

WATZNAUERIA MANIVITAE BUKRY - TAXONOMIC PROBLEMS AND DISTRIBUTION IN THE JURASSIC-LOWER CRÉTACEOUS SEDIMENTS OF ISRAEL AND OTHER TETHYAN AREAS.

By

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Introduction

Investigators working on the calcareous nannofossil assemblages of the Upper Jurassic and Lower Cretaceous sediments of various parts of the Tethyan Province have long noted the presence, sometimes in high amounts, of large, subelliptical to subcircular coccoliths (France - Manivit, 1966; the Atlantic Ocean - Worsley, 1971; Roth, 1983; Israel - Moshkovitz and Ehrlich, 1976; 1981; the Pacific Ocean - Bukry, 1973; Indian Ocean - Bukry, 1974; Proto Decima, 1974).

These large coccoliths were assigned by various authors to Coccolithus deflandrei Manivit, Cyclagelosphaera deflandrei (Manivit) Roth or to Watznaueria manivitae Bukry.

It is the purpose of this short note to elucidate the taxonomic confusion concerning these distinctive forms and summarize information on their stratigraphical distribution in Israel and other parts of the world, especially in the Tethyan Province.

Taxonomy

Watznaueria manivitae Bukry 1973

Pl. 1, Figs. 1-11

(Neotype Figs. 1-3)

- 1971 Coccolithus deflandrei Manivit - Worsley, Pl. 2, Figs. 37-39.
1973 Cyclagelosphaera deflandrei (Manivit) - Roth, p. 273 (partim), Pl. 27, Fig. 6 (non Pl. 26, Fig. 7).
1973 Watznaueria manivitae Bukry - p. 877.
1974 Watznaueria manivitae Bukry - Proto Decima, p. 595, Pl. 9, Fig. 1.
1976 Cyclagelosphaera deflandrei (Manivit) - Thierstein, Pl. 2, Figs. 20-21.
1976 Watznaueria sp. - Moshkovitz and Ehrlich, Pl. 6, Figs. 6-7.
1981 Watznaueria manivitae Bukry - Moshkovitz and Ehrlich, Pl. 1, Figs. 1-3.
1983 Cyclagelosphaera deflandrei - Roth, Pl. 2, Figs. 1-2 (non C. cuvillieri)

Description: large subelliptical to subcircular coccoliths (9-15 μ m), made of two thick superimposed shields. The distal one, which is strongly convex, is composed of two cycles, the outer one with some 30-40 imbricated elements, the inner with short radial elements irregularly arranged. The central area is subelliptical to elliptical, sometimes obstructed by irregular coarse elements. The proximal shield is somewhat smaller and the central area is sometimes blocked by radial elements. In light microscope between crossed nicols, this species is easily recognized by its high birefringence colours and the well marked, relatively small and elongated central area, showing two curved slit-like lines, aligned with the long axis of the ellipse. This form shows features rather similar to those of W. barnesae, which is however much smaller and thinner (Pl. 1, Fig. 14).

Remarks: great confusion exists in the literature concerning the systematic position of coccoliths of Jurassic and Early Cretaceous age, which match the above description and different names have been used (see synonymy).

Large circular coccoliths from the Middle Valanginian of Carnes, France have been described as Coccolithus deflandrei by Manivit (1966). Roth (1973) proposed a new combination, i.e. Cyclagelosphaera deflandrei (Manivit), for similar coccoliths recorded in the DSDP Leg

17, Site 167 (core 73 down to 94) of Late Tithonian-Hauterivian age. Bukry (1973), who worked on the same site, mentioned abundant "large coccoliths" in core 94 (Tithonian or Berriasian) and related them to the genus "Watznaueria" (probably because of their elongated shape). He proposed the name W. manivitae "as a substitute for Coccolithus deflandrei" since the name W. deflandrei was already occupied by another, very small form, i.e. Actinosphaera deflandrei Noël 1965 = Watznaueria deflandrei (Noël) Reinhardt 1971. Unfortunately, Bukry (1973) did not figure or describe his specimens. W. manivitae was, however, later reported from Leg 27, Site 261 (Late Jurassic-Early Cretaceous) by Bukry (1974) and Proto Decima (1974), who worked on the same material, described and figured it as "W. manivitae (Coccolithus deflandrei auct)". The present authors obtained material from the same Leg (Site 261) and could observe in cores 32-2 and 32-4 large subcircular specimens together with subelliptical-elliptical ones (Pl. 1, Figs. 1-4; 6-7). These specimens are identical with the forms found in the Upper Jurassic sediments of Israel and adjacent areas in various localities (e.g. Pl. 1, Figs. 8-11).

Examination of well-dated samples from England, has shown that W. manivitae occurs, although rarely, in the Upper part of the Callovian (Peltoceras athleta zone) and in the Lower Oxfordian (Pl. 1, Fig. 5). Thierstein (1976), who has figured a specimen (Pl. 2, Figs. 20-21) from the lower Oxfordian (Quenstedtoceras mariae zone) in England, has related it to Cyclagelosphaera deflandrei in spite of its subelliptical shape and elliptical central area. Roth (1983) who described the calcareous nannofossils from the West Atlantic (Site 534A), figured (Pl. 2, Figs. 1-2) a large specimen from core 110 cc (a level regarded by him as of latest Oxfordian to earliest Kimmeridgian in age). This specimen with subcircular shape and elliptical central area, which was related by him to C. deflandrei (non C. cuvillieri vide p. 608) bears a great resemblance to other Oxfordian specimens (cf. Thierstein, 1976).

Comparing the reported Jurassic descriptions with the generotypes of Watznaueria (W. barnesae) and Cyclagelosphaera (C. margereli) it seems that most are closer to Watznaueria by their elliptical-subelliptical shape, especially when considering their central elliptical part; this part in various Cyclagelosphaera species (e.g. C. margereli, C. rotaclypeata or C. reinhardtii) is clearly circular (Pl. 1, Figs. 12-13).

It is therefore suggested that the name W. manivitae Bukry by used and to regard as a neotype (since a holotype was not designated by the author from the original locality) the specimen presented hereby in Pl. 1, Figs. 1-3 (given both in LM and in the SEM) from the Eastern Indian Ocean, Leg 27, Site 261, core 32-4, 90-91 cm (Upper Jurassic).

Stratigraphical notes and listed distribution

The systematic confusion has led to contradictory conclusions concerning the stratigraphic range of these large nannofossils. Our observations and review of the described forms in the literature have shown that whereas large subelliptical to elliptical forms (which seem to be related to Watznaueria) are present in the Upper Jurassic (Upper Callovian-Berriasian) the circular to subcircular ones (Cyclagelosphaera?) are mostly distributed from the ?Kimmeridgian-Tithonian and upwards. Although Thierstein (1976) assigns a Callovian to Hauterivian range to C. deflandrei, he agrees that the subelliptical forms start in the Middle-Upper Callovian, whereas the circular forms appear later, in the Kimmeridgian-Tithonian (personal communication, 1978).

Forms which were related to the W. manivitae-C. deflandrei group

are found rather commonly in the Paleotethyan Provinces (including the Atlantic, Mediterranean, Indian and Pacific Oceans) where they seem mainly abundant in the eastern parts, however, similar forms were also found in more northern areas (e.g. England).

Reports concerning distribution in various stratigraphical levels and which seem to be relevant to the above discussion are as follows:

Upper Callovian: England - within the Peltoceras athleta zone, adhered to Eboraciceras cadiforme. Israel - NE Negev, within an interval with Peltoceras aff. antiquum, Pachyceras lalandeanum and other Upper Callovian ammonites (Moshkovitz and Ehrlich, 1981).

?Callovian-Oxfordian: Eastern Indian Ocean-DSDP, Leg 27, Site 261, core 30 (Bukry, 1974). Proto Decima (1974) recorded from the same site W. manivitae in levels regarded by her as Oxfordian to Hauterivian in age.

Callovian-Berriasian: Northwest Atlantic Ocean-DSDP, Leg 76, Site 534. Roth (1983) who investigated the nannofossils in this area figured his specimen from core 110 cc which he regarded as of latest Oxfordian to earliest Kimmeridgian in age.

Lower Oxfordian: England - within the Quenstedtoceras mariae zone (Thierstein, 1976; Moshkovitz and Ehrlich, 1981). Israel and adjacent areas (Moshkovitz and Ehrlich, 1976; 1981).

Tithonian-Berriasian: Central Pacific Ocean-DSDP, Leg 17, Site 167, core 94 (Bukry, 1973, p. 877). From the same site Roth (1973, p. 723) records large coccoliths and relates them to the Tithonian-Hauterivian.

Middle Valanginian: France - Carnes. The large coccoliths described by Manivit (1966) as Coccolithus deflandrei and renamed as Cyclagelosphaera deflandrei (Manivit) Roth 1973, are clearly circular both in outer shape and central area.

ACKNOWLEDGEMENTS

The authors would like to thank Dr A. R. Lord, University College London, for his critical reading of the manuscript.

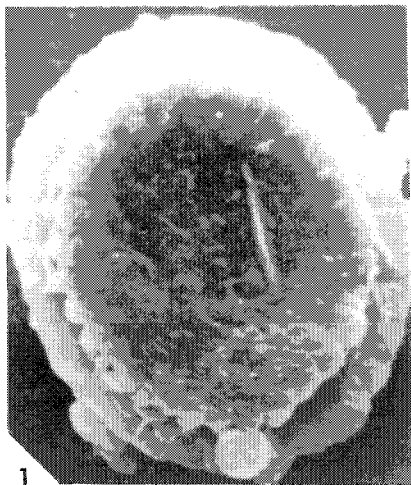
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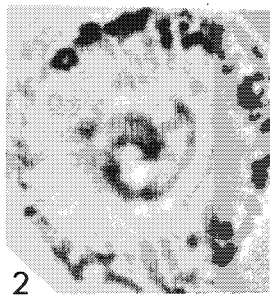
PLATE 1

Figures

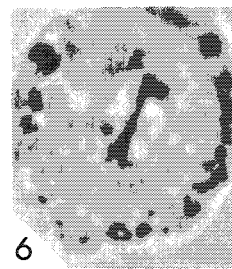
- 1 Watznaueria manivitae Bukry, proximal side. DSDP Leg 27, Site 261, Core 32-4, 90-91 cm, Upper Jurassic. SEM x 4500.
- 2,3 Watznaueria manivitae Bukry, LM (Fig. 2, ordinary light; Fig. 3, polarized light). Same specimen as in Fig. 1. x 3000.
- 4 Watznaueria manivitae Bukry, distal side. Same locality and sample as Fig. 1. SEM x 4000.
- 5 Watznaueria manivitae Bukry, proximal side. Warboys, Huntingdonshire, England. C. cordatum? zone, Lower Oxfordian BK 29; LFS 1938, Geol. Mus. London, GSI N-4918. SEM x 4250.
- 6,7 Watznaueria manivitae Bukry, LM (Fig. 6, ordinary light; Fig. 7, polarized light). DSDP, same locality and sample as in Fig. 1. x 3000.
- 8,9 Watznaueria manivitae Bukry, LM. (Fig. 8, ordinary light, Fig. 9, polarized light), Delta-1 well, Israel offshore, depth 4366 m, Upper Callovian-Oxfordian. GSI. N-958. x 3500.
- 10,11 Watznaueria manivitae Bukry, LM. (Fig. 10, ordinary light, Fig. 11, polarized light). Gan Yavneh-3 well, central coastal plain, Israel, depth 2541 m. Upper Callovian-Oxfordian. GSI-N. 3162. x 3500.
- 12 Cyclagelosphaera margereli Noël, distal side. Mount Hermon, Upper Callovian-Oxfordian, GSI-N. 4066. SEM x 8000.
- 13 Cyclagelosphaera margereli Noël, LM (polarized light). Same locality and sample as in Fig. 12. x 3000.
- 14 Watznaueria barnesae (Bläck) Perch-Nielsen, LM (polarized light). Delta-1 well, Israel offshore, depth 4270 m, Upper Callovian-Oxfordian. GSI-N. 956. x 3000.



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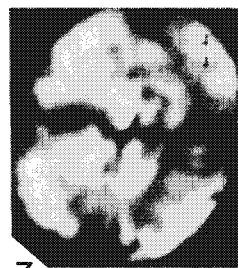
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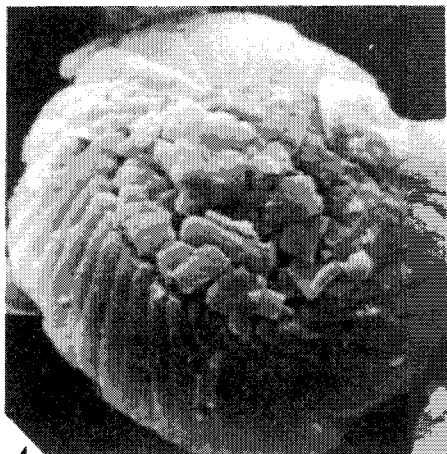
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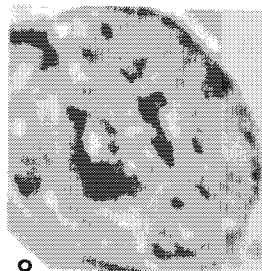
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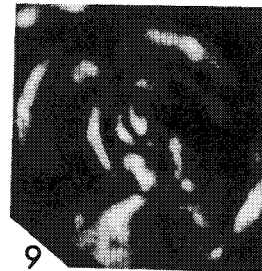
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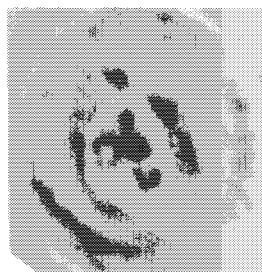
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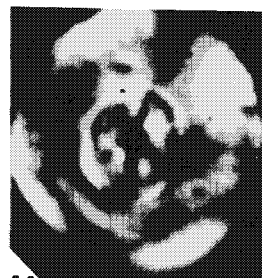
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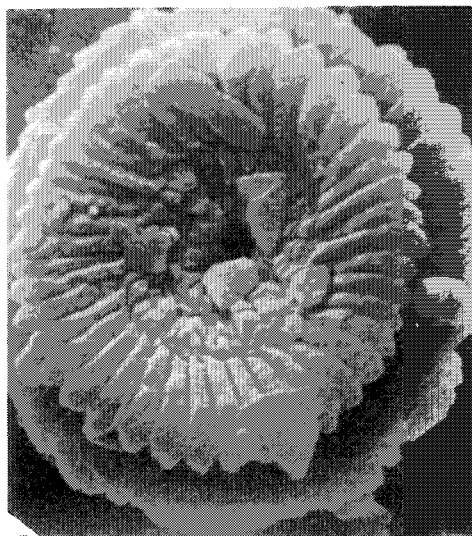
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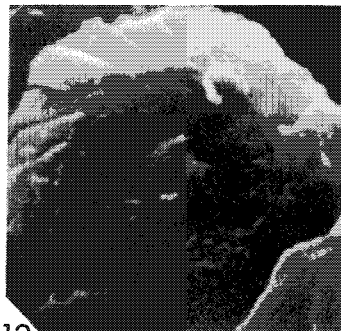
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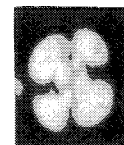
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Plate 1