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VOLUME IX, PART 3, JULY, 1958

184. AMMOCYCOLOCOULINA, N. GEN., AN UNKNOWN FORAMINIFERAL GENUS

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ABSTRACT

An arenaceous isomorph of Cycloloculina Heron-Allen and Earland, 1908, is herewith described and figured as Ammocycloloculina, n. gen. This hitherto monotypic new genus is based on Spirocyclina erratica Joukowsky and Favre, 1913, from the Infravalanginian of Mt. Salève, Haute-Savoie (France).

INTRODUCTION

While revising the species of the genera Pseudocyclammina and Spirocyclina by means of both original and topotype material, I also had the opportunity of a firsthand study of a largely ignored form, described by E. Joukowsky and J. Favre (1913, p. 491-492) as Spirocyclina erratica, n. sp. Numerous specimens of this large discoïd form were found in the Infravalanginian of Monnetier, Petit Salève in Haute-Savoie, France, whereas the same beds of Grand Salève contain only a few tests (loc. cit., p. 492). These basal Valanginian limestones which surmount the Purbeckian beds (with Planorbis, Clypeina, Chara, ostracods, etc.) are reported to contain, moreover, Natica leviathan Pictet and Campiche and Heterodiceras lucii Défrance.

The original material on which this species from the Salève was based is deposited in the Museum of Natural History at Geneva, Switzerland. Dr. E. Lanterno, head of the Department of Geology and Paleontology of the museum, very kindly placed over a hundred isolated specimens (original collection of J. Favre) at my disposal for which I feel greatly obliged to him.

The large-sized foraminifer which is being discussed in the present note has been assigned by its authors to the lituolid genus Spirocyclina Munier-Chalmas, 1887, as will be pointed out on the following pages, this attribution is refuted as "Spirocyclina erratica" Joukowsky and Favre differs in its fundamental structural features from the Senonian type of the genus (Spirocyclina choiffati Munier-Chalmas, 1887; unfig.) and cannot be aligned with the forms or form described as "Spirocyclina lusitanica" and "S. infravalanginiensis" from Portugal neither of which should be placed in the genus Spirocyclina Munier-Chalmas (non Schlumberger et auct.) on account of their different interior structure (Maync, 1938, 1956, 1958).

It is with these Portuguese species that E. Joukowsky and J. Favre (loc. cit., p. 492) have compared their new species erratica but neither of them has much in common with the form described from the Infravalanginian of Mt. Salève. However, specimens which generically may be placed in the Portuguese genus occur in great number in the Purbeckian of Mt. Salève. Thanks to the kindness of Dr. E. Gasche from the Geological Department of the Museum of Natural History at Basel, Switzerland, I was able to examine a sample from that locality which is labeled "Spirocyclina cf. infravalanginiensis" Choffat (det. J. Pfender), Purbeckian, Salève (Etournelles)."2

Genus Ammocycloloculina Maync, n. gen. (incertae familiae)

Type species.—Ammocycloloculina erratica (Joukowsky and Favre), pl. 13, figs. 1a-c.


Lectogenotype.—Joukowsky and Favre (1913, pl. 34, fig. 10).2

Paratypes.—(loc. cit., pl. 34, figs. 11-13); Ammocycloloculina erratica: pl. 13, figs. 2-5, pl. 14, figs. 1-5.

Locus typicus.—Quarry of Monnetier on SW slope of Petit Salève, Haute-Savoie (France).

Stratum typicum.—Infravalanginian (beds with Natica leviathan Pictet and Campiche); bed No. 11 (Joukowsky and Favre, 1913, p. 331, fig. 9—section).

Diagnosis.—A large-sized arenaceous isomorph of Cycloloculina Heron-Allen and Earland, 1908.

Description.—The excellent original description of Spirocyclina erratica Joukowsky and Favre is quoted in full in the following:

"SPIROCYCLINA ERRATICA n. sp. (Pl. 34, fig. 10-13)

"Diamètre du plus grand individu ........... 15 mm.
Epaisseur " " " ........... 0 mm,8.
"Dans le jeune âge et jusqu'à un diamètre de

2 According to a published citation, this sample contains "'Spirocyclina infravalanginiensis' Choffat" (det. J. Pfender) and is derived from the Valanginian (Bernoulli, 1948).

3 No holotype specimen had been selected by the authors but the designation "n. sp." unmistakably indicates that the figured specimens were regarded as syntypes (cotypes).

All the tests figured by E. Joukowsky and J. Favre (1913) have kindly been placed at my disposal by Dr. E. Lanterno, Geneva.
0 mm, 7 à 0 mm, 8 environ, cette espèce possède un plasmostracum discohérent de 6 à 8 loges disposées en spirale. À partir de ce moment, le mode de croissance change complètement ; la dernière loge du jeune plasmostracum spiralé est recouverte à sa périphérie par des loges toujours plus embrassantes qui finissent par se rejoindre à leurs extrémités et à entourer complètement la partie centrale spiralée (fig. texte 56 et pl. 34, fig. 13). À partir de ce moment, les loges deviennent annulaires, le plasmostracum prend alors la forme d'un disque très aplati, rarement plan, mais en général légèrement gauche ou ondulé et présentant des côtes concentriques correspondant aux loges annulaires. Ces dernières sont au nombre de 16 à 17 pour un individu de 8 mm de diamètre. Le test de cette espèce est arénacé calcaire. Les parois des loges sont plus épaisse que l'espace qu'elles laissent entre elles, surtout vers la périphérie. Les loges ne présentent pas de cloisons propres à leur intérieur, mais comme le test est arénacé et muni par conséquent d'aspirités, elles montrent de retrécissements irréguliers. Nous n'avons pu observer le réseau polygonal constaté chez S. choffati Mun. Chalmas, ni les ouvertures de la périphérie du disque.

"Nous n'avons constaté qu'une seule forme chez cette espèce.


"Gisement. Cette espèce se rencontre dans une couche marneuse de l'assise à Natica leviathan (no. 9 de la coupe fig. 114), en compagnie de Terebratula valdensis de Lor., dans les carrières de Monnetier, sur le versant du Petit Salève où elle est assez abondante et sur le versant du Grand Salève où elle est très rare.


Additional remarks.—The largest specimen observed shows a diameter of 14.2 mm. Another one is 11.2 mm. in diameter, its thickness at the center is 0.40 mm., near the periphery 0.71 mm. The smallest test measured has a diameter of 3.5 mm. and a peripheral thickness of 0.45 mm. The dimensions and variability of the test of Ammocycloloculina erratica (Joukowsky and Favre) are graphically represented on Figure 1.

The axial thin section on Pl. 14, fig. 1 shows a diameter of 7 mm. while its thickness amounts to 0.40 mm. (center) and 0.54 mm. (near the margin of the disc).

The tests of A. erratica are, in other words, very thin Nummulites-like discs which show a thickening from the center towards the periphery. They are, moreover, irregularly undulated (Pl. 13, figs. 1b, 2b, 3b, 4b, 5b) on which account perfect median thin sections are very rare.

The prepared equatorial (median) thin sections reveal a closely coiled initial stage (neptic spire of 6 chambers) which corresponds to a diameter of 0.7 to 0.85 mm. Then follows a fan-shaped or Pavonina-like stage with 5-6 strongly embracing chambers which finally infold the entire series of previous chambers. This dual spiral stage occupies 1.7-1.9 mm. in diameter (central part of the disc) and is succeeded by a

4 Typographic error; the correct reference is "bed No. 11, section fig. 9 (see Joukowsky & Favre, 1913, p. 331).
series of concentrically arranged (annular) chambers. In the studied specimens attaining 10-11 mm. in diameter, the adult cyclical stage consists of 8-9 annular chambers; in a test measuring 13 mm. the number of cyclical chambers amounts to 12.

The thin-sectioned specimen figured by E. Joukowski and J. Favre (1913, pl. 34, fig. 13) shows an initial series of concentrically arranged (annular) chambers. Such a great number of adult cyclical chambers.

E. Joukowski and J. Favre (loc. cit., p. 491, 492) report having observed forms of 8 mm. in diameter which contain as many as 16-17 annular chambers but none of the numerous tests I could examine showed such a great number of adult cyclical chambers.

The studied specimens reveal a coarsely agglutinated test with incorporated grains of quartz and of a dark mineral, smaller foraminiferida, shell and echinoid fragments, etc., held together by a calcareous cement. The circular test externally shows concentric striae which correspond with the sutures of the annular chambers. The imperforate surface coating is of a finely microgranular texture. There is no subepidermal alveolar layer developed which is a fundamental feature of the choffatelline (olim spirocyclinate) group of lituolid foraminifera.

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The chamber walls, being usually thicker than the width of the lumina which they enclose, are irregularly perforated by tubular passages (Pl. 14, figs. 2-5) which in coarsely textured parts coincide with the interstitial spaces between the individual foreign particles.

The chambers are not systematically subdivided by any radially set elements (septa or buttees). However, owing to the different size and shape of the coarse grains and fragments that build up the wall, the interior side of the chambers generally shows an uneven outline, viz. the irregular particles of which the septa are composed project more or less into the cyclical chambers.

Nothing definite is known concerning the apertural character of the form; in view of the irregularly perforated chamber walls (septa), however, it may be assumed that the aperture consists of peripheral pores.

Taxonomy and relationship.—Originally, the form Ammocycloloeulina erratica was placed in the lituolid genus Spirocyclina Munier-Chalmas, 1887, and it has been compared with the Portuguese species (“Spirocyclina” lusitanica and “S.” infravalanginiensis). These forms differ, however, principally from the unfigured genotype Spirocyclina choffati Munier-Chalmas, cited from the Senonian of the Marseille region, a fact which has led me to separate them from the latter (Mayne 1938, 1952, 1956, 1958). Anyway, the Portuguese species disclose a complex interior structure and possess the characteristic reticulate network (alveolar sub-epidermal layer) of the Choffatellinae either of which is lacking in the species described from Mt. Salève. It is, therefore, not justified to align “Spirocyclina” erratica with Spirocyclina, s. str., or with any genus of the choffatelline group of the Lituolidae.

Other genera showing a cyclical adult stage are found in the Meandropsinidae which include microgranular and/or finely agglutinated tests, respectively: In Meandropsina Munier-Chalmas, 1898, the annular chambers are subdivided by regular partitions and Tuberina Keyzer, 1945 (-Edonia Henson, 1948), reveals the presence of both pillars and meandropsinid partitions. Broeckinella, Saudia, Qatara, Dohaia, etc. (Henson, 1948), develop annular chambers in the adult; showing a more or less complex subepidermal structure and displaying some kind of systematic subdivision of the cyclical chambers, none of them can, on this account, be compared with Ammocycloloeulina, n. gen.

The strongest resemblance, especially with respect to the mode of coiling, exists between Cycloloeulina Heron-Allen and Earland, 1908, and Ammocycloloeulina, n. gen. Cycloloeulina is a calcareous coarsely perforated form which is superficially ornamented by radial ripples or folds but which lacks any radial partitions of the cyclical chambers. It displays an initial evolve spire involving 6-7 chambers (“Discorbine” stage) which is followed by 2-3 chambers which overlap and infold the “Discorbine” early coil. This “Pavonine” stage is finally succeeded by a series of chambers which are concentrically arranged round the precedent stages (“Annular” stage). The very same succession of the same type of coiling also characterizes the new genus Ammocycloloeulina, and this parallelism or isomorphism finds its expression in the etymology of the proposed generic name. Cycloloeulina shows, like Ammocycloloeulina, a definite thickening of the test from the center toward the periphery.

Cyclolina d’Orbigny, 1846, differs from Ammocycloloeulina, n. gen., in having a very delicate calcareous test formed by an insignificant embryonic stage (trochoid coil) succeeded by a great number of narrow annular chambers. Some species referred to that genus are reported to have the cyclical chambers subdivided into chamberlets but in the specimens of C. cretacea

5. Spirocyclininae in previous papers (Mayne 1950, 1952); because of the foreseen breaking-up of the genus Spirocyclina, the name Cheffatellinae, n. subfam., has recently been proposed (Mayne, 1958).

6. In his latest paper, F. R. S. Henson assembles both the agglutinated/microgranular (lituolid-meandropsinid) and the porcellaneous (peneropolid) tests in the family Peneropolidae (Henson, 1950), a viewpoint which is not shared by the writer.
d'Orbigny I was able to examine (collection Ch. Schlumberger, Paris) such partitions are as a rule not developed.

Another, although still somewhat problematical genus, showing a calcareous finely microgranular test made up by undivided annular chambers is Cyclopsinella Galloway, 1933 (substitute for Cyclopsina Munier-Chalmas, 1887, preoccupied). In this form, of which also material was available for direct comparison (collection of Ch. Schlumberger, Paris)\(^7\), the cyclical undivided chambers are, as in Dicyclina, arranged in two parallel planes on which account it cannot be an isomorph of Ammocycloloculina, n. gen.

Orbitopsella Munier-Chalmas, 1902, also develops annular chambers in the adult. The test, though calcareous-microgranular, may contain more or less agglutinated detrital material (see, e.g., Henson, 1948, p. 18) and shows a spiral, then a reniform, and finally a cyclical phase of coiling similar to that outlined above in Ammocycloloculina, n. gen. Thin sections disclose, however, that the annuli are systematically subdivided into rectangular chamberlets by radial partitions as well as by irregular pillars (especially in the central region); an alveolar near-surface layer is reportedly not developed. Thin sections of Orbitopsella praecursor (Gümbel) from the Liassic Rotzo beds of Tyrol (stratum typicum), present in the collection of Ch. Schlumberger, Paris, very distinctly reveal this regular subdivision of the narrow cyclical chambers by delicate partitions. In view of the lack of such a systematic interior organization Ammocycloloculina, n. gen., obviously cannot be compared with the genus Orbitopsella.

Other calcareous genera showing concentrically arranged chambers in the adult are Orbiculina Lamarck, 1816, and Broecchina Munier-Chalmas, 1882, which are endowed with some kind of dividing elements in the annular chambers and, therefore, neither can be compared with Ammocycloloculina, n. gen. The cyclical calcareous tests of Dicyclina Munier-Chalmas, 1887, display an alveolar sub-epidermal layer which is absent in Ammocycloloculina. Dicyclina shows, moreover, a double layer of chambers each of which is subdivided by regular partitions whereas Ammocycloloculina shows undivided annuli.

There is, to sum up, no described genus of Foraminifera into which "Spirocyclina" erratica Joukowsky and Favre from the Infravalanginian of Mt. Salève (Haute-Savoie) would fit. Hence, the genus Ammocycloloculina, n. gen., is herewith proposed which is still monotypic.

Ammocycloloculina, n. gen., is, as suggested by the proposed name, an arenaceous isomorph of the genus Cycloloculina Heron-Allen and Earland, 1908.

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Mayne: *Ammocycloloculina*, n. gen.


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EXPLANATION OF PLATE 14

<table>
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<td>1-5. <em>Ammocycloloculina erratica</em> (Joukowsky and Favre); Infravalanginian Monnetier, Petit Salève (Haute-Savoie, France)</td>
<td>53</td>
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Thin sections prepared from original material (collection J. Favre, Museum of Natural History, Geneva, Switzerland). 1, axial section, ×16. 2, median section, ×16. 3, 4, median sections, ×13.5. 5, equatorial section showing the coarse structure of the peripheral portion (adult annular chambers), ×16.

All the figured thin sections are deposited at the Museum of Natural History at Geneva, Switzerland.
CONTRIBUTIONS FROM THE CUSHMAN FOUNDATION FOR FORAMINIFERAL RESEARCH
VOLUME IX, PART 3, JULY, 1958

185. CERTAIN SMALLER BRITISH PALEOCENE FORAMINIFERA
PART IV. ARENACEA, LAGENIDEA, BULIMINIDEA AND CHILOSTOMELLIDAE

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ABSTRACT

Fifty-one species and varieties, including seven new species and four new varieties, are described from the Thanet Beds of East Kent in the United Kingdom.

INTRODUCTION

Scope of the paper.—This paper is the fourth in a series representing the results of a taxonomic and stratigraphic revision of the foraminiferal fauna of the Thanet Beds of Kent in the United Kingdom. Fifty-one species are described.

Species previously recorded.—Species recorded by H. Burrows and R. Holland (1897) in their pioneer work on the Thanet Beds but unsubstantiated by the present work are as follows:

- Cristellaria crassa d'Orbigny
- Cristellaria arcuata d'Orbigny
- Nodosaria raphanus (Linne)
- Lagena marginata (Walker and Jacob)
- Lagena laevis (Montagu)
- Chilostomella ovoidea Reuss

In this work specimens referred by the two authors to Ammodiscus incertus d'Orbigny were described respectively as follows:

- Involutina cretacea (Reuss)
- Textularia sagittula Defrance
- Lagena reticulata Macgillivray
- Cristellaria fragaria Gumbel
- Nodosaria obliqua (Linne)
- Nodosaria communis d'Orbigny
- Cristellaria gibba d'Orbigny

are described respectively as follows:

- Involutina cretacea (Reuss)
- Textularia thanetana Lalicker
- Lagena hexagona (Williamson)
- Astacolus platypleura (Jones)
- Dentalina bifurcata d'Orbigny
- Dentalina glaesneri 'Ten Dam
- Astacolus danvillensis (Howe and Wallace) var. venetii Haynes, n. var.

Species substantiated by the present work are as follows:

- Astacolus platypleura (Jones)
- Lagena apiculata (Reuss)

Provenance.—Provenance of the species described is given in numbers referring to the stratigraphical columns illustrated in Certain Smaller British Paleocene Foraminifera, Part I (Haynes, 1956).

The figures of the species described were drawn by the author with the aid of a microprojector.

SYSTEMATIC PART

Family TOLYPAMMINIDAE
Subfamily INVOLUTININAE
Genus Involutina Terquem, 1862

Involutina cretacea (Reuss)
Plate 15, figures 3, 3a

1845, Operculina cretacea Reuss, Geinitz Grunder Verstein, p. 35, pl. 13, figs. 64, 65.
1946, Ammodiscus cretaceus Cushman, U. S. Geol. Surv. Prof. Paper 206, p. 17, pl. 1, fig. 35.

Distinguishing features.—A smooth, white Involutina apparently composed almost entirely of cement with up to fifteen whorls in a diameter of 1 to 1.5 mm.

Description.—Test planispiral, compressed; whorls about 12, increasing in size slowly, slightly embracing; sutures distinct, deeply impressed; wall siliceous, smooth, white, cement dominant; aperture formed by the open end of the tube.

Dimensions.—Maximum diameter 1 mm.
Horizon.—P23, Pegwell Marls.

Variation.—Several of the specimens were distorted and showed constrictions as described by Cushman. Alternation of generations was not observed.

Discussion.—Burrows and Holland referred certain specimens recovered from the Thanet Beds to Ammodiscus incertus d'Orbigny. As these specimens are lost and there is no figure it is a matter of conjecture whether these were identical with the species described here.

Burrows and Holland refer certain specimens collected by Fieldan's citation of Recent specimens of A. incertus in their synonymy. These specimens have brown cement, are larger and show less whors in a given diameter than I. cretacea.

Range.—Upper Cretaceous of N.W. Europe and N. America.

Involutina pyrotecnica Haynes, n. sp.
Plate 15, figures 2, 2a

Distinguishing features.—A smooth, white Involutina apparently composed almost entirely of cement.
with numerous depressed whorls, up to seventeen in a diameter of 0.66 mm.

Description.—Test planispiral; whorls 15, increasing rapidly in width while remaining almost constant in height; sutures distinct, deep; wall siliceous, smooth, white, cement dominant; aperture formed by the open end of the tube.

Dimensions.—Diameter 0.35 mm.

Horizon.—P21, Pegwell Marls.


Variation.—Round to elliptical forms occur and there is some variation in the compression of the whorls. Sections did not reveal alternation of generations.

Discussion.—This species is distinguished from other species by its extreme depression.

Genus Glomospirella Plummer, 1945

Glomospirella woodi Haynes, n. sp.

Plate 15, figures 1-1c

Distinguishing features.—A Glomospirella with up to six whorls and reaching a diameter of 0.35 mm. The second tubular chamber does not increase much in size and the test is composed almost entirely of siliceous cement. The early irregularly coiled part is dominant in some forms, possibly microspheric forms, and subsidiary in others, possibly megalospheric forms.

Description.—(Pl. 15, fig. 1). Test of 6 whorls, irregularly arranged in the initial part, planispiral in the last 3 whorls, increasing little in diameter; aperture formed by the open end of the tube; wall siliceous, finely arenaceous, white, cement dominant.

Dimensions.—Diameter 0.36 mm.

Horizon.—P22, Pegwell Marls.


Discussion.—Owing to preservation it was found impossible to discern differences in proloculus diameters in the sections cut.

This species differs from the type species, G. umbilicata (Cushman and Waters), in its narrower whorls, smaller size and greater irregularity of the initial part.

Derivation of name.—The species is named in honour of Alan Wood.

Family REOPHACIDAE

Genus Hormosina Brady, 1879

Hormosina sp.

Plate 15, figure 13

Description.—Test oval; a unilocular megalospheric form or the initial chamber of a broken specimen; aperture terminal with a neck; wall siliceous, finely arenaceous, white, cement dominant; pores not discerned.

Dimensions.—Maximum diameter 0.4 mm.

Horizon.—P26, Pegwell Marls.


Discussion.—One other smaller, single white chamber was found. This is possibly a fragment of Hormosina also.

Family LITUOLIDAE

Genus Trochamminoides Cushman, 1910

Trochamminoides sp.

Plate 15, figures 6, 6a

Description.—Test planispiral, compressed, evolute, periphery rounded; 7 chambers visible at the periphery, irregular and increasing in size slowly; sutures radial, deeply impressed; aperture median at the basal suture of the last chamber; wall arenaceous with brown cement.

Dimensions.—Diameter 0.66 mm.; width 0.15 mm.

Horizon.—Pegwell Marls, Haine Pit.


Discussion.—The specimen recovered resembles T. velascoensis Cushman, but is more roughly finished, more inflated and with higher chambers. These characters and its pentagonal outline similarly distinguish it from T. proteus (Karrer).

Genus Haplophragmoides Cushman, 1910

Haplophragmoides burrowsi Haynes, n. sp.

Plate 15, figures 7, 7a

Distinguishing features.—A smooth, finely arenaceous Haplophragmoides with white cement and four and a half chambers visible at the periphery. The chambers increase rapidly in size and are separated by impressed, radial sutures.

Description.—Test planispiral, involute; periphery rounded, lobate; umbilici small; 4½ chambers visible at the periphery; sutures radial, impressed; aperture median, low, at the basal suture of the last chamber; wall finely arenaceous, white, cement dominant; pores not observed.

Dimensions.—Diameter 0.38 mm.

Horizon.—Pegwell Marls, Haine Pit.


Discussion.—Only the specimen described was found in an uncollapsed state. Numerous other specimens were recovered, all distorted in various ways, but showing essentially the same features. Alternation of generations was not discerned.

This species differs from H. fragile Höglund, described from the Skagerak, in that it is completely involute and slightly more inflated. The closely allied species H. kirki Wickenden shows five chambers at the periphery and increases less rapidly in size. The Thanet species is also slightly more coarsely arenaceous than Wickenden’s species from the Upper Cretaceous of the Canadian plains.
Derivation of name.—This species is named in honour of H. Burrows, a pioneer worker on the Thanet Formation.

_Haplophragmoides_ cf. _H. obliquicameratus_ Marks

Plate 15, figures 11, 11a

_Description._—Test distorted, globose, periphery broadly rounded; umbilici small, deep; 9 chambers visible at the periphery, slowly increasing in size, depressed; sutures radial, distinct; aperture apparently median, low, at the basal suture of the last chamber; wall arenaceous with much white cement.

_Dimensions._—Diameter 0.60 mm.

_Horizon._—Pegwell Marls, Haine Pit.


_Discussion._—All specimens recovered were distorted in various ways. Marks’s specimens were similarly collapsed and he went so far as to suggest that it might be an inherent character. However, the case of _H. burrowsi_, only one specimen of which was found undistorted, suggests that the sheared form of _H. obliquicameratus_ is also due to deformation.

**Genus Cyclammina** Brady, 1876

_Cyclammina incisa_ (Stache)

Plate 15, figures 12, 12a

1864, _Haplophragmium incicum_ Stache, Novara Expd. Geol. Theil, vol. 1, p. 165, pl. 21, fig. 1.


1931, _Cyclammina incisa_ Cushman and Laiming, Journ. Paleontology, vol. 5, p. 93, pl. 9, figs. 6a, b.

_Distinguishing features._—A smooth, compressed _Cyclammina_ with up to eight chambers at the periphery and radial sutures. The periphery is acute and white cement dominant in the wall.

_Description._—Test planispiral, compressed; periphery acute; 8 chambers visible at the periphery, slowly increasing in size; sutures flush, slightly curved; aperture and supplementary apertures obscured, presumably at the basal suture; wall finely arenaceous, white cement dominant, interior coarsely alveolar.

_Dimensions._—Diameter 0.7 mm.

_Horizon._—P40, Pegwell Marls.


_Discussion._—The Thanet specimens are much compressed, presumably the result of preservation. Smaller specimens noticeably possessed a higher ratio of cement to agglutinated material.

_Range._—Miocene, New Zealand, California.

_Cyclammina challinorii_ Haynes, n. sp.

Plate 15, figures 8, 8a

_Distinguishing features._—An inflated _Cyclammina_ with rounded, entire periphery and up to nine chambers visible, tending to increase rapidly in height. The tubuli are large, apparently of one size only and the chamber cavity is not much reduced by thickening of the wall. Agglutinated quartz grains are large, the septa being one layer thick.

_Description._—Test planispiral, involute, inflated; periphery rounded, entire; umbilici shallow; 9 chambers visible at the periphery, rapidly increasing in height; sutures flush, radial; wall arenaceous with brown cement, interior coarsely labyrinthic, exterior smooth; pores not observed.

_Dimensions._—Diameter 0.66 mm.

_Horizon._—P26, Pegwell Marls.


_Discussion._—This species differs from _C. cancellata_ Brady in its fewer chambers visible and in its large tubuli, apparently of one size, and in the small amount of thickening seen in section. The Recent species _C. bradyi_ Cushman also shows nine chambers at the periphery but is more compressed with subangular periphery.

_Derivation of name._—This species is named in honour of John Challinor.

Family TEXTULARIIDAE

**Genus Textularia** Defrance, 1824

_Textularia thanetana_ Lalicker

Plate 15, figures 5-5c

1897, _Textularia sagittula_ Burrows and Holland (not Defrance), Proc. Geol. Assoc., vol. 15, p. 31, pl. 11, fig. 10.


_Distinguishing features._—A compressed _Textularia_, rhomboid in section with subacute periphery, low chambers and an initial planispiral coil in all generations. There are up to twenty-six chambers developed in the microspheric generation, up to sixteen in those specimens with the largest megalospheres.

_Description._—(Pl. 15, figs. 5, 5a). Test compressed, rhomboid in section; chambers including proloculus 23, wider than high, slowly increasing in size, the first 4 arranged in a planispiral coil, the rest biseriately arranged; sutures wide, distinct, impressed between the last four chambers; wall thick, arenaceous, light brown, cement siliceous with a small amount of calcareous matter; aperture low along the basal suture of the last chamber; pores not observed.

_Dimensions._—Length 0.75 mm.; maximum width 0.35 mm.; proloculus diameter about 20 microns.

_Horizon._—RB2, Reculver Silts.


_Alternation of generations._—The accompanying...
CONTRIBUTIONS FROM THE CUSHMAN FOUNDATION FOR FORAMINIFERAL RESEARCH

FIGURE 1

Horizon P51

Horizon RB4

Chamber number in relation to proloculus diameter in Textularia thanetana Lalicker
graphs (Fig. 1) show the relation of proloculus diameter to chamber number in specimens recovered from the Reculver Silts at Pegwell and Reculver. In both cases there is some tendency for the specimens to fall into three groups.

In group 1 proloculus diameters range from 10 to 24 microns and up to 26 chambers are developed. This may represent the microspheeric generation.

In group 2 proloculus diameters range from 29 to 39 microns and up to 20 chambers are developed. This possibly represents Hofker’s A1 generation. (Pl. 15, fig. 5b).

In group 3 proloculus diameters range from 42 to 54 microns and up to 18 chambers are developed. This possibly represents Hofker’s A2 generation. (Pl. 15, fig. 5c).

Length in relation to chamber number is not shown on the graphs but specimens of group 3 are larger than group 2 with the same chamber number.

Discussion.—This species was lumped by Burrows and Holland under T. saggitula Defrance which differs, however, in its greater compression and sharper periphery. Spiroplectammina paleocenica Cushman appears to be closely allied to the Thanet species and may possibly be an immature form.

Range.—Paleocene, Thanet Beds.

Family VERNEUILINIDAE

Genus Verneulina d’Orbigny, 1840

Verneulina sp.

Plate 15, figure 9

Description.—Test collapsed but complete, elongate, tapering, greatest breadth above the middle, section presumably triangular with rounded angles, spiral twisting small; chambers 15, triserial throughout, slowly increasing in size; sutures deeply impressed; wall arenaceous with much white cement; aperture arched at the basal suture of the terminal chamber.

Dimensions.—Length 0.39 mm.; maximum width 0.18 mm.

Horizon.—Pegwell Marls, Haine Pit.


Genus Pseudoclavulina Cushman, 1936

Pseudoclavulina anglica Cushman

Plate 15, figures 4, 4a


?1927, Clavulina parisiensis Franke, Dan. Geol. Under, 2, no. 46, p. 10, pl. 1, fig. 6.


1944, Pseudoclavulina anglica Ten Dam, Med. Geol. Sticht., ser. C-V, no. 3, p. 84.

1948, Pseudoclavulina anglica Brotzen, Sver. Geol. Undersöks, ser. C, no. 493, p. 37, pl. 5, figs. 1, 2.


Distinguishing features.—A coarsely arenaceous Pseudoclavulina with siliceous cement. The initial triserial portion is rounded and the chambers are indistinct. In the uniserial part the chambers are low and round in section with impressed sutures.

Description.—Test elongate, robust; chambers in the initial part triserial, indistinct, 4 low chambers in the uniserial part, slowly increasing in size; sutures impressed in the uniserial part; aperture round, terminal; wall coarsely arenaceous, siliceous.
Haynes: British Paleocene Foraminifera
Dimensions.—Length 1.25 mm.; maximum width 0.40 mm.

Horizon.—P22, Pegwell Marls.


Variation.—Large specimens up to 2 mm. in length were recovered. The chambers in the uniserial part vary slightly in length and individual tests vary in width. Alternation of generations was not observed.

Range.—Upper Danian, Sweden; Paleocene, Denmark, Sweden, Holland, Magellanes; lower Eocene, England, France.

Family TROCHAMMINIDAE

Genus Trochammina Parker and Jones, 1859

Trochammina pentagona Haynes, n. sp.

Plate 15, figures 10-10c

Distinguishing features.—A compressed, coarsely arenaceous Trochammina with up to six chambers visible on the involute ventral side, radial sutures and pentagonal outline.

Description.—Test trochoid, compressed, pentagonal in outline, ventral side involute, dorsal side evolute; periphery acute, 6 chambers visible at the periphery; ventral sutures radial, dorsal sutures curved; aperture ventral, along the basal suture of the last chamber beneath a flap; wall coarsely arenaceous with siliceous cement.

Dimensions.—Diameter 0.55 mm.

Horizon.—P26, Pegwell Marls.


Discussion.—This species has affinity with the Upper Cretaceous species T. diagonis (Carsey) but is smaller, more coarsely arenaceous and pentagonal rather than lobate in outline. The Miocene species T. parva Cushman is also closely related but is keeled and has fewer chambers visible.

Family NODOSARIIDAE

Genus Lenticulina Lamarck, 1804

Lenticulina sp.

Plate 16, figure 2

Description.—Test planispiral, involute, compressed, smooth; 7 chambers visible; sutures at 45 degrees to each other, the suture below the terminal chamber impressed, previous sutures raised slightly; aperture terminal, slightly produced with radial grooves; each umbilicus filled with a small boss.

Dimensions.—Diameter 0.9 mm.

Horizon.—P21, Pegwell Marls.


Discussion.—The specimen described resembles Cristellaria subangulata Reuss but is umbonate and is round not pentagonal in outline. It is near in form to Robulus nuttalli Cushman and Renz but differs in its raised sutures and lack of robuline apertural slit.

Genus Astacolus Montfort, 1808

Astacolus platypleura (Jones)

Plate 15, figures 14-14g


1944, Cristellaria fragaria Burrows and Holland (not Gümbel), ibid., p. 38, pl. 2, fig. 1.


1940, Cristellaria multiformis Staesche and Hilterman, Abb. der Reich. für Boden, heft. 201, pl. 2, fig. 1.


1944, Cristellaria (Lenticulina) multiformis var. oblonga Ten Dam, ibid.


Distinguishing features.—An ornamented Astacolus with raised sutures and a variable development of longitudinal costae. There are up to ten chambers in the evolute megalospheric generation, up to thirteen chambers in the close coiled microspheric generation.

Description.—(Pl. 15, fig. 14d). Test planispiral, involute, compressed, carinate; 13 chambers visible at the periphery, slowly increasing in size; sutures backward curving, raised, knotted and cross-grooved; aperture at the peripheral angle with radial grooves; wall radiate; pores minute; each umbilicus filled with a boss of shell material; weak longitudinal ornament developed across the raised sutures.

Dimensions.—Maximum diameter 2 mm.

Horizon.—P34, Pegwell Marls.


Alternation of generations.—At least two groups of proloculus size could be discerned, one group ranging in diameter about 0.06 mm. and representing the microspheric generation, and another group ranging in diameter about 0.20 mm. and representing the megalospheric generation. Megalospheric specimens show uncoiling of the later chambers and a smaller total number of chambers than the rarer microspheric forms.

Variation.—This species is very variable throughout the Thanet Beds in ornament and in the amount of uncoiling shown by the later chambers in megalospheric forms. The majority of specimens recovered are similar to the specimens illustrated in fig. 14a with
ornament of raised sutures dominant. In other specimens longitudinal ornament is well developed and in rare cases becomes dominant as in the specimen illustrated in fig. 14e.

Discussion.—This species is interesting both in its variable ornament and in the fact that the microospheric generation is close coiled like Lenticulina. Cristellaria multiformis Franke shows a very similar range of variation to the Thanet species and would appear to be identical.

Range.—Paleocene, Sweden, Netherlands, Denmark, Northwest Germany.

Astacolus danvillensis (Howe and Wallace) var. venetii Haynes, n. var.

Plate 16, figures 1-1f

!1897, Cristellaria gibba Burrows and Holland (not d'Orbigny), Proc. Geol. Assoc., vol. 15, p. 44, pl. 2, figs. 5, 6.

Distinguishing features.—An umbonate variety of Astacolus danvillensis with up to thirteen chambers, the later ones becoming evolute and short.

Description.—(Pl. 16, figs. 1, la). Test planispiral, becoming evolute, compressed, becoming more compressed in the evolute part, carinate, umbilici filled with clear calcite bosses; 12 chambers visible, increasing in size slowly; sutures distinct, flush, backward curving; aperture at the peripheral angle with radial grooves; wall radiate; pores minute; surface glossy.

Dimensions.—Length 1.3 mm.

Horizon.—P33, Pegwell Marls.


Additional specimens P42495.

Alternation of generations.—Two proloculus sizes were discerned. In one, ranging about 0.08 mm. in diameter, up to ten chambers are developed, in the other, ranging about 0.13 mm. in diameter, up to five or six chambers are developed. These groups may represent phases of the megalospheric generation.

Variation.—The chambers are generally short but occasionally longer ones are developed.

Derivation of name.—The specific name commemorates the Icenii of Iron Age East Anglia.

Genus Marginulina d'Orbigny, 1826

Marginulina costifera Ten Dam

Plate 15, figure 16

1944, Marginulina costifera Ten Dam, Meded. Geol. Sticht, ser. C-V, no. 3, p. 97, pl. 2, fig. 22.

Distinguishing features.—A Marginulina with up to four or five chambers, produced excentric aperture and sparse, intermittent longitudinal costae.

Description.—Test elongate, becoming semi-inflated; chambers 4, slowly increasing in size; sutures distinct, flush, oblique; aperture excentric, produced, with radial grooves; wall radiate; pores minute; ornament of sparse intermittent costae.

Dimensions.—Length 0.42 mm.

Horizon.—P38, Pegwell Marls.


Range.—Paleocene, Netherlands.

Marginulina cf. M. densicostata Thalmann

Plate 15, figures 17, 17a

Description.—Test evolute, becoming semi-inflated, with a keel; chambers 8, slowly increasing in size; sutures distinct, slightly impressed; aperture broken off; ornament of longitudinal costae showing slight clockwise twisting.

Dimensions.—Length 1.9 mm.

Horizon.—P21, Pegwell Marls.


Discussion.—Four specimens were recovered all differing from each other in details of ornament.
Marginulina cf. M. dorsata Cushman
Plate 15, figure 18

Description.—Test with initial part broken off, becoming semi-inflated; peripheral edge straight, with a blunt, pinched off keel; chambers remaining 5, increasing in size rapidly; sutures impressed, oblique; aperture at the peripheral edge, with radial grooves.

Dimensions.—Length 1.8 mm.

Horizon.—P16, Pegwell Marls.


Genus Dentalina d'Orbigny, 1826

Dentalina glaessneri Ten Dam
Plate 16, figures 3-3h


1944, *Dentalina glaessneri* Ten Dam, Meded. Geol. Sticht, ser. C-V, no. 3, p. 92, pl. 2, fig. 11.

Distinguishing features.—A gently curved *Dentalina* with up to six, elongate chambers and impressed oblique sutures. In the microspheric generation there are up to six chambers gradually increasing in size from the pointed initial end. In the megalospheric generation there are from two to six chambers and the proloculus tends to be larger than the chamber following it.

Description.—(Pl. 16, fig. 3a). Test elongate with pointed initial end, gently curved and gradually increasing in size; chambers 6, elongate; sutures oblique, impressed; aperture broken (in other specimens terminal chamber slightly excentric; aperture broken off); pores minute.

Dimensions.—Length 0.91 mm.; width at terminal chamber 0.11 mm.

Horizon.—P33, Pegwell Marls.


Dentalina megapolitana Reuss
Plate 16, figure 8

1855, *Dentalina megapolitana* Reuss, Deutsch. Geol. Gesell., vol. 7, p. 267, pl. 8, fig. 10.

1931, *Dentalina megapolitana* Cushman, Journ. Paleontology, vol. 5, p. 304, pl. 34, fig. 17.


Distinguishing features.—An elongate, gently curved *Dentalina* with short chambers. The sutures become impressed between the last few chambers which tend to be of equal size. The terminal chamber may be smaller than the chamber preceding it.

Description.—Test elongate, gently curved; chambers 9, short, slowly increasing in size in the initial part, the last three semi-inflated and of almost equal size; sutures straight, flush in initial part, impressed between the last few chambers; aperture terminal, excentric, with radial grooves; wall radiate; pores minute.

Dimensions.—Length 1.66 mm.; width at terminal chamber 0.53 mm.

Horizon.—P22, Pegwell Marls.
Dentalina fallax Franke

1928, Dentalina fallax FRANKE, Preuss. Geol. Landes, vol. 3, p. 28, pl. 2, fig. 29.
1944, Dentalina lorneiana CUSHMAN, ibid., vol. 20, p. 6, pl. 1, fig. 24.
1946, Dentalina lorneiana CUSHMAN, J. S. Geol. Surv. Prof. Paper, 206, p. 66, pl. 23, figs. 7-11.

Distinguishing features.—A Dentalina with inflated, round to ovate chambers, produced central aperture and impressed sutures almost at right angles to the central, produced, with radial grooves; pores minute.

Description.—(Pl. 16, fig. 15). Test with initial portion broken off, inflated; 3 chambers remain, slowly increasing in size; sutures impressed; aperture terminal, slightly inflated; sutures slightly impressed; aperture broken off (in other specimens terminal, slightly produced, with radial grooves); wall radiate hyaline; pores minute.

Dimensions.—Length 4.5 mm.; maximum width 0.5 mm.; proloculus diameter 250 microns.

Horizon.—P22, Pegwell Marls.

Range.—Upper Cretaceous, N.W. Europe, North American (Taylor and Navarro), Mexico (Velasco).

Dentalina lorneiana d’Orbigny

1897, Nodosaria farcimen BURROWS AND HOLLAND (not SOLDANI), Proc. Geol. Assoc., vol. 15, p. 35, pl. 11, fig. 4.

Dentalina lorneiana d’Orbigny var. semisulcata Haynes, n. var.

1931, Dentalina lorneiana CUSHMAN, Tennessee Geol. Bull. 41, p. 28, pl. 3, figs. 4-7.
1944, Dentalina lorneiana CUSHMAN, ibid., vol. 20, p. 6, pl. 1, fig. 24.
1946, Dentalina lorneiana CUSHMAN, J. S. Geol. Surv. Prof. Paper, 206, p. 66, pl. 23, figs. 7-11.

Distinguishing features.—A large, slender, curved Dentalina with up to twelve elongate chambers about twice as long as wide.

Description.—(Pl. 16, fig. 11a). Test long and slender; chambers 9, slowly increasing in size, about twice as long as wide in the later part; sutures impressed, oblique; aperture terminal, excentric, with radial grooves; wall radiate hyaline; pores minute.

Dimensions.—Length 4.5 mm.; maximum width 0.5 mm.; proloculus diameter 250 microns.

Horizon.—P16, Pegwell Marls.

Discussion.—The Thanet specimens appear to be almost identical with those described from the Upper Cretaceous of Europe and North America but are larger. The dentaline form with oblique sutures distinguishes this species from Nodosaria farcimen Soldani.


Dentalina lorneiana d’Orbigny var. spirans Cushman in possessing sulci not costae. It is stouter than the typical Dentalina lorneiana in the Thanet Beds.

Dentalina aff. D. cognata Reuss

1897, Nodosaria farcimen BURROWS AND HOLLAND (not SOLDANI), Proc. Geol. Assoc., vol. 15, p. 35, pl. 11, fig. 4.
tures impressed; aperture terminal, excentric, with radial grooves; wall thick; pores minute.

**Dimensions.**—Length 3.3 mm.; maximum width 0.7 mm.; proloculus diameter about 500 microns.

**Horizon.**—P16, Pegwell Marls. (Possibly derived).


**Discussion.**—The specimen described is almost the same size as the specimen described from the Senonian by Reuss, with the same number of chambers. The sutures differ in being much less impressed. This holds true in other incomplete and young Thanet specimens.

**Dentalina bifurcata** d’Orbigny

Plate 15, figures 15-15h


1867, *Dentalina bifurcata* Reuss, *ibid.*, vol. 55, Abth. 1, p. 82.

1897, *Nodosaria obliqua* Burrows and Holland (not Linne), Proc. Geol. Assoc., vol. 15, p. 35, pl. 2, fig. 3.


**Distinguishing features.**—A large, costate *Dentalina* with slender, curved, dentaline microspheric generation and straight, semi-inflated megalospheric generation with almost straight sutures. There are up to ten chambers with nine costae in the microspheric generation and up to six chambers with fifteen costae in the megalospheric generation. The costae anastomose and divaricate and the number developed shows a relation to the chamber size.

**Description.**—(Pl. 15, fig. 15). Test elongate, straight, chambers 5, semi-inflated, increasing slowly in size; sutures impressed, almost straight; aperture terminal, central, with radial grooves; wall radiate hyaline; pores minute; ornament of longitudinal costae, 11 on proloculus, increasing to 15 on the terminal chamber.

**Dimensions.**—Length 2.48 mm.; maximum width 0.44 mm.; proloculus diameter 360 microns.

**Horizon.**—P33, Pegwell Marls.


**Alternation of generations.**—Specimens presumed to represent the microspheric generation are slender with oblique sutures, with minute, elongate proloculi and have up to ten chambers. The first few chambers are often smooth. A maximum of nine costae were noted on the terminal chamber of one specimen. Megalospheric specimens show proloculus diameters ranging from 160 microns to 400 microns (possibly falling into two groups). Specimens with proloculus diameters at the lower end of the size range develop up to six chambers while specimens with proloculus diameters at the higher end of the size range develop up to three chambers.

**Variation in the development of costae.**—The first chambers may be smooth in microspheric specimens but about nine costae are generally attained when the chambers reach 0.24 mm. in diameter. As for example in the following specimens from the Pegwell Marls (P33)—

1) Initial chamber broken off, five costae commencing on the first of the remaining chambers, increasing to nine on the sixth chamber (diameter 0.24 mm.), smoothing out on the terminal chamber.

2) Complete specimen, costae twisted, reaching nine on the chamber below the terminal chamber (diameter 0.24 mm.).

3) Specimen broken at both ends, three chambers remaining, costae increasing from five to seven and to nine on the last chamber (diameter 0.34 mm., a sudden increase in size over the previous chamber).

Figure 2 shows the number of costae on the megalospheres and terminal chambers of certain megalospheric specimens.

The number of costae on the megalospheres ranges from 8 to 12. In general the larger megalospheres appear to carry the most costae although the smallest megalosphere has 10 and one of the largest megalospheres only bears 9. None of the megalospheres below 300 microns in diameter bear more than 10 costae, making an interesting correspondence with the microspheric specimens discussed, where chambers of about 250 microns diameter possessed about 9 costae.

The number of costae on later chambers is very generally related to size. The highest number counted, 15, is attained only where chamber diameters are near 500 microns. This simple relation to chamber size is complicated by the tendency for costae to decrease by anastomosing together where the chambers following the megalosphere are smaller, as in specimens 3 and 4. In specimens which increase little or very evenly in size, as in specimen 8, the costae tend to divaricate and anastomose evenly, maintaining the same number. As in the microspheric generation the most marked increases in number are noted where chamber size increase is abrupt.

In conclusion it may be stated that in the Thanet Sands population the number of costae appears to vary from zero on the initial chambers of microspheric forms to fifteen on the adult chambers of megalospheric forms. This presumably genetic character is related to size and is possibly modified by vigour of growth.
### FIGURE 2
Relation of costae number to chamber size in *Dentalina bifurcata* d’Orbigny

<table>
<thead>
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<th>Costae Number on Megalosphere</th>
<th>Costae Number on Terminal Chamber</th>
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<tbody>
<tr>
<td>Megalosphere Diameter</td>
<td>Costae Number</td>
</tr>
<tr>
<td>1) 360 microns</td>
<td>11</td>
</tr>
<tr>
<td>2) 260</td>
<td>10</td>
</tr>
<tr>
<td>3) 300</td>
<td>10</td>
</tr>
<tr>
<td>4) 400</td>
<td>10</td>
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<tr>
<td>5) 260</td>
<td>10</td>
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<tr>
<td>6) 280</td>
<td>9</td>
</tr>
<tr>
<td>7) 300</td>
<td>11</td>
</tr>
<tr>
<td>8) 380</td>
<td>9</td>
</tr>
<tr>
<td>9) 400</td>
<td>12</td>
</tr>
<tr>
<td>10) 240</td>
<td>8</td>
</tr>
<tr>
<td>11) 250</td>
<td>10</td>
</tr>
<tr>
<td>12) 160</td>
<td>10</td>
</tr>
<tr>
<td>13) 200</td>
<td>8</td>
</tr>
</tbody>
</table>
Discussion.—Burrows and Holland referred this species to *Nodosaria obliqua* Linné. This modern species differs from the Thanet species in its larger size, larger number of chambers and in its finer, more numerous, costae.

Range.—Eocene, Hungary; Miocene, Vienna Basin.

**Dentalina** sp.

Plate 16, figures 5, 5a

Description.—(Pl. 16, fig. 5). Test incomplete, slender, curving; chambers 2, semi-inflated, increasing rapidly in size; suture impressed; aperture produced, apparently with fine, radial grooves; wall radiate hyaline; pores minute.

Dimensions.—Length 0.81 mm.; maximum width 0.2 mm.

Horizon.—P31, Pegwell Marls.


**Family LAGENIDAE**

According to Parr (1947) unilocular lagenids belong to one family, Lagenidae, and were derived from the same common ancestor as the multilocular lagenids, Nodosariidae. Some support is given to Parr's views by the character of the walls and pores in the Thanet lagenids. All the multilocular genera possess thick, radiate hyaline walls with minute, dense pores. In the unilocular genera discovered the walls and pores were found to be of a similar character (except in the ornamented species where striae and pits cause complication of the wall). Two species with internal tubes and possibly referable to *Oolina* show the same characters. If *Oolina* were derived from such a family as the Buliminidae in which large pores, often oval or of irregular size, are common (Haynes, 1954) this would not be expected.

**Genus Lagena** Walker and Jacob, 1798

**Lagena (Oolina) apiculata** Reuss

Plate 17, figures 9, 9a

1851, *Oolina apiculata* Reuss, Haidinger's Naturw., vol. 4, p. 22, pl. 1, fig. 1.


**Distinguishing features.**—An oval, smooth *Oolina* with a short initial spine and aperture with radial grooves.

Description.—(Pl. 17, fig. 9). Test elongate oval with greatest width about the middle; unilocular; aperture with radial grooves and short internal tube; wall radiate hyaline, translucent, thin, smooth; pores minute; ornament of a short basal spine.

Dimensions.—Length 0.26 mm.; maximum width 0.15 mm.

Horizon.—P39, Pegwell Marls.


Range.—Upper Cretaceous, N.W. Europe; Paleocene, Venezuela, Alabama.

**Lagena (Oolina) caudigera** Wiesner var. *lemoni* Haynes, n. var.

Plate 17, figure 10

**Distinguishing features.**—A variety of *Oolina caudigera* that is smaller, bears a variable amount of small spines and possesses a wider external collar to the internal tube.

Description.—Test oval; unilocular; aperture with internal tube and low, wide collar, apparently with

**EXPLANATION OF PLATE 16**

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<td>3-3h. <em>Dentalina</em> glaesneri Ten Dam, ×30.</td>
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<td>70</td>
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<td>6, 6a. <em>Dentalina</em> cf. <em>D. antenna</em> Cornuel, ×30.</td>
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<td>14. <em>Buliminella</em> sp., ×100.</td>
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<td>19. <em>Angulogerina</em> cf. <em>A. wilcoxensis</em> Cushman and Ponton, ×100.</td>
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</table>
Haynes: British Paleocene Foraminifera
faint radial grooves; wall radiate hyaline; pores minute; ornament includes an initial spine and scattered spines on the surface of the test.

**Dimensions.**—Length 0.23 mm.; maximum width 0.16 mm.

**Horizon.**—RB11, Reculver Silts.


**Variation.**—Other specimens were recovered completely covered in spinose ornament.

**Derivation of name.**—In honour of Roy H. Lemon.

**Lagena hexagona** (Williamson)

Plate 17, figures 8-8b


**Distinguishing features.**—An oval *Lagena* with hexagonal ornament and a tubular, non-radiate aperture.

**Description.**—(Pl. 17, fig. 11). Test oval with produced apertural end; unilocular; aperture produced, tubular, without radial grooves; wall radiate hyaline; pores minute; ornament of 12 costae which run with flange-like extensions up the tubular aperture.

**Dimensions.**—Length 0.38 mm.; maximum width 0.2 mm.

**Horizon.**—RB1, Reculver Silts.


**Lagena striata** (d’Orbigny)

Plate 17, figures 7, 7a


**Distinguishing features.**—An oval *Lagena* with about twenty-four fine striae which do not continue onto the tubular aperture.

**Description.**—(Pl. 17, fig. 7a). Test oval; unilocular; aperture tubular with short spines, not radiate; wall radiate; pores minute; ornament of about 24 longitudinal striae.

**Dimensions.**—Length 0.25 mm.; maximum width 0.16 mm.

**Horizon.**—P35, Pegwell Marls.


**Discussion.**—Although the type figure shows an unornamented aperture many specimens have been assigned to the species with spiral and annular ridges on the apertural end, as by Brady (1884) in the Challenger Report. On the other hand these features were used by Reuss as a basis for setting up new species, as was the occurrence of basal spines, for example in *Lagena striata var. basisenta* Cushman and Stainforth. The taxonomic importance of these details is still uncertain.

**Range.**—Tertiary, N.W. Europe, N. America, Australia.

**Lagena gracilicosta** Reuss

Plate 17, figures 5, 5a


**Distinguishing features.**—An elongate-ovate *Lagena* with about twelve costae which continue up the tubular aperture with flange-like extensions.
with complex ornament of striae with rows of minute pits between them and a produced tubular aperture.

**Description.**—(Pl. 17, fig. 5a). Test elongate-ovate with produced apertural end; unilocular; aperture produced, tubular, no radial grooves; wall radiate hyaline; pores minute; ornament of striae with rows of minute pits between them.

**Dimensions.**—Length 0.36 mm.; maximum width 0.11 mm.

**Horizon.**—P22, Pegwell Marls.


**Range.**—Oligocene, Germany.

*Lagena inornata* (d’Orbigny) var. *spinescens* Haynes, n. var.

**Plate 17, figure 4**

**Distinguishing features.**—A variety of *Lagena inornata* with short scattered spines and a long, tubular aperture.

**Description.**—Test elongate-ovate; unilocular; aperture stoutly tubular, possibly with faint radial grooves; wall thick, radiate hyaline; pores minute; ornament of short scattered spines, surface dull white.

**Dimensions.**—Length 0.36 mm.; maximum width 0.16 mm.

**Horizon.**—RB4, Reculver Silts.


*Lagena simplex* (Reuss) var. *lacrima* (White)


**1936, Lagena ellipsoidalis** Brotzen, Sver. Geol. Undersök, Ars. 30, no. 3, p. 110, pl. 17, fig. 4.

**Distinguishing features.**—A large, globose *Lagena* with produced tubular aperture.

**Description.**—Test globose with greatest width just below the middle and produced apertural end; unilocular; aperture tubular with a suspicion of radial grooves at its tip; wall thick, milky white with minute pores; ornament of initial spine.

**Dimensions.**—Length 0.55 mm.; greatest width 0.36 mm.

**Horizon.**—P16, Pegwell Marls (possibly derived).


**Range.**—Upper Cretaceous, (Tampico) Mexico.

*Lagena amphora* Reuss


**Distinguishing features.**—An elongate-ovate *Lagena* with about twelve strong costae running onto the produced, tubular aperture.

**Description.**—Test elongate-ovate with the greatest width near the base and tapering towards the apertural end; unilocular; aperture terminal, tubular; wall radiate hyaline; pores minute; ornament of about 12 longitudinal costae which continue onto the produced apertural end.

**Dimensions.**—Length 0.4 mm.; maximum width 0.15 mm.

**Horizon.**—P16, Pegwell Marls.


**Range.**—Oligocene, (Pietzpuhl) Germany.

*Lagena amphora* Reuss

**Plate 16, figure 2**


**Distinguishing features.**—An elongate-ovate *Lagena* with about twelve strong costae running onto the produced, tubular aperture.

**Description.**—Test elongate-ovate with the greatest width near the base and tapering towards the apertural end; unilocular; aperture terminal, tubular; wall radiate hyaline; pores minute; ornament of about 12 longitudinal costae which continue onto the produced apertural end.

**Dimensions.**—Length 0.4 mm.; maximum width 0.15 mm.

**Horizon.**—P16, Pegwell Marls.


**Range.**—Oligocene, (Pietzpuhl) Germany.

*Lagena ellipsoidalis* Schwager

**Plate 17, figure 1**


**Distinguishing features.**—A large, globose *Lagena* with produced tubular aperture.

**Description.**—Test globose with greatest width just below the middle and produced apertural end; unilocular; aperture tubular with a suspicion of radial grooves at its tip; wall thick, milky white with minute pores; ornament of initial spine.

**Dimensions.**—Length 0.55 mm.; greatest width 0.36 mm.

**Horizon.**—P16, Pegwell Marls (possibly derived).


*Lagena aff. L. jacobi* Marie

**Plate 17, figure 3**

**Description.**—Test elongate-ovate, semi-inflated; unilocular; aperture terminal with radial grooves; wall radiate hyaline; pores minute; ornament of fine striae covers the lower half of the test.

**Dimensions.**—Length 0.25 mm.; maximum width 0.17 mm.

**Horizon.**—P16, Pegwell Marls.


**Discussion.**—Only one specimen was recovered. It differs from those figured by Marie in the smoothly acuminate, not produced apertural end.

Family BULIMINIDAE

Genus *Buliminella* Cushman, 1911

*Buliminella* sp.

**Plate 16, figure 14**

**Description.**—Test minute, globose, ovate; chambers about 12, inflated, the last 4 making up two thirds of the test; sutures distinct, impressed; aperture a slit extending into the apertural face from the basal suture of the last chamber; wall radiate hyaline; pores minute.

**Dimensions.**—Length 0.23 mm.; maximum width 0.16 mm.
Horizon.—Reculver Silts.


Discussion.—The specimen described is near in form to B. obtusa var. inflata Marie but is squat with a narrow aperture. B. parvula Brotzen is less inflated with higher chambers.

Genus Bulimina d'Orbigny, 1826
Bulimina paleocenica Brotzen
Plate 16, figure 17
1948, Bulimina paleocenica Brotzen, Sver. Geol. Undersök., ser. C, no. 493, p. 61, pl. 6, figs. 5, 6.

Distinguishing features.—An elongate Bulimina, triangular in section with up to seven or eight whorls of chambers slowly increasing in size.

Description.—Test elongate, triserial, triangular in section; chambers about 15, sutures distinct, flush, spiral sutures obsolete; aperture comma shaped, exchambers slowly increasing in size.

Dimensions.—Length 0.27 mm.; maximum width 0.13 mm.

Horizon.—RB19, Reculver Silts.


Discussion.—The Thanet specimens resemble the holotype of Cushman and Edwards in possessing the apertural characters of Uvigerinella. The paratype figured by these authors shows a different form in which the aperture is terminal without a suture connecting it to the base of the chamber. The specimens ascribed to A. europea by Brotzen resemble this paratype.

Brotzen has erected the new genus Pyramidina to include triangular forms with Uvigerinella-like aperture connected to the base of the chamber by a suture but without raised collars. It is uncertain whether this form is generically distinct from Uvigerinella or from Praevigerina Hofker.

Range.—Paleocene, (Montian and Thanetian) Paris Basin.

Uvigerinella oveyi Haynes, n. sp.
Plate 16, figures 15, 15a

Distinguishing features.—An elongate, striated Uvigerinella with up to five whorls of low chambers without marked spiral sutures.

Description.—(Pl. 16, fig. 15). Test elongate, inflated, round in section; chambers about 12, in four whorls, triserial, the last 6 making up three quarters of the test, low, little embracing; sutures impressed; aperture terminal, large, with raised collars on each border and joined to the base of the chamber by a suture; wall radiate hyaline; pores large, scattered.

Dimensions.—Length 0.25 mm.; maximum width 0.13 mm.

Horizon.—RB1, Reculver Silts.


Additional specimens P42568.

EXPLANATION OF PLATE 17

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Discussion.—This species is distinguished from *Uvigerinella sparsicosta* Cushman and Laiming by its small size and proportions and in the possession of striae not costae.

Genus *Angulogerina* Cushman, 1927

*Angulogerina* cf. *A. wilcoxensis* Cushman and Ponton

Plate 16, figure 19

Description.—Test elongate, triangular, greatest width above the middle; chambers 12, increasing steadily in size, trierial in the initial part, the last two apparently uniserial; sutures distinct, not impressed; wall radiate hyaline, pores large, scattered; aperture broken off; ornament of two keels running unbroken down each angle of the test, the last few chambers excavated at the base.

Dimensions.—Length 0.32 mm.; maximum width 0.15 mm.

Horizon.—Reculver Silts.


Discussion.—Only one specimen was recovered. The shape, chambering and ornament are the same as in *A. wilcoxensis*, a zonal guide fossil in the Midway of Alabama.

Family VIRGULINIDAE

Genus *Virgulina* d’Orbigny, 1826

*Virgulina dibollensis* Cushman and Applin

Plate 16, figure 18


1944, *Virgulina dibollensis* Bandy, Journ. Paleontology, vol. 18, no. 4, p. 136, pl. 26, figs. 9a-b.

Distinguishing features.—A slender, elongate *Virgulina* with up to thirteen chambers arranged in a spiral or almost regular biserial series.

Description.—Test elongate, slender, slightly compressed; chambers 13, high, slowly increasing in size, arranged in an almost regular biserial series; sutures distinct, flush; aperture at the peripheral edge of the last chamber, running from the basal suture to the apex; wall granular; pores dense, minute, round.

Dimensions.—Length 0.58 mm.; maximum width 0.13 mm.

Horizon.—RB12, Reculver Silts.


Discussion.—The majority of the specimens recovered are broken and an exact examination of the tongue could not be made but in external characters the Thanet specimens appear to be indistinguishable from *V. dibollensis*.

Range.—Eocene, N. America.

Family CHILOSTOMELLIDAE

Genus *Pullenia* Parker and Jones, 1862

*Pullenia quinqueloba* (Reuss)

Plate 17, figures 16-21a


1940, *Pullenia quinqueloba* Cushman, *ibid.*, vol. 16, p. 72, pl. 12, figs. 13, 14.


1943, *Pullenia quinqueloba* Cushman and Todd, *ibid.*, vol. 19, p. 10, pl. 2, fig. 5.


Distinguishing features.—A semi-compressed *Pullenia* with five chambers visible at the periphery. The apertural face is high, one third to one half the total height of the last chamber, and the diameter of the test is twice the width from umbilicus to umbilicus.

Description.—(Pl. 17, figs. 20, 21). Test planispiral, involute, semi-compressed, periphery semi-lunate and broadly rounded; 5 chambers visible at the periphery; sutures distinct, slightly impressed, almost radial; aperture low, with a lip, extending along the basal suture from umbilicus to umbilicus; wall granular; pores not observed.

Dimensions.—Diameter 0.44 mm.; width 0.20 mm.; height of apertural face 0.12 mm.; height of last chamber 0.25 mm.; angle between sutures about 70°.
Haynes: British Paleocene Foraminifera
Horizon.—P42, Pegwell Marls.

Alternation of generations.—About twenty specimens were sectioned and proloculus sizes were found to range about 25 microns in diameter. It is therefore possible that only one generation is represented in the specimens recovered. All stages of growth occur up to specimens with four whorls and about 0.6 mm. in diameter. Sectioned specimens of the size of that described were found to possess about three whorls of chambers.

Variation.—There is variation towards the six chambered species with high apertural face, P. salisburyi Stewart and Stewart, and in the other direction towards the more globose P. quaternaria (Reuss) with four chambers visible and low apertural face. Some of the specimens show an angular periphery.

Description.—Cushman and Todd (1943) distinguished compressed specimens of P. quinqueloba as a variety, P. quinqueloba var. angusta; their definition being based on a population from the Midway of Texas. It must be pointed out that their variety is, however, less compressed than Reuss’ figure of P. quinqueloba and less compressed than their own figure of a toptype from the Septarian Clays.

Range.—Tertiary, N.W. Europe, Mid-East, N. America.

Pullenia quaternaria (Reuss)
Plate 17, figures 13-15

1851, Nonionina quaternaria Reuss, Haidinger’s Naturw., vol. 4, pt. 1, p. 34, pl. 2.

Distinguishing features.—A sub-globular Pullenia with four and a half chambers visible at the periphery. The apertural face is a third or less of the height of the last chamber and the height of the test is less than twice the width from umbilicus to umbilicus.

Description.—(Pl. 17, figs. 13, 14). Test planispiral, sub-globular, involute; periphery rounded, semi-lobate; 4½ chambers visible; sutures almost radial, slightly impressed; aperture low, with a lip, running from umbilicus to umbilicus at the basal suture; wall granular; pores not observed.

Dimensions.—Diameter 0.33 mm.; width 0.22 mm. Angle between sutures 80°.

Horizon.—P22, Pegwell Marls.

Variation.—There is variation towards P. quinqueloba (Reuss) but the specimens do not seem to show a continuous morphological series. Reuss’ specimen from the Limburg Chalk shows four chambers only so the Thanet forms may have shifted in mode.

Range.—Upper Cretaceous, Germany.

Pullenia salisburyi Stewart and Stewart
Plate 17, figures 12, 12a

1930, Pullenia salisburyi Stewart and Stewart, Journ. Paleontology, vol. 4, p. 72, pl. 8, fig. 2.
1931, Pullenia salisburyi Cushman and Laming, ibid., vol. 5, p. 117, pl. 14, fig. 2.

Distinguishing features.—A semi-compressed Pullenia with six chambers visible. The apertural face is greater than one third of the total height of the last chamber.

Description.—Test planispiral, involute, semi-compressed; periphery rounded; 6 chambers visible; sutures almost radial, impressed; aperture low, with a lip, running from umbilicus to umbilicus at the basal suture; wall granular; pores not observed.

Dimensions.—Diameter 0.35 mm.; width 0.17 mm.; height of last chamber 0.20 mm.; height of apertural face 0.09 mm.; angle between sutures about 60°.

Horizon.—P16, Pegwell Marls.

Range.—Miocene, California.

REFERENCES


CONTRIBUTIONS FROM THE CUSHMAN FOUNDATION
FOR FORAMINIFERAL RESEARCH
VOLUME IX, PART 3, JULY, 1958

RECENT LITERATURE ON THE FORAMINIFERA

Below are given some of the more recent works on the Foraminifera that have come to hand.

AGIP MINERARIA. Foraminiferi Padani (Tertiary o Quaternario). Atlante Iconografico e Distribuzione Stratigrafica.—AGIP Mineraria, 1957, 52 pls. (quarto).

An invaluable compilation presented in convenient form. Over 500 species and varieties are illustrated by excellent photographs (several views each). As a part of each plate explanation, a chart showing range and abundance of each species faces every plate.


—Lower Maestrichtian age based on Foraminifera. Numerous species listed.

Pyroclastic quartzes in the Tortonian of the Cracow region (in Polish with English and Russian summaries).—Instyt. Geol. (Warsaw), Bull. 113, 1957, p. 27-61, pls. 1, 2, text figs. 1-8, tables 1, 2.—Lower Tortonian Foraminifera in intercalated clays are used in correlation.

ARNOLD, ZACH H. A precision sectioning instrument for microfossils.—Micropaleontology, v. 4, No. 1, Jan. 1958, p. 163-112, text figs. 1-3.—Whereby one may watch the sectioning process through the microscope.


BARTENSTEIN, H. HLMUT. Ein bisher unbekanntes Tectril-Vorkommen (Mittel-Oligozän) auf Messtischblatt Lauenau (3722).—Geol. Jahrb., v. 73, Dec. 1957, p. 283-298, text figs. 1-2 (map, microphotographs).—Thirty-three species recorded, some illustrated.


BIELECKA, WANDA. Investigations of microfauna of the Lower Malm in the vicinity of Tychenia (Upper Silesia) (in Polish with English summary).—Instyt. Geol. (Warsaw), Bull. 162, 1956, p. 59-90, pl. 4 (distribution and abundance chart), text fig. 1 (columnar sections).—Seven zones on Foraminifera are distinguished.

Note on Triassic foraminifers of the north-west periphery of the Swiety Krzyza Mountains (in Polish with English summary).—Instyt. Geol. (Warsaw), Bull. 162, 1956, p. 81-95, pl. 5 (columnar section), text figs. 1, 2 (Ostracoda).—Presence of arenaceous forms, mainly Haplophragmoides, is recorded.

BIELECKA, WANDA, and BOZARTSKY, Wladyslaw. Micropaleontological stratigraphy of the Upper Malm in central Poland (in Polish with English and Russian summaries).—Instytut Geol., Prace, Warszaw, tom 12, 1954, p. 1-206, pls. 1-12, tables 1, 2, text figs. 1-4.—Sixty-one species and varieties of Foraminifera, 12 species and 4 varieties new, are described and illustrated. Twelve local zones are based on short-lived species of Foraminifera.

BOLTOVSKOY, ESTEBAN. Contribucion al conocimiento de las Tecamebas del Rio de la Plata.—Acta Geol. Lilloana, v. 1, 1956, p. 299-314, 1 pl., map.—Eleven species of Thecamoebina, none new, from fresh-water environments.

On the cyclical occurrence of Foraminifera.—Dusenia, v. 7, pt. 4, Sept. 30, 1956, p. 211-218.—Using as example the records of Buccella frigida on the Argentine shelf and adjacent waters during the past century, the author discusses the probability of cyclical fluctuations, and some problems of their recognition.

Los Foraminiferos del estuario del Rio de la Plata y su zona de influencia.—Rev. Inst. Nat. Invest. Cien­ncias Nat., Museo Argentino Ciencias Nat. "Bernardo Rivadavia," Ciencias Geol., v. 6, No. 1, 1957, p. 1-77, pls. 1-11, map, table 1 (distrib. and abund.).—Quantitative and qualitative study of 123 bottom samples ranging between 7 and 95 meters depth, with interpretations based on comparisons with other areas. One hundred and forty-three species and sub-species recorded; one new species described; most are illustrated.


BRONNIMANN, PAUL, and BROWN, NOEL, JR. Hedbergella, a new name for a Cretaceous planktonic foraminiferal genus.—Journ. Washington Acad. Sci., v. 48, No. 1, Jan. 1958, p. 15-17, text fig. 1.—Hed­bergella (type species Anomalina boroniana var. troc­oideae Gandolfi), a new name for Hedbergella.

BUCHANAN, JOHN B. The bottom fauna communities across the continental shelf off Accra, Ghana (Gold

BUTTERLIN, JACQUES. Les formations CUMMINGS, ROBERT H. The faunal analysis and CONTRIBUTIONS FROM

COOGAN, DALBIEZ. F. Cuneolina hensoni. a new lowermost Cre- FERREIRA, J. MARTINS, and ROCHA, A. TAVARES. Feraminiferos do Senoniano de Catunella (Ansga) (with English summary).—Garcia de Orta (Lisboa), v. 5, No. 3, 1957, p. 517-545, tables 1-3.—Fifty-six species, none new, are recorded and discussed; none are illustrated. Planktonics are abundant. Ecology is interpreted as medium to deep cool waters.

FEYLING-HANSSEN, ROLF W. Strataflaci og skler- fasthet et Geoteknisk Problem Geologisk Belyst (in Norwegian).—Naturen, Univ. Bergen, v. 82, No. 1, 1958, p. 5-19, 1 pl., text figs. 1-5 (graphs).—Pleistocene Foraminifera illustrated and discussed.


GLAESNNER, M. F., and WOODWARD, G. D. The mic­ mopalaeoontological examination of the Willunga Bore. —Geol. Survey So. Australia, Rept. Invest. No. 8, 1956, p. 11-14 (distrib. table).—Occurrence in the bore of about 145 species of smaller Foraminifera is recorded. The age of the upper fauna is interpreted as upper Oligocene to lower Miocene and that of the lower strata as upper Eocene to Oligocene.


GRADER, P., and REISS, Z. On the Lower Cretaceous of the Heletz area.—Israel Geol. Survey Bull. No. 16, Jan. 1958, p. 1-14, pls. 1-17, map, composite log.—A composite section of about 1200 meters from the Ju­ rassic (Kimmeridgian) to the Vrconian is subdivided into 19 rock-units. Their faunal characteristics (large and small Foraminifera and other groups) are illus­ trated by thin section photographs and plotted on the composite log.

GRELL, K. G. Studien zum Differenzierungsproblem an Foraminfern.—Naturwissenschaften, 45 Jahrg., heft 2, 1958, p. 25-32, text figs. 1-12.—Reproductive forms in Myxotheca arenilea, Patellina corrugata, Rotaliella heterocaryotica, R. rosefissensis, Rubratella intermedia, and Glabratella sulcata.


HORNIBROOK, N. de B. New Zealand Upper Cretaceous and Tertiary foraminiferal zones and some overseas correlations.—Micropaleontology, v. 4, No. 1, Jan. 1958, p. 25-38, pl. 1, tables 1. 2 (correlation chart, range chart).—The twenty-five New Zealand stages are approximately correlated with the international time scale, and notes are included on their diagnostic Foraminifera. New Zealand ranges of 84 species or genera are shown. Six of Finlay’s species are re-illustrated with 2 others, 1 new.

IGO, MISAYOSHI. Fusulinids of Pakuli, southeastern part of the Hida Massif, Central Japan.—Sci. Repts. Tofuku Kyoku Daigaku, sec. C, v. 5, No. 47, March 20, 1957, p. 153-246, pls. 1-15, text figs. 1, 2.—Forty- three species (19 new and 6 indeterminate) and 3 var­ ieties (all new) are described and illustrated from 2 formations in which 6 zones based on fusulinids are recognized.

text figs. 1, 2.—Fusulina is polygenetic, one group descended from primitive Fusulinella and the other directly from Profusulinella. The two groups constitute an example of parallel evolution and convergence. Beedeinia Galloway, 1933 (type species Fusulinella girtyi Dunbar and Condra, 1927) is emended and Fusulina is restricted to the group of F. cylindrica.


KOBAISHI, MANABU. Paleontological study of the Inukiyama Limecone, Shiga Prefecture, Central Japan.—Sci. Repts. Tokyo Kyoiku Daigaku, sec. C, v. 5, No. 45, March 26, 1957, p. 247-311, pls. 1-10, text figs. 1, 2 (map, range chart). table 1.—From this Permian formation 41 species (7 new and 7 indeterminate) and 1 variety are described and illustrated and their local ranges indicated. Four zones, two of which are further subdivided into 2 subzones, are based on fusulinids.

KOPIC, JANUSZ. Stratigraphy and microfauna of the Jurassic in the "Burocice" deep bore-hole near Loczyca (district of Lodz) (in Polish with English summary).—Instytut. Geol. (Warsaw), Biul. 195, p. 51-58, pls. 2, 3 (distribution and abundance chart, columnar section).—Occurrence and abundance of 45 species of Foraminifera in the lower Dogger are recorded.

KRISTIAN, EDITH. Ophalimididae and Tetrataxinae (Foraminifera) aus dem Rift der Hohen Wand in Nieder-Österreich.—Jahrh. Austria Geol. Bundes., Jahhr. 1957, Band 100, heft 2, p. 257-267, pls. 22-27, text figs. 1-4.—Twenty one species, 16 new and 2 indeterminate, in 11 genera. 5 new. Seminivoluta (genotype S. clari n. sp.), Anzuloidiscus (genotype A. communis n. sp.), Coronella (genotype C. austriaca n. sp.), and Galea (genotype G. tilmannii n. sp.) in the Ophalimididae; and Duniotaxis (genotype D. metula n. sp.) in the Trochamminidae. Also, Trochonella (subgenotype T. (T.) crassa n. sp.) new subgenus of Trocholina.


LISZKOWA, JANINA. Microfauna of the sub-Silesian series (in Polish).—Przegląd Geol., 1955, zeszyt 10, p. 463-469, text figs. 1-3 (columnar sections).—Many Foraminifera mentioned.


MARIE, PIERRE, and MONGIN, DENISE. Le Valan­ginien du Mont-Rose de la Madrague (massif de Mar­seilleveyre. Bouches-du-Rhône).—Soc. géol. France Bull., ser. 6, tome 7, fasc. 4-5, Dec. 1957, p. 491-524, pl. 27, text figs. 1-4, table 1.—In the section by P. MARIE seven species of Foraminifera, none new, are recorded and illustrated by sections.


McGUAGAN, ALAN. A sorting device for smaller Foraminifera.—Micropaleontology, v. 4, No. 1, Jan., 1958, p. 113, 114.


POZABYISKI, WŁADYSŁAW, and WITWICKA, EMILIA. Globotruncana of the Upper Cretaceous in central Poland (in Polish with English summary).—Instytut. Geol. (Warsaw), Biul. 195, p. 5-30, pl. 1 (range chart).—Ranges of 18 species shown between Cenomanian and Maestrichtian. In the Santonian and later, the faunas indicate probable limitation of connections with the Alpine geosyncline.

POURI, HARBANS S. Stratigraphy and zonation of the Ocala group.—Florida Geol. Survey, Geol. Bull., No. 38, Nov. 1, 1957, Part I, Stratigraphy: p. 1-39, pls. 1-3, text figs. 1-30, tables 1-3; Part II, Foraminifera: p. 91-184, pls. 1-16, table 1; Part III, Ostracoda: p. 185-244, pls. 1-15, table 1.—Eight fauniones, based mostly on Foraminifera, are recognized in the 3 formations of the Ocala group. Illustrations and descriptions or notes on 145 species of larger and smaller Foraminifera, 17 species of smaller Foraminifera new. Two new genera: Neoclavulina (type species Valvulina intermedia Applin and Jordan) and Verno­nina (type species V. tuberculata n. sp.).


Notes on Foraminifera from Israel. 5. Classification of Complanatulinina eocenica Debourle.-Israel Geol. Survey Bull. 11, May 1957, p. 1-9, text fig. 1, pl. A, B, p. 1-5, range chart.—Eorupertia magna (Le Calvez) and accompanying species recorded from Middle Eocene of Israel. Descriptions and illustrations show bilamellar wall structure. Gyroidinella a junior synonym of Eorupertia. Range chart of 158 genera, subgenera, and species-groups from Late Jurassic to late Pliocene.

Classification of lamellar Foraminifera.—Micropaleontology, v. 4, No. 1, Jan. 1958, p. 1-37, table 1.—Lamellar Foraminifera are included in 2 suborders, 6 superfamilies, and 42 families. Numerous thin-section photographs illustrate both lamellar and non-lamellar species.

SAID, RUSHDY, and KAMEL, TOSSON. Recent littoral Foraminifera from the Egyptian Mediterranean Coast between Rosetta and Saloum.—Bull. Inst. Egypte, v. 37, fasc. 2, Sess. 1954-55, 1956, p. 341-372, pl. 1, 2, text fig. 1 (map).—Eighty species, none new but 2 given new names, are recorded and illustrated. Notes are included on probable origins of some genera, subgenera, and species-groups from Late Jurassic to late Pliocene.

Recent Foraminifera of mangrove swamps and river estuaries and their fossil counterparts in Trinidad.—Micropaleontology, v. 4, No. 1, Jan. 1958, p. 79-92, pl. 1, 2, text figs. 1-3 (map, distribution, correlation table).—Eight species, 2 new, described and illustrated from brackish-water deposits and Miocene and Pliocene deposits of similar ecology.


SKOLNICK, HERBERT. Lower Cretaceous Foraminifera of the Black Hills area.—Journ. Pal. v. 32, No. 2, March 1958, p. 275-285, pls. 36-38, text fig. 1 (map).—Fifteen arenaceous species (families Lituitidae and Trochamminidae), 9 new, comprise an assemblage similar to those of Fredericksburg and Washita age. Environment interpreted as near-shore, brackish, shallow-water lacustrine deposits.


T. The Miocene Foraminifera from Dubois County, Indiana.—Indiana Geol. Survey Bull. No. 19, Feb. 1957, p. 1-66, pls. 1-5, text figs. 1-3 (map, columnar section, phylogeny diagram), table 1.—Descriptions and illustrations of 22 species, 4 new, from a single outcrop, and interpretation of its paleoecology. Families Endothyridae and Fusulinidae include most of the fauna.

PECLETYS is suppressed as a synonym of Endothyra. Species are illustrated both as free specimens and as thin sections, the latter indicating that the granular appearance is due to recrystallization of the original wall, notaggulination of the tests. Notes on sectioning techniques and a glossary of terms are included.


TREDI SCHI, D., and ZAN MATTI, C., II. Diagnosi de forme nuove.—Riv. Ital. Pal. Stratig., v. 63, no. 4, 1957, p. 247-254, text figs. 1-8.—Four new species and four new varieties described and illustrated by excellent photographs from Miocene and Pliocene of Italy.

THOMPSON, M. L., DODGE, H. W., and YOUNGQUIST, WALTER. Fusulinids from the Sublett Range, Idaho.—Journ. Pal., v. 32, No. 1, Jan. 1958, p. 113-125, text fig. 1 (map), tables 1-4.—Ten species, 2 new and 3 indeterminate, from Pennsylvanian and Permian rocks.

WOOD, ALAN. The "Devonian Foraminifera" from Tamworth, New South Wales.—Mem. Nat. Mus. Victoria, No. 22, pt. 5, June 14, 1957, p. 1-4, pl. 1 (thin section photographs).—The supposed Foraminifera are oolite grains.