscaphus ROOD et al. 1971

Type species: Truncatoscaphus delftensis (STRADNER & ADAMIKER 1966) ROOD et al. 1971

Truncatoscaphus intermedius n. sp.

Pl. 1, Fig. 12, 13

1973 *Truncatoscaphus delftensis* in NOEL, p. 108, Fig. 6, Pl. IV, Fig. 4–6.
1985a *Truncatoscaphus intermedius* in PERCH-NIELSEN, p. 405, Fig. 79; 80/10.

Holotype. – Plate 1, Figure 13 (from NOEL 1973, Pl. IV, Fig. 6).
Derivation of name. – Intermedius, Latin: intermediate.

Type locality. – Armailles (Ain, France).

Type level. – Late Kimmeridgian (french sense).

Diagnosis. – A species of *Truncatoscaphus* with 14 ± 1 bars.

Description. – *T. intermedius* has the typical outline of *Truncatoscaphus* with slightly curved, long sides and truncate ends. The number of bars and thus the openings is usually 14, but may differ by one. A short central spine is present in some specimens.

Remarks. – *T. intermedius* differs from the other species of *Truncatoscaphus* by the number of bars in the central area. The distinction between forms with differing numbers of bars seems justified by the observation, that forms with few bars (6 and 8) appear in the Middle Jurassic, forms with more bars (10 and 14) appear in the Late Jurassic and finally forms with more than 14 bars in the Early Cretaceous (see PERCH-NIELSEN 1985a).

Occurrence. – *T. intermedius* has only been reported from the Kimmeridgian so far.

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Plate 1

Fig. 1–8	*Cruciplacolithus vanheckae* n. sp. Middle Eocene DSDP Site 356, São Paulo Plateau, sample 9-2, 70 cm. Fig. 1, 2: SEM of holotype, proximal and side view, ca. ×5250. Fig. 3–8: LM, parallel and crossed nicols, ca. ×2000.
Fig. 9–11	*Cruciplacolithus cribellum*. Middle Eocene DSDP Site 356, São Paulo Plateau, sample 9-2, 70 cm. Fig. 9: SEM of distal view, ca. ×6000. Fig. 10, 11: LM, parallel and crossed nicols, ca. ×2000.
Fig. 12, 13	*Truncatoscaphus intermedius* n. sp. Late Kimmeridgian Armailles, France. Fig. 12: SEM from GALLOIS & MEDD (1979), ca. ×30,000. Fig. 13: SEM of holotype in proximal view, ca. ×16,000, from NOEL (1973).

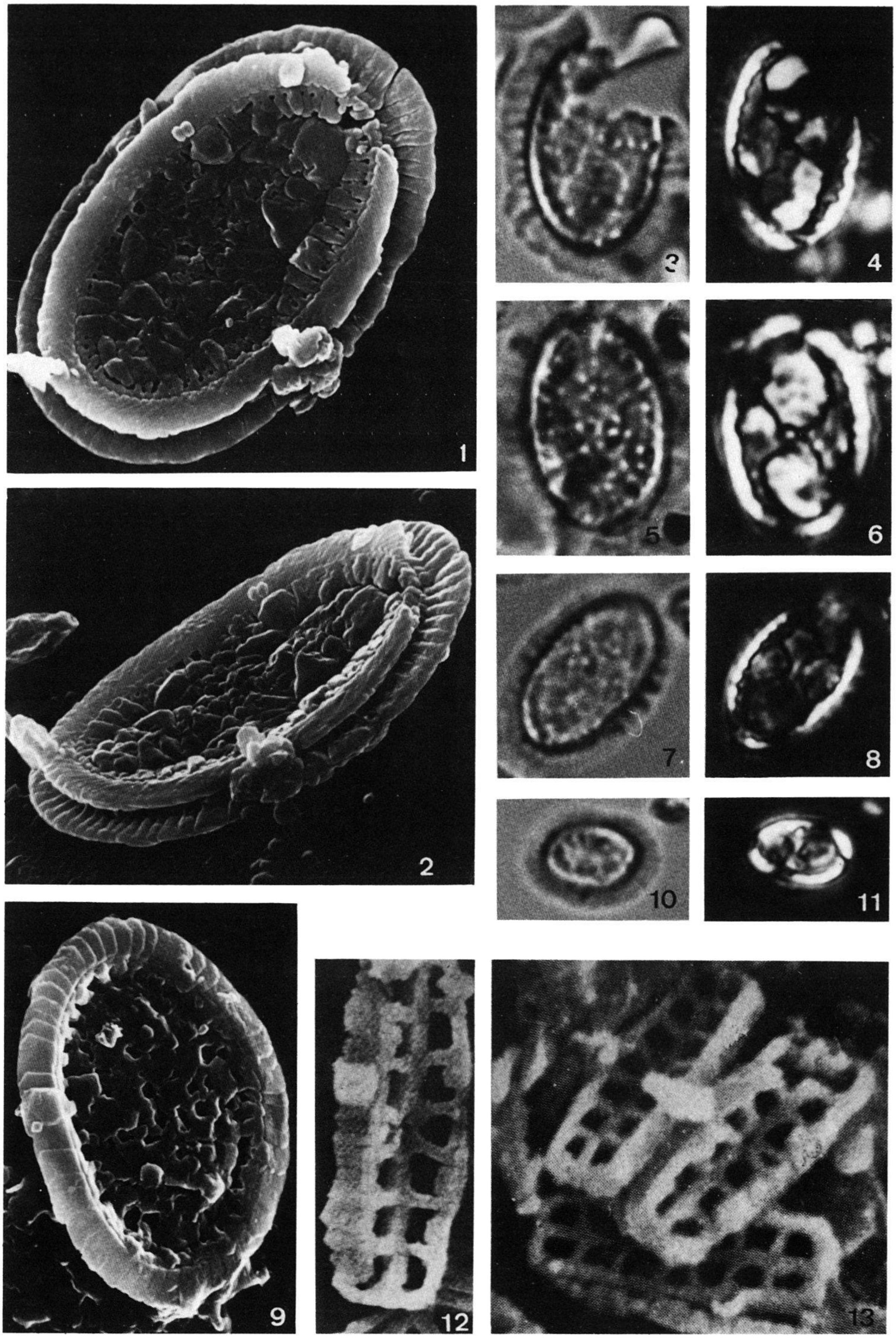
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Plate 2

Fig. 1–4	*Lithraphidites kennethii* n. sp. Upper Maastrichtian DSDP Site 356, South Atlantic (Fig. 1, holotype, SEM, ca. ×6000). Fig. 2: Lower Danian of Bidart, France (reworked?), SEM, ca. ×6000. Fig. 3, 4: LM from GARTNER (1968, Pl. 6: 9a, b, Maastrichtian Corsicana Marl, Texas, ca. ×3200).
Fig. 5	*Lithraphidites quadratus*. Lower Danian (reworked?) DSDP Site 356, South Atlantic, SEM, ca. ×6000.
Fig. 6–9	*Lucianorhabdus inflatus* n. sp. Upper Campanian of Kabylie, Algeria. Fig. 6: SEM of holotype, ca. ×8000. Fig. 7–9: LM between crossed nicols, at 0°, ca. ×2000.
Fig. 10–14	*Pseudomicula quadrata*. Fig. 10–12: SEM of turned specimen from the Lower Danian of DSDP Site 356, ca. ×5000, 7000, 7000. Fig. 13: SEM of holotype (from PERCH-NIELSEN et al. 1978) from the Upper Maastrichtian of Gebel Oweina, Egypt. ca. ×9000. Fig. 14: SEM of specimen with small "proximal shield" from the Paleocene of El Kef, Tunisia (reworked?), ca. ×5400.

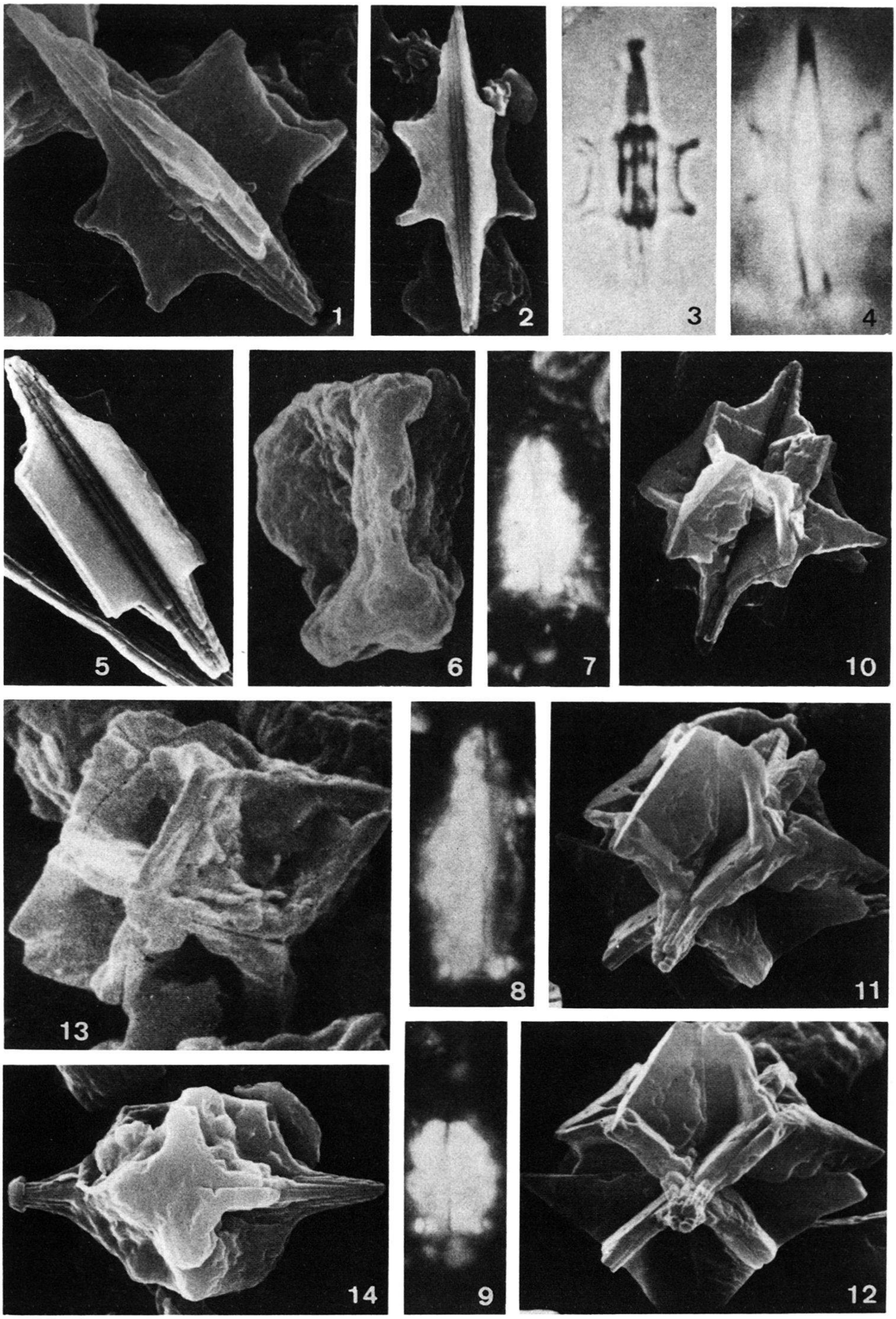
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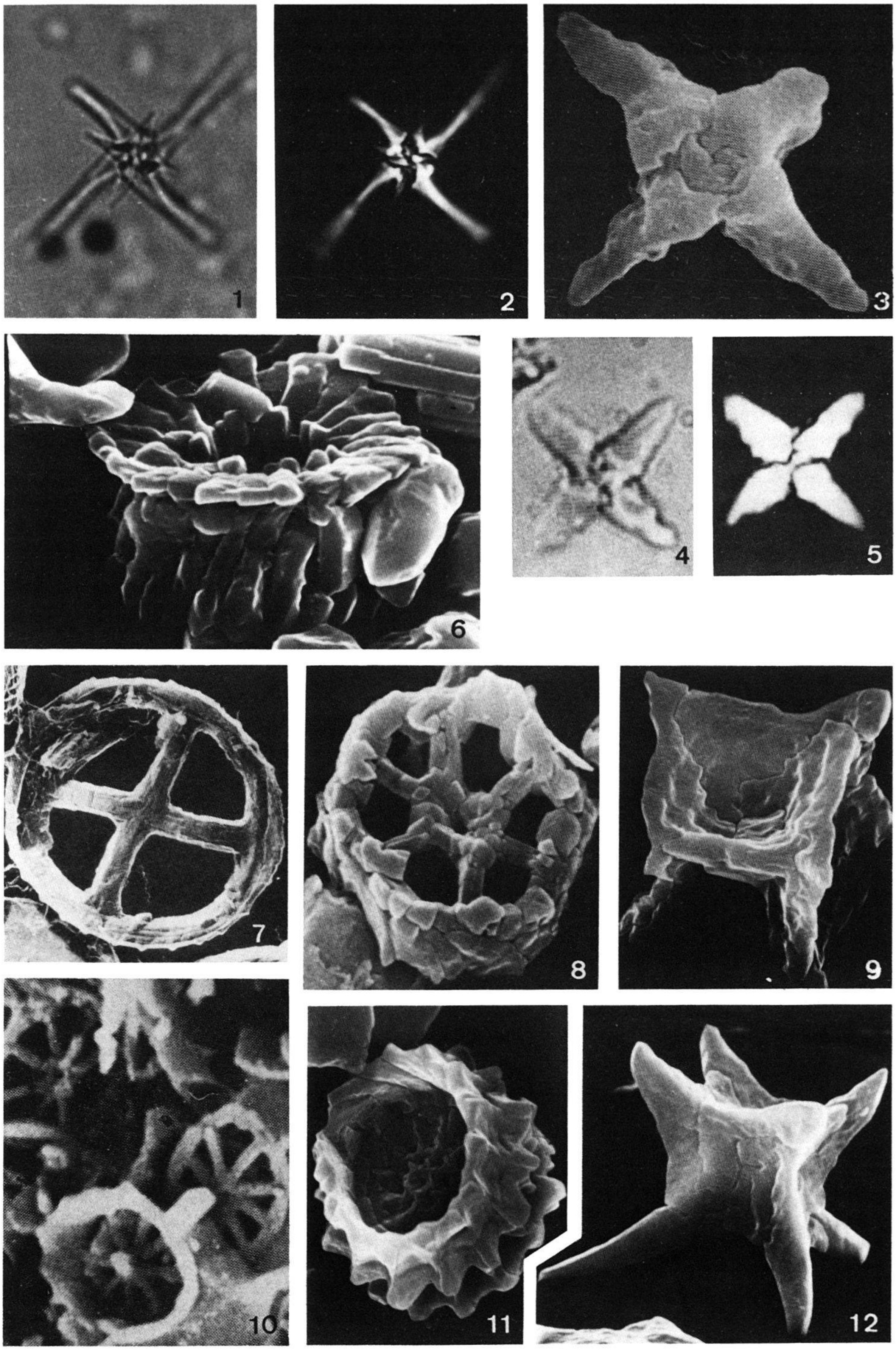
Plate 3

Fig. 1, 2	*Nannotetrina nitida,* Middle Eocene Brocklesham, UK; LM ca. ×2000. From AUBRY (1983).
Fig. 3–5	*Quadrum sissinghii* n. sp. Late Campanian of Ain Amur, Egypt. Fig. 3: SEM of holotype from MOHAMED (1982), ca. ×6500. Fig. 4, 5: LM, parallel and crossed nicols from MOHAMED (1982), ca. ×2000.
Fig. 6	*Cylindralithus serratus,* Maastrichtian DSDP Site 524, South Atlantic; SEM of side view, ca. ×10,000.
Fig. 7	*Stoverius achylosus.* Albian, New Museums Site, Cambridge, UK. TEM of distal view from BLACK (1973), ca. ×8000.
Fig. 8	*Corollithion exiguum.* Late Maastrichtian of Bidart, France. SEM of proximal view, ca. ×9000.
Fig. 9	*Micula swastica.* Late Maastrichtian DSDP Site 524, South Atlantic; SEM of oblique view, ca. ×7000.
Fig. 10	*Rotelapillus radians.* Kimmeridgian of Armailles, France. SEM of holotype from NOEL (1973), ca. ×8400.
Fig. 11	*Cribrocorona gallica.* Danian (reworked?) of DSDP Site 356, São Paulo Plateau, South Atlantic; SEM of oblique view, ca. ×6000.
Fig. 12	*Micula concava.* Danian (reworked?) of DSDP Site 356, São Paulo Plateau, South Atlantic; SEM ca. ×7000.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