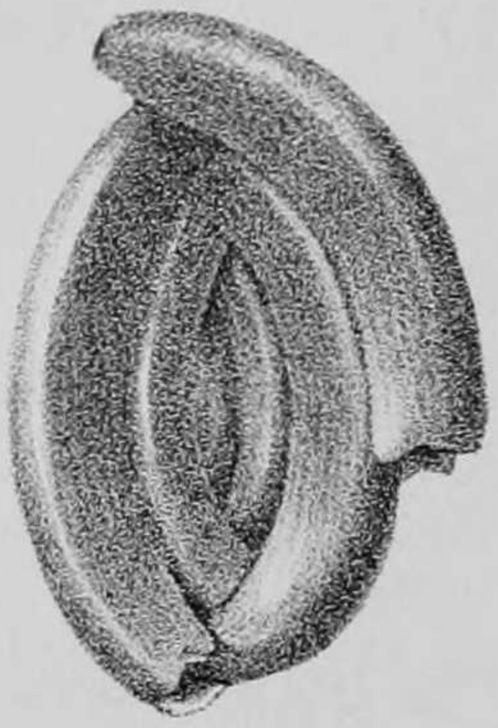
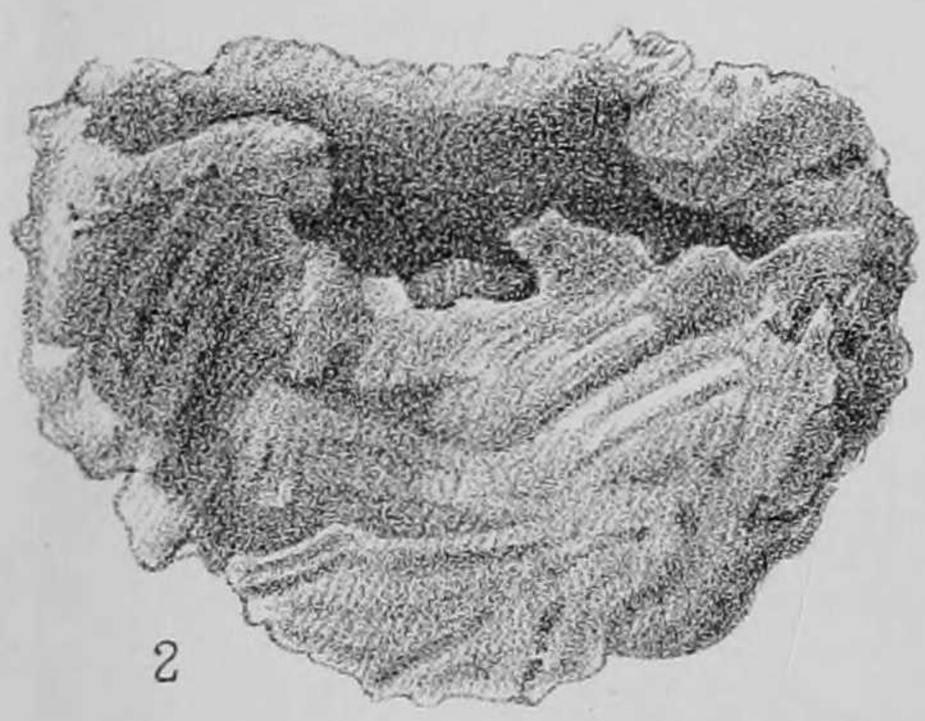
1

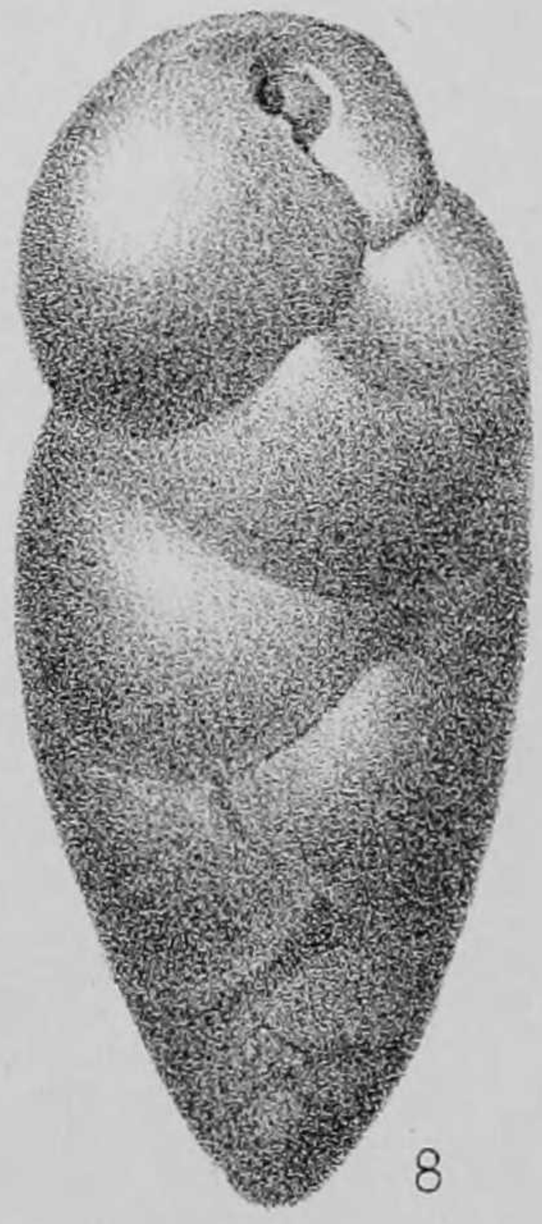


3

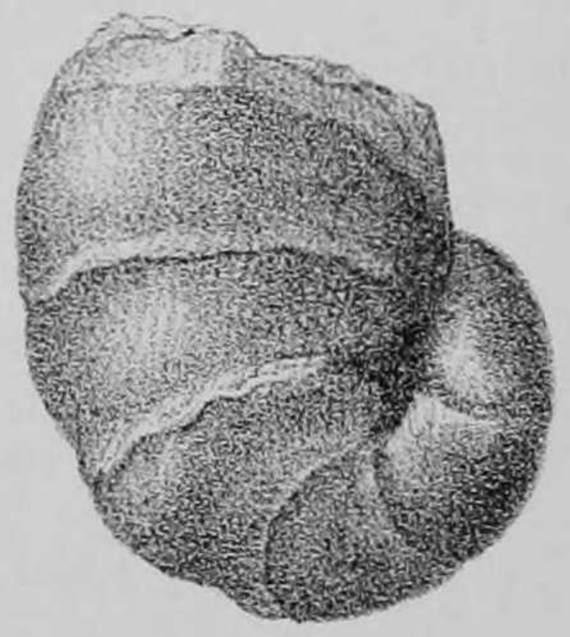
4



2



8

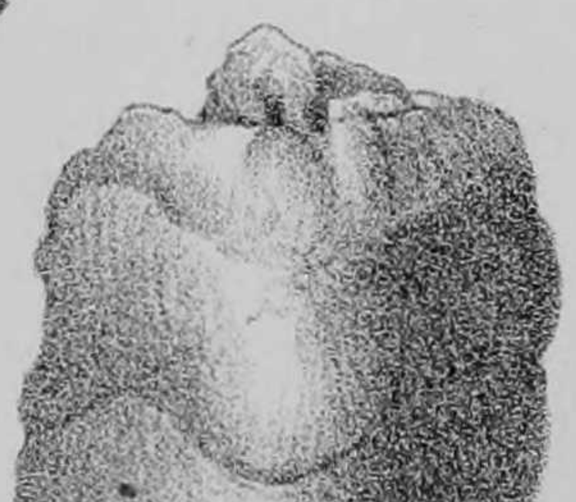


5

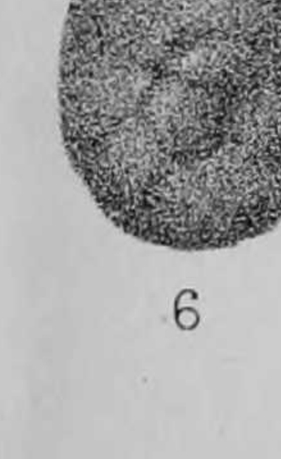
6

11

9



7



12

13

10

West,Newman lith.

JOURNAL

OF THE

ROYAL MICROSCOPICAL SOCIETY

AUGUST, 1910.

TRANSACTIONS OF THE SOCIETY.

XI.—*On the Recent and Fossil Foraminifera of the Shore-sands of Selsey Bill, Sussex.*—V. *The Cretaceous Foraminifera.*

By Edward Heron-Allen, F.L.S., F.R.M.S.,
and Arthur Earland.

(*Read May* 25, 1910.)

Plates VI.-XI.

We have already, on more than one occasion, called attention to the presence, among the floatings and washings of Foraminiferous material from these sands, of a large proportion of fossil forms from the Upper Chalk.* It was not, however, until we had systematically examined gatherings from all points of the shore, and assisted Nature by breaking open some hitherto undamaged flint sponges found between tidemarks on the beach, that we

* See this Journal, 1908, p. 540; 1909, p. 307.

EXPLANATION OF PLATE VI.

Fig. 1.—*Nubecularia lucifuga* Defrance. × 50.
,, 2.—Ditto. Ditto.
,, 3.—*Spiroloculina excavata* d'Orbigny. × 50.
,, 4.—*Haplophragmium inflatum* Reuss sp. × 50.
,, 5.—Ditto. Ditto.
,, 6.—*Spiroplecta prælonga* Reuss sp. × 100.
,, 7.—*Clavulina angularis* d'Orbigny. × 100.
,, 8.—*Bulimina ovata* d'Orbigny. × 50.
,, 9.—*B. pyrula* d'Orbigny. × 100.
,, 10.—Ditto. Oral view. × 100.
,, 11.—*B. elegans* d'Orbigny. × 100.
,, 12.—*B. elegantissima* d'Orbigny. × 150.
,, 13.—*Virgulina schreibersiana* Czjzek sp. × 150.

realised the variety and extent of these forms. The subjoined list of Chalk Foraminifera, comprising as it does no less than 118 species, contains, it will be observed, a very full and highly typical series of Upper Cretaceous forms. So varied indeed is this fauna that we have deemed it desirable to submit our specimens and lists to Mr. Joseph Wright, F.G.S., of Belfast, before submitting this paper to the Society as a not unimportant section of our work upon these shore-sands.

A certain number of the species have been pronounced by Mr. J. Wright to be new to the Chalk, being for the most part species which have hitherto been described as making their first appearance in geological time in Tertiary beds. In point of fact many of these were recorded by us, in the year 1894, from the Upper Chalk of the Twyford-Maidenhead Railway cutting,* and prior to that date many of these species had been recorded from the same locality by Mr. Frederick Chapman.†

Recent and Tertiary fossil specimens of many of these forms have already been recorded by us in the preceding papers of this series; and when this is the case, we have thought it expedient to preserve in the subjoined list the consecutive number under which it was originally described. The whole of the described species will, however, be co-ordinated with proper reference numbers in the analytical table which will conclude this series of papers, when the supplement now in course of preparation has appeared in this Journal.

As the paper on the Twyford-Maidenhead Chalk above referred to was not published in the Proceedings of any Society, we shall take the opportunity of distributing the remaining copies of the paper to the workers to whom this paper will be sent, and shall take pleasure in sending copies of it, so far as possible, to any students of the Foraminifera who may apply for it.

To avoid repetition and economise space in the bibliographical references under each species, we have intimated the occurrence of the species among those recorded in the Prolegomena above referred to by the letters (H-A) after the number. Whenever possible, that is to say in most cases, reference has been made to Egger's excellent monograph on the Foraminifera of the Upper Bavarian Chalk, which is by far the most complete and best illustrated work on Cretaceous Foraminifera.

In order to restrict the present paper to those species of the Cretaceous origin of which there can be no shadow of a doubt, we

* Prolegomena towards the Study of the Chalk Foraminifera: an elementary paper on the collection, preparation, examination, identification, and mounting of Foraminifera from the Chalk, illustrated by a study of the Chalk from the Twyford-Maidenhead Railway cutting. By Edward Heron-Allen, F.L.S., F.R.M.S, London: Nichols, 1894.

† On Microzoa from the Phosphatic Chalk of Taplow. By F. Chapman, F.R.M.S., Quart. Journ. Geol. Soc., 1892, p. 514.

have included nothing which was not obtained from the interior of unbroken flints found on the Selsey foreshore. Apart from these, however, we have recorded the following list of species, found free in the shore-sand, and which, judged by their external appearance or known records, have been derived from Cretaceous sources probably by the breaking up of similar flints, as previously suggested.

7. *Spiroloculina tenuis* Czjzek sp.
23. *Miliolina linnæana* d'Orbigny sp.
12. „ *seminulum* Linné sp.
36. *Cornuspira involvens* Reuss sp.
52. *Ammodiscus incertus* d'Orbigny sp.
62. *Verneuilina spinulosa* Reuss sp.
* *Spiroplecta biformis* Parker and Jones.
77. *Bulimina elegans* d'Orbigny.
75. „ *affinis* d'Orbigny.
* „ *elegantissima* d'Orbigny.
* „ *fusiformis* Williamson.
* „ *marginata* d'Orbigny.
80. „ *pupoides* d'Orbigny.
81. „ *squamigera* d'Orbigny.
83. *Bolivina* *œnariensis* Costa sp.
84. „ *beyrichi* Reuss sp.
88. „ *plicata* d'Orbigny.
* „ *robusta* Brady.
* *Lagena* *bicarinata* Terquem.
102. „ *hexagona* Williamson sp.
103. „ *lævigata* Reuss sp.
95. „ *lævis* Montagu sp.
* „ *lineata* Williamson.
104. „ *lucida* Williamson sp.
106. „ *orbignyana* Seguenza sp.
* „ *orbignyana* (var. *Walleriana*) Wright.
* „ *formosa* Schwager.
99. „ *semistriata* Williamson.
100. „ *squamosa* Montagu sp.
95. „ *striata* d'Orbigny sp.
96. „ *sulcata* Walker and Jacob sp.
108 *Nodosaria* (*G*) *lævigata* d'Orbigny.
* *Vaginulina legumen* Linné sp.
117. *Cristellaria crassa* d'Orbigny.
130. *Polymorphina communis* d'Orbigny.
128. „ *complanata* d'Orbigny.
127. „ *compressa* d'Orbigny.
120. „ *lactea* Walker and Jacob.
121. „ „ (var. *oblonga*) Williamson.
126. „ *lanceolata* Reuss.
131. „ *rotundata* Bornemann sp.
124. „ *sororia* Reuss.
136. „ *spinosa* d'Orbigny sp.
* *Uvigerina* *asperula* Brady.
148. *Spirillina* *inæqualis* Brady.
147. „ *vivipara* Ehrenberg.

* Species appearing in this place without any number will be found recorded in the Supplement.

167. *Discorbina biconcava* **Parker and Jones.**
166. „ *dimidiata* **Jones and Parker.**
159. „ *isabelleana* **d'Orbigny sp.**
156. „ *obtusa* **d'Orbigny sp.**
160. „ *orbicularis* **Terquem sp.**
161. „ *parisiensis* **d'Orbigny sp.**
* „ *polystomelloides* **Parker and Jones.**
153. „ *turbo* **d'Orbigny sp.**
* „ *ventricosa* **Brady.**
176. *Truncatulina lobatula* **Walker and Jacob sp.**
* *Anomalina ariminensis* **d'Orbigny.**
195. *Pulvinulina exigua* **Brady.**
205. *Rotalia calcar* **d'Orbigny.**
204. „ *suessonensis* **d'Orbigny.**
210. *Nonionina pompilioides* **Fichtel and Moll sp.**
214. „ *scapha* **Fichtel and Moll sp.**
209. „ *umbilicatula* **Montagu sp.**
220. *Operculina ammonoides* **Gronovius sp.**
219. „ *complanata* **Defrance.**

In view of the recognised difficulty of determining the geological age of derived fossils, it must be understood that the above list is published with all reservations.

Sub-Kingdom **PROTOZOA.**

Class RHIZOPODA.

Order *FORAMINIFERA.*

Family II. MILIOLIDÆ.

Sub-family 1. Nubeculariinae.

Nubecularia **Defrance.**

1. (H-A) ***Nubecularia lucifuga*** **Defrance.**

(Plate VI. figs. 1, 2.)

The fragments figured are probably referable to this species. It will be seen that sponge spicules are utilised in the construction of the test, being imbedded in the shell substance. The incorporation of sand grains and shell fragments is a very frequent occurrence in recent *Nubeculariæ*, but we have never seen another instance of the utilisation of sponge spicules by this genus.

Sub-family 2. Miliolininae.

Spiroloculina **d'Orbigny.**

5. ***Spiroloculina excavata*** **d'Orbigny.**

(Plate VI. fig. 3.)

This species was described by d'Orbigny from Miocene beds in the Vienna Basin, but it does not appear to have been recorded

* Species appearing in this place without any number will be found recorded in the Supplement.

from the Chalk. *Spiroloculina cretacea** Reuss, however, which is also figured and described in Egger's monograph (Foram. Kreidemergeln der Oberbayerischen Alpen, 1899, p. 21, pl. i. figs. 22–24), is a weakly developed form of the *excavata* type.

Sub-family 4. Peneroplidinae.

Cornuspira Schulze.

36. (H-A) *Cornuspira involvens* Reuss.

Family IV. LITUOLIDAE.

Sub-family 1. Lituolinae.

Reophax Montfort.

226. *Reophax scorpiurus* Montfort.

Reophax scorpiurus Montfort, 1808, Conchyl. Syst. vol. i. p. 330, 83e genre.
Reophax helvetica Haensler, 1883, Quart. Journ. Geol. Soc., vol. xxxix. p. 27, pl. ii. figs. 8–10.
Reophax scorpiurus (Montfort) Brady, 1884, Foram. 'Challenger,' p. 291, pl. xxx. figs. 12–17.

One fragment doubtfully referred to this species, which does not appear to have been recorded from the Chalk, although Haensler records it from the Jurassic of Switzerland under the synonym *Reophax helvetica*.

Haplophragmium Reuss.

227. *Haplophragmium fontinense* Terquem.

Haplophragmium fontinense Terquem, 1870, Mém. Acad. Imp. Metz., 1869–70, p. 235, pl. xxiv. figs. 29, 30.
Ditto. (Terquem) Brady, 1884, Foram. 'Challenger,' p. 305, pl. xxxiv. figs. 1–4.
Ditto. (Terquem) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 140, pl. i. figs. 14–16, 19, 20, 25–29; pl. ii. figs. 40–42.

228. (H-A) *Haplophragmium inflatum* Reuss sp.

(Plate VI. figs. 4, 5.)

Spirolina inflata Reuss, 1851, Haidinger's Naturw. Abh. Band iv., Abth. 1, p. 32, pl. ii. figs. 5, 6.
Haplophragmium inflatum (Reuss) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 143, pl. iii. figs. 8, 9, 18.

Sub-family 2. Trochammininae.

Webbina d'Orbigny.

229. (H-A) *Webbina irregularis* d'Orbigny.

Webbina irregularis d'Orbigny, 1850, Prodrom. Paléont., vol. ii. p. 111, No. 783.

* *Spiroloculina cretacea* Reuss, 1854, Denkschr. K. Akad. Wiss. Wien, vol. vii. pt. i. p. 72, pl. xxvi. fig. 9.

Family V. TEXTULARIDÆ.

Sub-family 1. Textularinae.

Textularia Defrance.

56. *Textularia agglutinans* d'Orbigny.

Recorded by Burrows, Sherborn and Baily, from the Red Chalk (Journ. R. Micr. Soc., 1890).

58. (H-A) *Textularia globulosa* Ehrenberg.

Perhaps the most typical of all Chalk Foraminifera.

230. *Textularia trochus* d'Orbigny.

Textularia trochus d'Orbigny, 1840, Mém. Soc. Géol. France, vol. iv., mém. 1, p. 45, pl. iv. figs. 25, 26.
Ditto. (d'Orbigny) Brady, 1884, Foram. 'Challenger,' p. 366, pl. xliii. figs. 15–19, xliv. figs. 1–3.
Ditto. (d'Orbigny) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 28, pl. xiv. figs. 27, 28.

231. (H-A) *Textularia turris* d'Orbigny.

Textularia turris d'Orbigny, 1840, Mém. Soc. Géol. France, vol. iv. p. 46, pl. iv. figs. 27, 28.
Ditto. (d'Orbigny) Brady, 1884, Foram. 'Challenger,' p. 366, pl. xliv. figs. 4, 5.
Ditto. (d'Orbigny) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 29, pl. xiv. fig. 29.

This is one of the most typical of Chalk Foraminifera.

Verneuilina d'Orbigny.

62 (H-A) *Verneuilina spinulosa* Reuss.

63 (H-A) *Verneuilina triquetra* Münster.

Tritaxia Reuss.

232. (HA) *Tritaxia foveolata* Marsson.

Tritaxia foveolata Marsson, 1878, Mitth. Nat. Ver. Neu-Pommern u. Rügen, Jahrg. x. p. 161, pl. iii. fig. 30 *a*, *b*, *c*.
Ditto. (Marsson) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 42, pl. iv. figs. 32–34.

65. (H-A) *Tritaxia tricarinata* Reuss.

Spiroplecta Ehrenberg.

233. (H-A) *Spiroplecta prælonga* Reuss sp.
(Plate VI. fig. 6.)

Textularia prælonga Reuss, 1845–1846, Verstein. Böhm. Kreide, vol. i. p. 39, pl. xii. fig. 14.
Spiroplecta prælonga (Reuss) Wright, 1886, Proc. Belfast Nat. Field Club, app. ix. p. 329, pl. xxvii. fig. 3.

This species differs very little from *Spiroplecta annectens* Parker and Jones, except in the smaller size of the early spiral portion and the increasing breadth of the later Textularian portion of the shell. *S. annectens* has been recorded from the Chalk of Taplow by Chapman, and also by Heron-Allen in his "Prolegomena," and by Egger from the Bavarian Chalk, etc. Probably many of the records should refer to the more typical cretaceous species *S. pralonga*.

68. (H-A) *Spiroplecta sagittula* Defrance.

Gaudryina d'Orbigny.

234. (H-A) *Gaudryina pupoides* d'Orbigny.

Gaudryina pupoides d'Orbigny, 1840, Mém. Soc. Géol. France, vol. iv. mém. 1, p. 44, pl. iv. figs. 22–24.
Ditto. (d'Orbigny) Brady, 1884, Foram. 'Challenger,' p. 378, pl. xlvi. figs. 1–4.
Ditto. (d'Orbigny) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 37, pl. iv. figs. 19, 20.

235. *Gaudryina subrotundata* Schwager.

Gaudryina subrotundata Schwager, 1866, Novara-Exped. Geol. Theil., vol. ii. p. 198, pl. iv. fig. 9, *a*, *b*, *c*.
Ditto. (Schwager) Brady, 1884, Foram. 'Challenger,' p. 380, pl. xlvi. fig. 13, *a*, *b*, *c*.

Not previously recorded from the Chalk.

236. (H-A) *Gaudryina rugosa* d'Orbigny.

Gaudryina rugosa d'Orbigny, 1840, Mém. Soc. Géol. France, vol. iv. mém. 1, p. 44, pl. iv. figs. 20, 21.
Ditto. (d'Orbigny) Brady, 1884, Foram. 'Challenger,' p. 381, pl. xlvi. figs. 14–16.
Ditto. (d'Orbigny) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 37, pl. iv. figs. 14, 15.

237. (H-A) *Gaudryina Jonesiana* J. Wright.

Gaudryina Jonesiana J. Wright, 1886, Proc. Belfast Nat. Field Club, 1884–5 app. ix. p. 329, pl. xxvii. figs. 1, 2.

Clavulina d'Orbigny.

238. *Clavulina angularis* d'Orbigny.

(Plate VI. fig. 7.)

Clavulina angularis d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 268, No. 2, pl. xii. fig. 7.
Ditto. (d'Orbigny) Brady, 1884, Foram. 'Challenger,' p. 396, pl. xlviii. figs. 22-24.

This species does not appear to have been recorded from the Chalk, though its ally *C. parisiensis* d'Orb. has been recorded by Egger from the Bavarian Chalk.

Sub-family 2. Buliminінae.

Bulimina d'Orbigny.

239. (H-A) *Bulimina variabilis* d'Orbigny.

Bulimina variabilis d'Orbigny, 1840, Mém. Soc. Géol. France, vol. iv. mém. 1, p. 40, pl. iv. figs. 9–12; facsimile in Science Gossip, 1870, p. 156, figs. 145, 146.
Polyphragma variabile (d'Orbigny) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 19, pl. xxiii. figs. 1, 2, 3.

75. (H-A) *Bulimina affinis* d'Orbigny.

240. *Bulimina ovulum* Reuss.

Bulimina ovulum Reuss, 1845–46, Verstein. Böhm Kreideformation, vol. 1, p. 37, pl. viii. fig. 57; pl. xiii. fig. 73.
Ditto. (Reuss) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 50, pl. xv. fig. 46.

This species is hardly separable from *Bulimina affinis* d'Orbigny.

241 (H-A) *Bulimina Presli* Reuss.

Bulimina Presli Reuss, 1845–46, Verstein. Böhm. Kreideformation, vol. i. p. 38, pl. xiii. fig. 72.
Ditto. (Reuss) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 52, pl. xv. fig. 56.

242. (H-A) *Bulimina ovata* d'Orbigny. (Plate VI. fig. 8.)

Bulimina ovata d'Orbigny, 1846, Foram. Foss. Vienne, p. 185, pl. xi. figs. 13, 14.
Ditto. (d'Orbigny) Brady, 1884, Foram. 'Challenger,' p. 400, pl. l. fig. 13 *a*, *b*.
Ditto. (d'Orbigny) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 49, pl. xv. p. 45.

243. (H-A) *Bulimina pyrula* d'Orbigny. (Plate VI. figs. 9, 10.)

Bulimina pyrula d'Orbigny, 1846, Foram. Foss. Vienne, p. 184, pl. xi. figs. 9, 10.
Ditto. (d'Orbigny) Brady, 1884, Foram. 'Challenger,' p. 399, pl. l. figs. 7–10.

EXPLANATION OF PLATE VII.

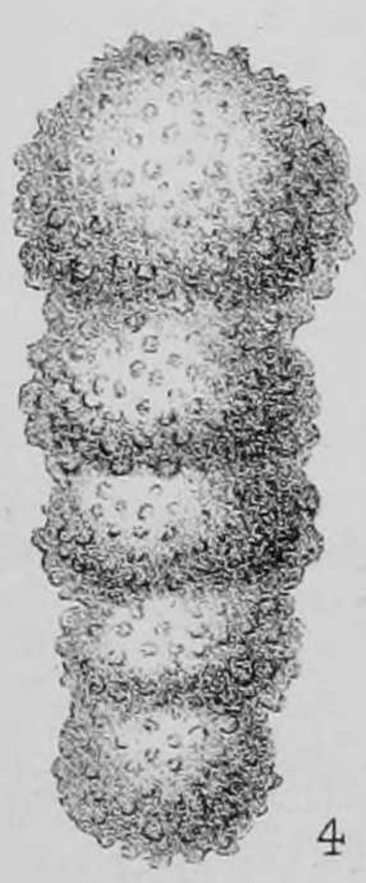
Fig. 1.—*Bolivina decorata* Rupert Jones. × 100.
,, 2.—Ditto. Ditto.
,, 3.—*B. punctata* d'Orbigny. × 50.
,, 4.—*Nodosaria hispida* d'Orbigny. × 50.
,, 5.—Ditto. Ditto.
,, 6.—*N. mucronata* Neugeboren. × 100.
,, 7.—*N. obscura* Reuss. × 100.
,, 8.—*N. plebeia* Reuss. × 100.
,, 9.—*Lingulina carinata* d'Orbigny. × 50.
,, 10.—*Frondicularia angulosa* d'Orbigny. × 50.
,, 11.—*F. archiaciana* d'Orbigny. × 50.
,, 12.—Ditto. Edge view, young specimen. × 50.
,, 13.—*F. inæqualis* Costa. × 50.
,, 14.—*F. crassa* Reuss. × 50.
,, 15.—*F. Verneuiliana* d'Orbigny. × 50.

1

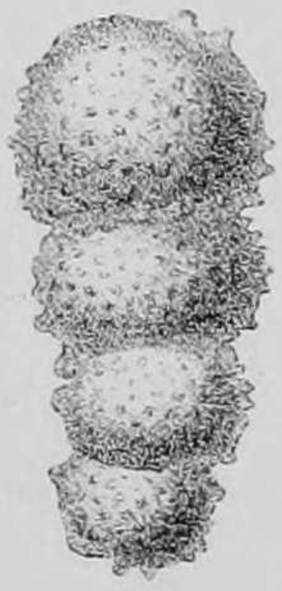
2

3

6



4

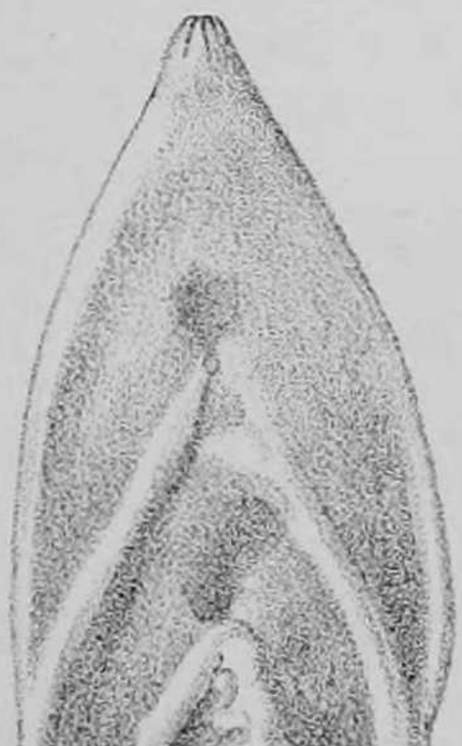


5

7

8

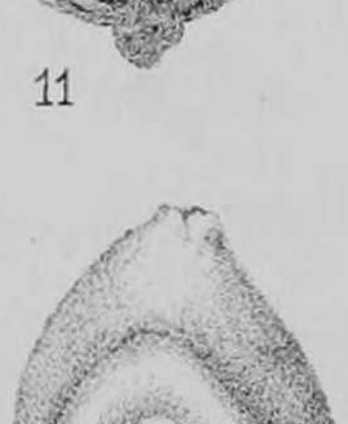
9



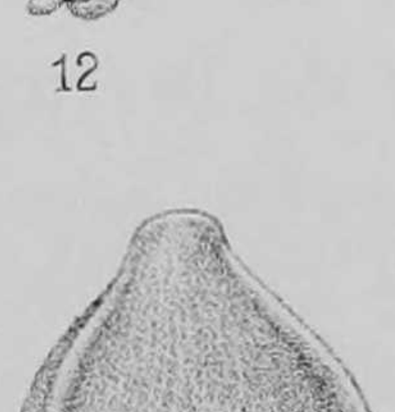
10

11

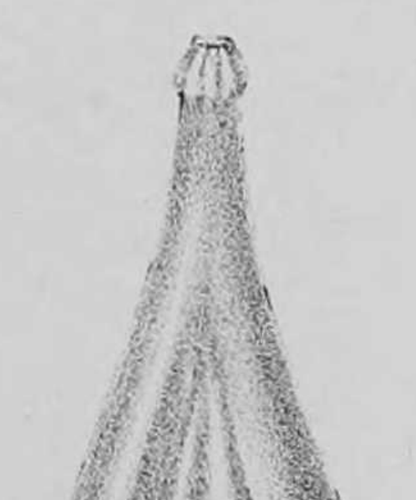
12



13



14



15

West, Newman lith.

244. *Bulimina elegantissima* d'Orbigny.

(Plate VI. fig. 12.)

Bulimina elegantissima d'Orbigny, 1839, Foram. Amér. Mérid., p. 51, pl. vii. figs. 13, 14.
Ditto (d'Orbigny) Brady, 1884, Foram. 'Challenger,' p. 402, pl. l. figs. 20-22.

Not previously recorded from the Chalk.

76. (H-A) *Bulimina brevis* d'Orbigny.

77. (H-A) *Bulimina elegans* d'Orbigny.

(Plate VI. fig. 11.)

245. (H-A) *Bulimina Murchisoniana* d'Orbigny.

Bulimina Murchisoniana d'Orbigny, 1840, Mém. Soc. Géol. France, vol. iv. mém. 1, p. 41, pl. iv. figs. 15, 16.
Ditto. (d'Orbigny) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 51, pl. xv. figs. 49, 50.

Virgulina d'Orbigny.

246. (H-A) *Virgulina schreibersiana* Czjzek.

(Plate VI. fig. 13.)

Virgulina schreibersiana Czjzek, 1847, Haidinger's Naturw. Abhandl., vol. ii. p. 147, pl. xiii. figs. 18–21.
Ditto. (Czjzek) Brady, 1884, Foram. 'Challenger,' p. 414, pl. lii. figs. 1–3.

Bolivina d'Orbigny.

247. (H-A) *Bolivina obsoleta* Eley sp.

Textularia obsoleta Eley, 1859, Geology in the Garden, p. 202, pl. viii. fig. 11c.
Textularia quadrilatera Schwager, 1866, Novara Exped. Geol. Theil., vol. ii. p. 253, pl. vii. fig. 103.
Ditto. (Schwager) Brady, 1884, Foram. 'Challenger,' p. 358, pl. xlii. figs. 8–12.

Owing to the character of the aperture, this species should be classed with *Bolivina* rather than with *Textularia*.

86. *Bolivina lævigata* Williamson sp.

Frequently recorded from the Chalk under its synonym *Bolivina textilarioides* Reuss.

89. *Bolivina punctata* d'Orbigny.

(Plate VII. fig. 3.)

A common, recent and Tertiary fossil. Also recorded by Chapman from the Chalk of Taplow, and, under its synonym *Bolivina elongata* Hantken, by Egger from the Chalk of Bavaria.

90. *Bolivina decorata* Jones.

(Plate VII. figs. 1, 2.)

Family VI. CHILOSTOMELLIDÆ.

Ellipsoidella g.n.

Among the specimens obtained from the flint were nine, which were at first attributed to *Pleurostomella subnodosa** Reuss, as they agreed, generally, very well with that author's figures of his species, except in respect of the aperture. This was, in our specimens, a crescentic slit situated at the terminal end of the final chamber, the shell on the convex edge of the crescent rising in a slight projection and curving somewhat over the slit.

The shape of the aperture bore such a striking resemblance to that which is characteristic of *Ellipsoidina* that it was decided to open some of the specimens, and, on effecting this operation, we found our expectations confirmed by the presence of a central tube exactly similar in structure and position to the axial tube of *Ellipsoidina*. (Pl. XI. figs. 1, 2.)

It thus became evident that our specimens occupied a position intermediate between *Pleurostomella* and *Ellipsoidina*, resembling the former genus in the irregular Textularian arrangement of the early chambers, and the latter in the crescentiform aperture, and in the possession of a central column. As *Pleurostomella* is classed with the Textularidæ and *Ellipsoidina* with the Chilostomellidæ, our specimens form a link connecting two families which hitherto have presented hardly any feature in common.

The genus *Pleurostomella* was founded by Reuss for the reception of some fossils from the Westphalian Chalk, and was placed by the author in d'Orbigny's family Stichostegia, which corresponds to some extent with Brady's sub-family Nodosarinæ, including those genera in which the chambers are arranged in a straight or slightly curved line. It was, however, removed by Brady, and is now by general consent retained in Brady's family Textularidæ, to which its affinities certainly belong. It may not be amiss to give a translation of Reuss' description of his genus from the work already referred to. Recognising their abnormal character, he created a new sub-family for the reception of the new genus, and proceeds as follows:—

Pleurostomellidæ.

"An altogether peculiar group, as yet represented only by the single genus *Pleurostomella*. It is therefore sufficient to introduce the characteristic features of the genus which so far have sufficed for the whole family.

Pleurostomella g.n.

"The first species of this genus, *Pleurostomella subnodosa*, I had formerly (regarding the irregularity of the chambers as something casual and unimportant) classified with similar varieties of *Den-*

* *Pleurostomella subnodosa* Reuss. Die Foraminiferen der westphälischen Kreideformation, 1860. Sitz. K. Akad. Wiss. Wien. vol. xl. p. 204, pl. viii. fig. 2, *a*, *b*.

talina, and figured and described incorrectly as *Dentalina nodosa** d'Orbigny and *Dentalina subnodosa*† Reuss. When I found more numerous examples of this species in the Westphalian Chalk formation, and still later a second type, *Pleurostomella fusiformis*, and convinced myself of the constant irregularity of the chambers, I was led to the closer inspection of the same, whereby I then at once perceived the great variation in the form and position of the opening, from which naturally and necessarily proceeds the above-mentioned arrangement of the chambers. It was now impossible to include these forms any longer with *Dentalina*.

"Apart from the great similarity to *Dentalina* in the external form, the chief difference lies in the aperture. Instead of the same being round as in *Dentalina* and situated on the end of the last chamber, it represents a half-moon or even semi-elliptic fissure, situated below the top of the chamber, on one side of the same, and on the upper end of a larger or smaller depression which has a raised edge. In consequence of this removal of the position of the aperture from the highest point of the chamber, the chambers no longer stand straight on one another, but each is more or less inclined towards the side aperture of the preceding chamber, so that the sutures take a slanting direction and the shell a slightly undulating curve.

"Moreover, the axis of the Pleurostomellæ is either nearly straight as in *Nodosaria* or slightly curved as in *Dentalina*. The shell substance is compact, shining like glass.

"The two species of the genus at present known belong to the Cretaceous formation, one to the white Chalk—the zones of *Belemnitella mucronata* and *B. quadrata*—and the other to the Gault.

"*Pleurostomella subnodosa*.—Length 0·892 mm. Breadth 0·219 mm. Shell straight, rather thick, tapering only a little from below to the blunt point, somewhat irregular (lit. knotted) owing to the alternate slant of all the chambers. All sutures somewhat oblique, especially those of the oldest chambers, and somewhat deep. The chambers arched, especially on the side opposite to the bend. The aperture lies on the upper end of a small, broad, oval, plate-shaped depression, which only takes up a third part of the side surface of the last chamber. It is crescent-shaped, and bounded above and sideways by a sharp rim. Scarce."

We here reproduce Reuss' figures of *Pleurostomella subnodosa*. (Pl. XI. fig. 3.)

The genus *Ellipsoidina* was founded by Seguenza,‡ in 1859,

* Reuss, 1845–46, Verstein. Böhm. Kreide, vol. i. p. 28, pl. xiii. fig. 22. (The figure is very small and quite unrecognisable.)

† Reuss, 1851, Foram. des Kreidemergels von Lemberg in Haidinger's Naturw. Abhandl., vol. iv. p. 24, pl. i. fig. 9. (The small figure represents a straight right-chambered tapering Nodosaria.)

‡ Seguenza, 1859. Eco Peloritano, Giornale di Scienze, Lettere ed Arti, Anno V. serie 2, fasc. 9. Translated and edited by Brady in Ann. Mag. Nat. Hist. 1868, ser. 4, vol. i.

for the reception of some abnormal specimens from the Miocene of Messina. He classed them with d'Orbigny's family Stichostegia, regarding them as allied to *Glandulina*; but Brady subsequently transferred them to his sixth family Chilostomellidæ. At the time of the publication of his Report on the Foraminifera of the 'Challenger' Expedition, the genus was known only from the single species *Ellipsoidina ellipsoides* Seguenza, and Brady's description of the genus was accordingly based on this. He states,* "The chambers are elliptical, and each larger than its predecessor as in *Chilostomella*; but their point of attachment instead of being at one side is at the base, and they are all projected symmetrically in one direction, instead of being directed alternately towards the two ends. The aperture is always at the distal extremity, and takes the form of an arcuate or nearly circular slit, either entire or more commonly divided by shelly bridges. From the centre of the superior end of each segment, that is to say, either from the space enclosed by the curved aperture or its immediate neighbourhood, rises a shelly column of sufficient length to reach to the top of the succeeding chamber. This column is an anomalous feature, to which there is nothing precisely analogous amongst other Foraminifera. It was originally supposed to be a tubular neck serving for the aperture, and the genus was on that account classed with the *Nodosarinæ*, but, as I have elsewhere† shown, this has not proved to be the fact, for the orifice occupies an independent position at its base, and the column itself is not hollow, but it is often deeply grooved longitudinally, or even split into two or three parts near the upper extremity."

In 1894 Mr. R. J. Lechmere Guppy published a paper "On some Foraminifera from the Microzoic Deposits of Trinidad, West Indies,"‡ in which he figured and described two further species of *Ellipsoidina*, viz. *E. subnodosa* Guppy, and *E. exponens* Brady, M.S.

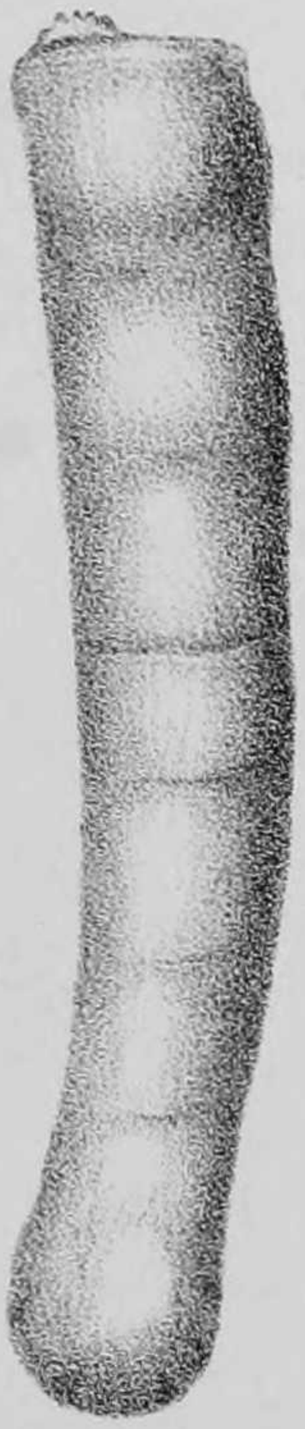
* Brady, 1884. Report on the Foraminifera of the Challenger Expedition, vol. i. p. 435.

† Ann. and Mag. Nat. Hist., ser. 4, vol. i. pp. 333 *et seq.* pl. xiii.

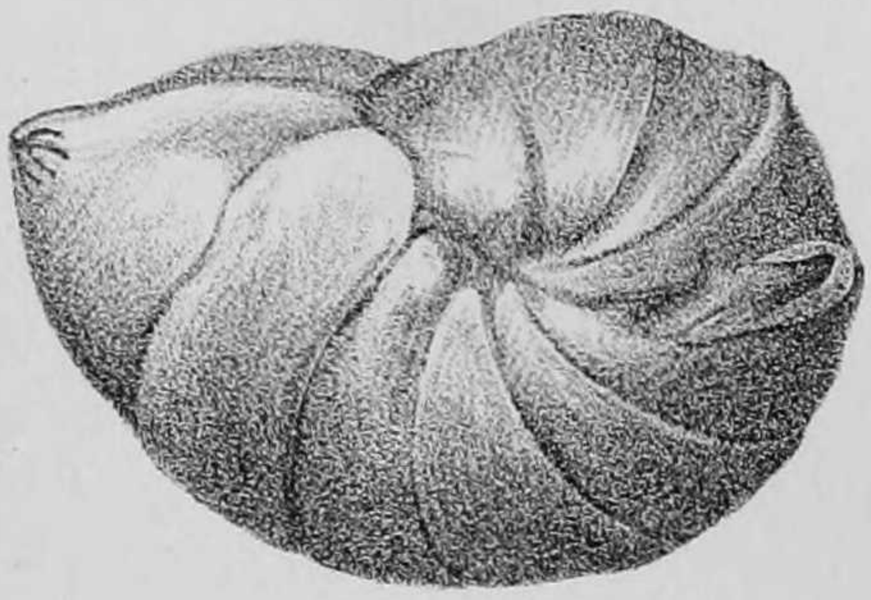
‡ Proc. Zool. Soc. London, Nov. 1894.

EXPLANATION OF PLATE VIII.

Fig. 1.—*Marginulina glabra* d'Orb. var. *elongata* d'Orb. × 25.
„ 2.—*Cristellaria convergens* Bornemann. × 30.
„ 3.—*C. vortex*, Fichtel and Moll sp. × 100.
„ 4.—*Flabellina Baudouiniana* d'Orbigny. × 50.
„ 5.—*F. interpunctata* Von der Marck. × 50.
„ 6.—*F. pulchra* d'Orbigny. × 50.
„ 7.—*F. rugosa* d'Orbigny. × 50.
„ 8.—*Sagrina cretacea* sp. n. × 150.
„ 9.—Ditto. Ditto.
„ 10.—Ditto. Ditto.
„ 11.—*Globigerina æquilateralis* Brady. × 100.
„ 12.—Ditto. Ditto.

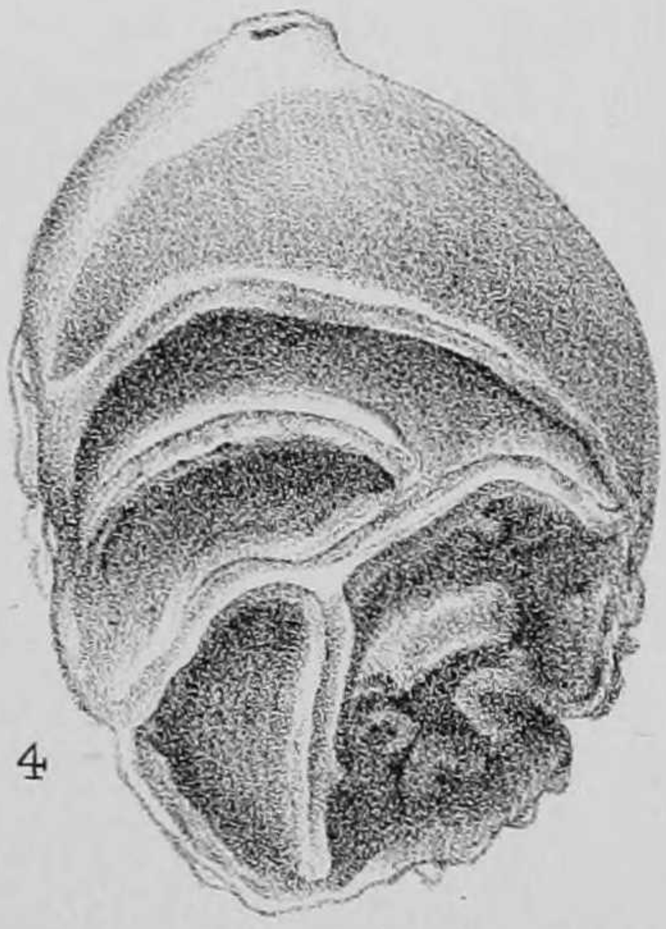


1

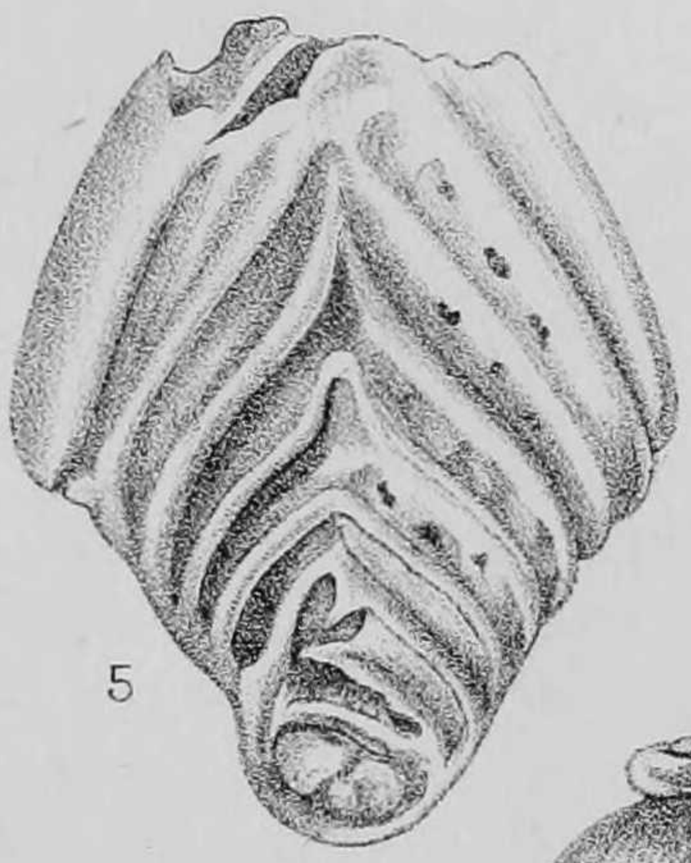


2

3

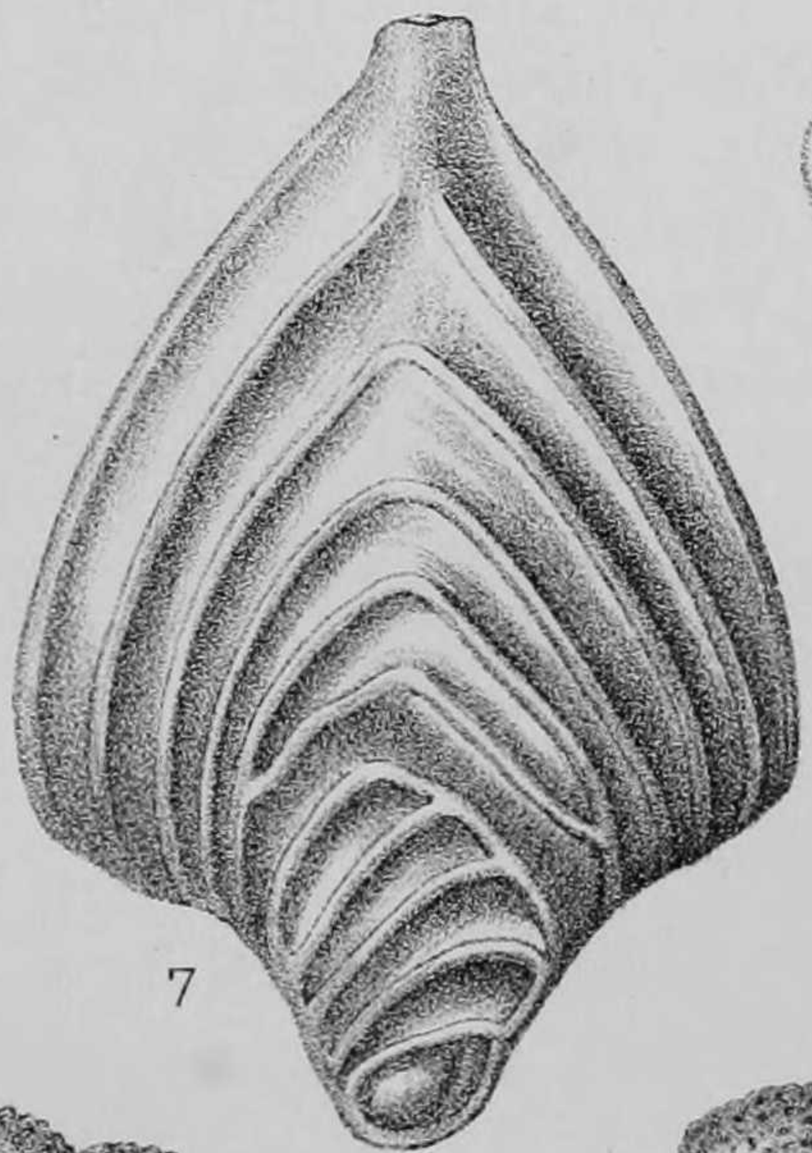


4



5

6



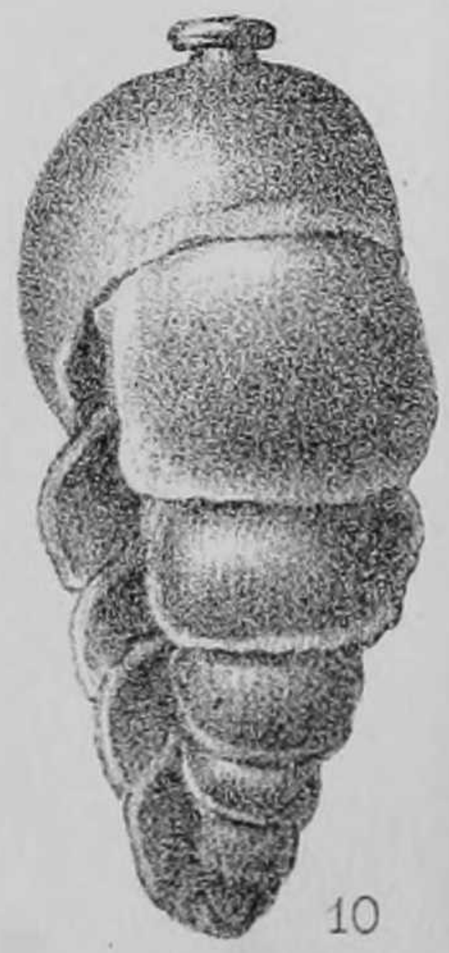
7

9

8

11

12



10

West, Newman lith.

Both of these depart from the original definition of the genus in the fact that the early chambers are visible instead of being entirely enclosed by the final chamber as in the type. *Ellipsoidina subnodosa*, in fact, to all external appearance is a moniliform Nodosaria, while *Ellipsoidina exponens* resembles a Glanduline Nodosaria.

Mr. Guppy in his description of *E. subnodosa* recognises the close relationship of his species to *Pleurostomella*, and he again draws attention to this in a later paper,* in which he attempts to trace the phylogeny of the Foraminifera, and places the genus *Ellipsoidina* next to *Pleurostomella* in order of divergence from a central stem. In his original description of *E. subnodosa* he remarks, "Notwithstanding the resemblance in shape to a Nodosaria, this may generally be distinguished by its more regularly cylindrical shape, the separation between the chambers being less strongly marked than in most Nodosariæ. The aperture and interior structure are more distinct marks of difference. The species represents a close approach to *Pleurostomella*; but the aperture is not situated in a depression as it is in that genus, it is terminal or nearly so. Further in our new species the segments rarely show a tendency to alternate as they do in *Pleurostomella*, though it is to be observed that in one or two specimens there is an indication of such a tendency near the apex.† The aperture resembles that of *Ellipsoidina ellipsoides* as represented by Brady's figure (Quart. Journ. Geol. Soc. 1888, vol. xliv. pl. i. fig. 1). Some specimens of *Pleurostomella subnodosa* come very close; see for instance the figures given by Burrows, Sherborn and Bailey (Journ. R. Micr. Soc. 1890, pl. viii. figs. 27–30)."

This reference to the figures in Messrs. Burrows, Sherborn and Bailey's paper, on "The Foraminifera of the Red Chalk of Yorkshire, Norfolk and Lincolnshire," is of great interest, as we had already noted the resemblance of their figures to our specimens before reading Mr. Guppy's paper. We think there can be no doubt that the specimens from the Red Chalk should be referred to our type, and not to *Pleurostomella nodosa* Reuss; and it is not unlikely that an examination of the specimens of *P. subnodosa* in collections would lead to the discovery of other instances in which our type has been incorrectly identified as *Pleurostomella subnodosa*.

This has in effect occurred in one instance at least in which sufficient details have been recorded to identify the specimens beyond doubt with our type. Boissel and Holzapfel, in their

* "Observations on some of the Foraminifera of the Oceanic Rocks of Trinidad," Proc. Victoria Institute of Trinidad, 1903, vol. ii. pt. i. p. 15.

† By the courtesy of Mr. Guppy, we have received a good many specimens of *E. subnodosa*, but none of them show any sign of a departure from the moniliform plan of growth either externally or when cut in section.

paper,* describe under the name *P. subnodosa* (Reuss) some specimens which are unquestionably similar to ours, for in the figures they give sections of the shell in which the central column is most distinctly shown. Their description is as follows: "The small initial chamber is oval, and the succeeding chambers are not compressed, but have a depression immediately beneath the apex in which is situated the crescentiform aperture. From this aperture a two-layered column reaches to the base of the shell, by which the aperture itself is contracted into a sickle-shaped slit. The two layers of the column unite in the adult shell, forming a hollow rope (*hohlen Strang*), which traverses the entire length of the shell. The succeeding chambers embrace their predecessors, being stouter on the side which bears the aperture, and developing an aperture on the side opposite to the last. The arrangement of the chambers becomes in this way irregularly biserial. On the surface of the shell the chambers are divided by deep sutures. The whole appearance of the shell is not unlike that of many of the Polymorphinæ, whose finely porous shell-structure is similar to that of the *Pleurostomella*. The most important difference lies in the aperture and in the presence of the vertical column (*Langsröhre*).

"The chambers number 8 to 11. The length of the shell, 2·8 to 4·0 mm. The diameter at the small end is 0·36 to 0·45 mm., and at the oral end 0·90 to 1·0 mm. The diameter of the inner tube (*Röhrer*) is 0·036 to 0·091 mm. The specimens figured by Reuss are identical with those from Aix, even to the swollen edges of the aperture, but they are hardly more than one-third of the size of the latter, whilst they agree with them in the number of the chambers."

We propose for our specimens a new genus under the name *Ellipsoidella*, and to place it in Brady's sixth Family Chilostomellidæ. In spite of the difference in size in our specimens we do not think that they represent more than a single species, though they may possibly represent this species in a dimorphous form. Nothing can, however, be decided on this point until the discovery of further specimens permits of a more detailed examination than has at present been practicable.

Family CHILOSTOMELLIDÆ.

Genus *Ellipsoidella* g.n.

Test free, cylindrical, the earlier chambers somewhat compressed and arranged in an irregularly triserial or biserial manner, the later chambers nodosarian; aperture a terminal crescentic slit,

* Die Foram. der Aachener Kreide. Abhandl. der König. Preuss. Geolog. Landesanstalt, n.s. pt. 3, p. 64, pl. xii. figs. 30–38, 1891.

surmounted by a slightly raised and overhanging process. The interior of each chamber traversed from base to apex by a column similar in appearance, position and structure to the internal column of Ellipsoidina.

248. *Ellipsoidella pleurostomelloides* sp. n.

(Plate X. figs. 1–11.)

Pleurostomella subnodosa Burrows, Sherborn and Bailey, 1890, Journ. R. Micr. Soc., p. 549, pl. viii. figs. 27–30.
Ditto. Boissel, 1891, Abhandl. der Königl. preuss. geolog. Landesanstalt, N.S. pt. iii.

We have at present nothing to add to our definition of the species.

Length	0·5–0 to 0·6 mm.	large specimens.
Greatest breadth	0·2 mm.	
Length	0·3–0 to 0·4 mm.	small specimens.
Greatest breadth	0·125 mm.	

Besides the nine specimens found in the interior of the flints, we have two small specimens found free in the shore-sand at the House-pond Bed, which have no doubt been derived from shattered flints.

Family VII. LAGENIDÆ.

Sub-family 1. Lageninae.

Lagena Walker and Boys.

92. *Lagena globosa* Montagu.

249. (H-A) *Lagena aspera* Reuss.

Lagena aspera Reuss, 1861, Sitzungsb. d. k. Akad. Wiss. Wien, vol. xliv. p. 305, pl. i. fig. 5.
Ditto. (Reuss) Brady, 1884, Foram. 'Challenger,' p. 457, pl. lvii. figs. 7–10, var. figs. 6, 11, 12.
Ditto. (Reuss) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 106, pl. v. fig. 10.

250. (H-A) *Lagena gracilis* Williamson.

Lagena gracilis Williamson, 1848, Ann. Mag. Nat. Hist., sér. 2, vol. i p. 13, pl. i. figs. 3, 4.
Ditto. (Williamson) Brady, 1884, Foram. 'Challenger,' p. 464, pl. lviii figs. 2, 3, 7–10, 19, 22–24.
Ditto. (Williamson) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 105, pl. v. fig. 14.

96. (H-A) *Lagena sulcata* Walker and Jacob.

97. (H-A) *Lagena acuticosta* Reuss.

Sub-family II. **Nodosarinae.**

Nodosaria Lamarck.

251. (H-A) ***Nodosaria radicula*** **Linné sp.**

Nautilus radicula Linné, 1767, Syst. Nat. 12th ed. p. 1164, 285; 1788, Ibid. 13th (Gmélin's) ed. vol. i. pt. 6, p. 3373, No. 18.
Nodosaria radicula (Linné) Brady, 1884, Foram. 'Challenger,' p. 495, pl. lxi. figs. 28–31.
Ditto. (Linné) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p 67, pl. v. fig. 40.

252. (H-A) ***Nodosaria farcimen*** **Soldani sp.**

Orthoceras farcimen Soldani, 1791, Testaceographia, vol. i. pt. 2, p. 98, pl. cv. fig. O.
Nodosaria farcimen (Soldani) Brady, 1884, Foram. 'Challenger,' p. 498, pl. lxii. figs. 17, 18.
Ditto. (Soldani) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 55, pl. vi. fig. 12.

109. (H-A) ***Nodosaria filiformis*** **d'Orbigny.**

Recorded as *Nodosaria gracilis* d'Orbigny.

253. (H-A) ***Nodosaria pauperata*** **d'Orbigny.**

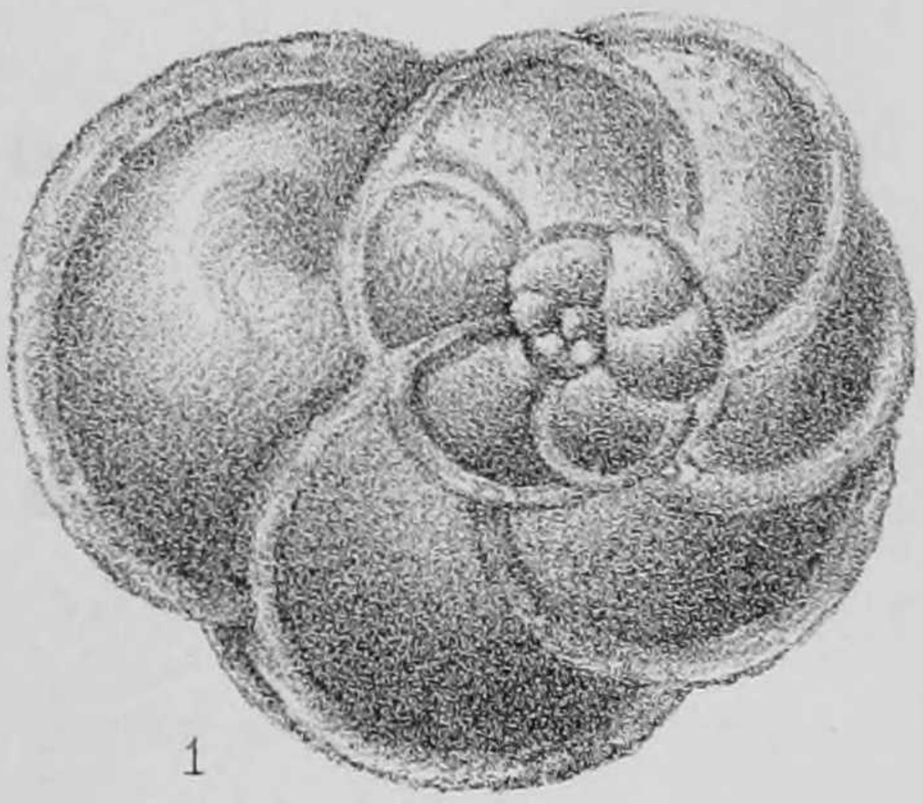
Dentalina pauperata d'Orbigny, 1846, Foram. Foss. Vienne, p. 46, pl. i. figs. 57, 58.
Nodosaria pauperata (d'Orbigny) Brady, 1884, Foram. 'Challenger,' p. 500, woodcuts 14 *a*, *b*, *c*.
Ditto. (d'Orbigny) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 60, pl. vi. fig. 20.

254. (H-A) ***Nodosaria Lorneiana*** **d'Orbigny.**

Dentalina Lorneiana d'Orbigny, 1840, Mém. Soc. Géol. France, vol. iv. mém. 1, p. 14, pl. i. figs. 8, 9. Facsimile in Science Gossip, 1870 p. 81, fig. 80.
Nodosaria Lorneiana (d'Orbigny) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 56, pl. vi. figs. 21, 22.

EXPLANATION OF PLATE IX.

Fig. 1.—*Globigerina marginata* d'Orbigny. × 100.
„ 2.—Ditto. Ditto.
„ 3.—Ditto. Ditto.
„ 4.—*Spirillina limbata* Brady. × 100.
„ 5.—Ditto. Ditto.
„ 6.—*Truncatulina haidingeri* d'Orbigny. × 100.
„ 7.—Ditto. Ditto.
„ 8.—*T. ungeriana* d'Orbigny. × 150.
„ 9.—Ditto. Ditto.
„ 10.—*Rotalia exsculpta* Reuss. × 100.
„ 11.—Ditto. Ditto.
„ 12.—Ditto. Ditto.



1

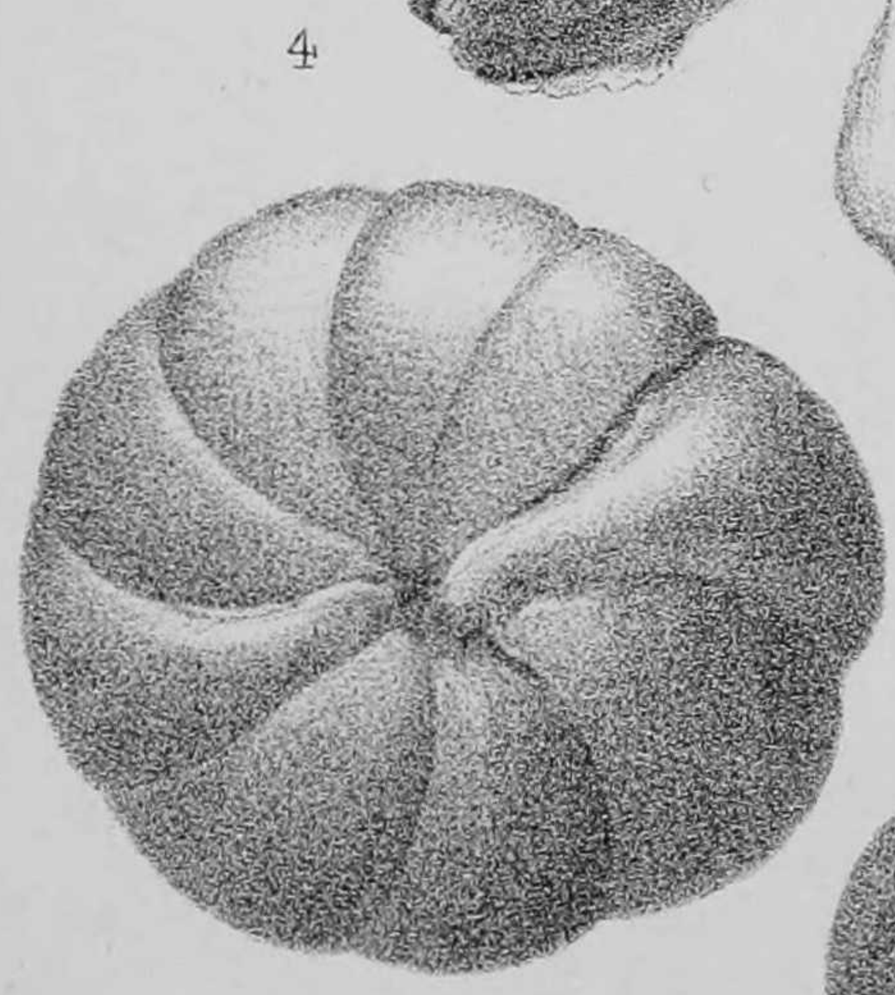
3

2

4

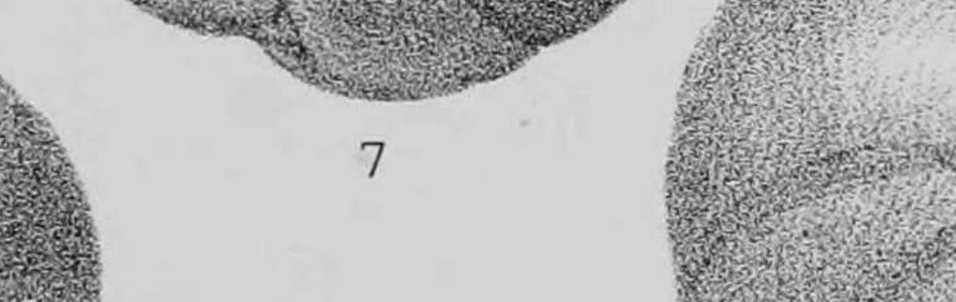
7

5

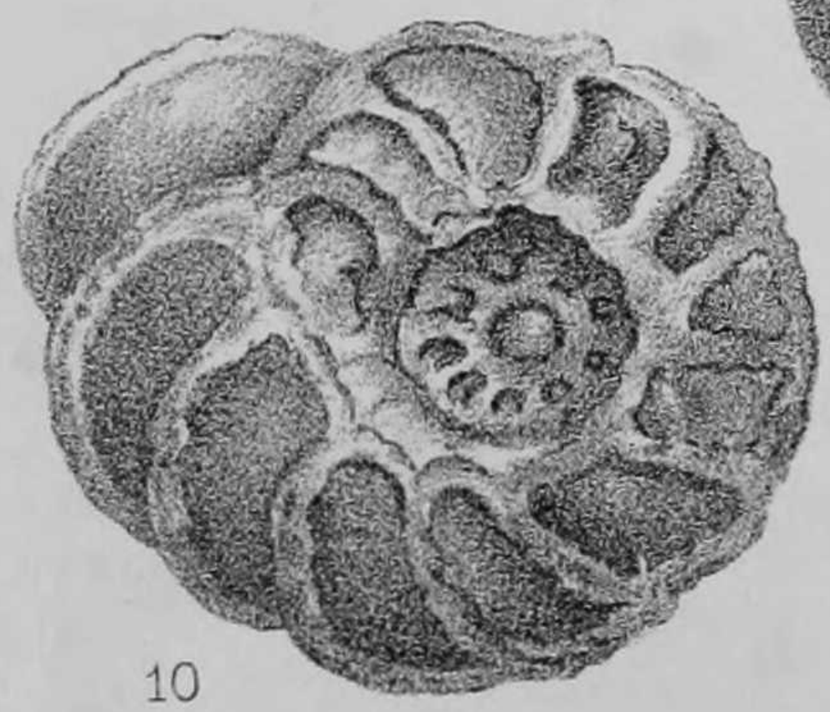


6

8

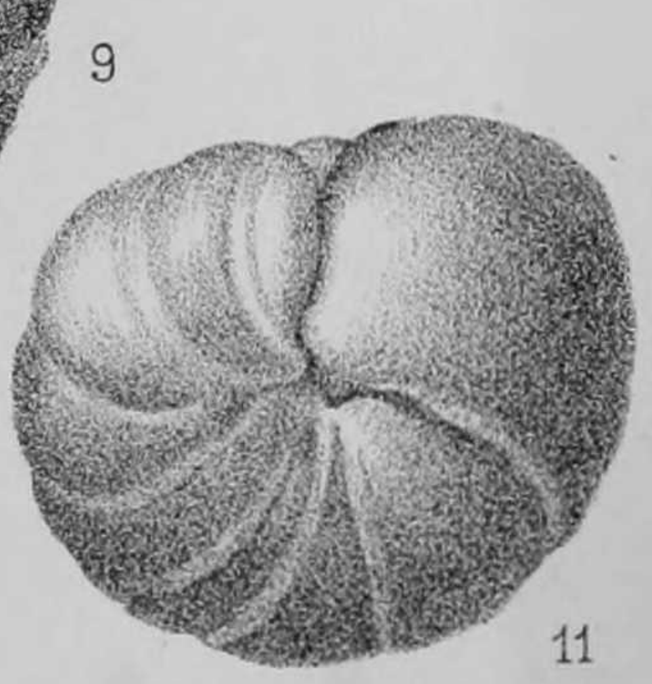


9



10

12



11

West, Newman lith.

255. (H-A) *Nodosaria consobrina* d'Orbigny.

Dentalina consobrina d'Orbigny, 1846, Foram. Foss. Vienne, p. 46, pl. ii. figs. 1–3.
Nodosaria consobrina (d'Orbigny) Brady, 1884, Foram. 'Challenger,' p. 501, pl. lxii. figs. 23, 24.
Ditto. (d'Orbigny) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 61, pl. v. fig. 44; pl. vi. figs. 31, 32, 33, 36.

256. *Nodosaria plebeia* Reuss.

(Plate VII. fig. 8.)

Dentalina plebeia Reuss, 1855, Zeitschr. d. deutsch. geol. Gesell., vol. vii. pl. 267, pl. viii. fig. 9.
Nodosaria plebeia (Reuss) Brady, 1884, Foram. 'Challenger,' p. 502, pl. lxiii. fig. 2.
Ditto. (Reuss) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 65, pl. vi. fig. 25.

257. (H-A) *Nodosaria communis* d'Orbigny.

Nodosaria (*Dentalina*) *communis* d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 254, No. 35.
Nodosaria communis (d'Orbigny) Brady, 1884, Foram. 'Challenger,' p. 504, pl. lxii. figs. 19–22.
Ditto. (d'Orbigny) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 65, pl. vi. fig. 4.

258. (H-A) *Nodosaria mucronata* Neugeboren.

(Plate VII. fig. 6.)

Nodosaria (*Dentalina*) *obliqua* d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 254, No. 36: Modèle No. 5.
Dentalina mucronata Neugeboren, 1856, Denkschr. d. k. Akad. Wiss. Wien, vol. xii. p. 83, pl. iii. figs. 8–11.
Nodosaria mucronata (Neugeboren) Brady, 1884, Foram. 'Challenger,' p. 506, pl. lxii. figs. 27–29, 30, 31.
Ditto. (Neugeboren) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 66, pl. vi. figs. 6, 7, 8.

259. (H-A) *Nodosaria hispida* d'Orbigny.

(Plate VII. figs. 4, 5.)

Nodosaria hispida d'Orbigny, 1846, Foram. Foss. Vienne, p. 35, pl. i. figs. 24, 25.
Ditto. (d'Orbigny) Brady, 1884, Foram. 'Challenger,' p. 507, pl. lxiii. figs. 12–16.
Ditto. (d'Orbigny) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 79, pl. viii. figs. 11–14; pl. ix. figs. 23, 24.

260. (H-A) *Nodosaria raphanus* Linné sp.

Nautilus raphanus Linné, 1767, Syst. Nat. 12th ed., p. 1164, 283; 1788, Ibid. 13th (Gmélin's) ed., p. 3372, No. 16.
Nodosaria raphanus (Linné) Brady, 1884, Foram. 'Challenger,' p. 512, pl. lxiv. figs. 6–10.

261. (H-A) *Nodosaria obscura* Reuss.

(Plate VII. fig. 7.)

Nodosaria obscura Reuss, 1845–1846, Verstein. Böhm. Kreideformation, vol. i. p. 26, pl. xiii. figs. 7–9.
Ditto. (Reuss) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 75, pl. xxiv. fig. 23.

This species is synonymous with *N. raphanus* Linné, being distinguishable only by its minute size and the delicate costæ.

262. (H-A) *Nodosaria conferta* Reuss.

Nodosaria conferta Reuss, 1845–1846, Verstein. Böhm. Kreideformation, vol. i. p. 26, pl. xiii. fig. 10.

263. (H-A) *Nodosaria Zippei* Reuss.

Nodosaria Zippei Reuss, 1845–1846, Verstein. Böhm. Kreideformation, vol. i. p. 25, pl. viii. figs. 1–3.
Ditto. (Reuss) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 78, pl. viii. figs. 1–3.

264. *Nodosaria Steenstrupi* Reuss.

Dentalina Steenstrupi Reuss, 1855, Zeitschr. deutsch. geol. Gesellsch., vol. vii. p. 268, pl. viii. fig. 14*a*.
Nodosaria Steenstrupi (Reuss) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 70, pl. vii. fig. 27.

Lingulina d'Orbigny.

265. *Lingulina carinata* d'Orbigny.

(Plate VII. fig. 9.)

Lingulina carinata d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 257, No. 1 Modèle, No. 26.
Ditto. (d'Orbigny) Brady, 1884, Foram. 'Challenger,' p. 517, pl. lxv. figs 16, 17.

Only the characteristic fissure-like aperture serves to identify the specimen which we have figured as belonging to this species. In all other respects it would pass for a Glanduline Nodosaria (*N. laevigata* d'Orb), there being no noticeable compression of the test. There can be no doubt as to the close relationship of the two forms.

Frondicularia Defrance.

266. (H-A) *Frondicularia angulosa* d'Orbigny.

(Plate VII. fig. 10.)

Frondicularia angulosa d'Orbigny, 1840, Mém. Soc. Géol. France, vol. iv. mém. 1, p. 22, pl. i. fig. 39. Facsimile in Science Gossip, 1870 p. 83, fig. 94.

267. (H-A) *Frondicularia Archiaciana* d'Orbigny.

(Plate VII. figs. 11, 12.)

Frondicularia Archiaciana d'Orbigny, 1840, Mém. Soc. Géol. France, vol. iv. mém. 1, p. 20, pl. i. figs. 34, 36. Facsimile in Science Gossip, 1870, p. 82, fig. 91.
Frondicularia Archiaciana (d'Orbigny) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 87, pl. x. fig. 19, 20.

268. (H-A) *Frondicularia Verneuiliana* d'Orbigny.

(Plate VII. fig. 15.)

Frondicularia Verneuiliana d'Orbigny, 1840, Mém. Soc. Géol. France, vol. iv. mém. 1, p. 20, pl. i. figs. 32, 33. Facsimile in Science Gossip, 1870, p. 82, fig. 90.

269. (H-A) *Frondicularia gaultina* Reuss.

Frondicularia gaultina Reuss, 1860, Sitz. k. Akad. Wiss. Wien, vol. xl. p. 194, pl. v. fig. 5.

270. (H-A) *Frondicularia inversa* Reuss.

Frondicularia inversa Reuss, 1845–46, Verstein. Böhm. Kreideformation, vol. i. p. 31, pl. viii. figs. 15–19; pl. xiii. fig. 42.
Ditto. (Reuss) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 90, pl. x., figs. 3, 4.

The specimen is not typical.

271. (H-A) *Frondicularia marginata* Reuss.

Frondicula ia marginata Reuss, 1845–46, Verstein. Böhm. Kreideformation, vol. i. p. 30, pl. xii. fig. 9; and vol. ii. p. 107, pl. xxiv. figs. 39, 40.

111. *Frondicularia inæqualis* Costa.

(Plate VII. fig. 13.)

272. (H-A) *Frondicularia crassa* Reuss.

(Plate VII. fig. 14.)

Frondicularia crassa Reuss, 1841, Geogr. Skizze Böhmen II. (I.), 212.

Marginulina d'Orbigny.

273. *Marginulina glabra* d'Orbigny, var. *elongata* d'Orbigny.

(Plate VIII. fig. 1.)

Marginulina elongata d'Orbigny 1840, Mém. Soc Géol. France, vol. iv. mém 1, p. 17, pl. i. figs. 20–22. Facsimile in Science Gossip, 1870, p. 82, fig. 85.
Ditto. (d'Orbigny) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 95, pl. ix. fig. 22; pl. xii. figs. 14, 15.

274. *Marginulina hispida* Neugeboren.

Marginulina hispida Neugeboren, 1851, Verh. Mitth. Siebenburg. Ver. Nat., vol. ii. p. 142, pl. iv. fig. 22.

275. (H-A) *Marginulina trilobata* d'Orbigny.

Marginulina trilobata d'Orbigny, 1840, Mém. Soc. Géol. France, vol. iv. mém. 1, p. 16, pl. i. figs. 16, 17. Facsimile in Science Gossip, 1870, p. 82, fig. 83.

Vaginulina d'Orbigny.

276. *Vaginulina legumen* Linné sp.

Nautilus legumen Linné, 1758, Syst. Nat. 10th ed. p. 711, No. 248; 1767 Ibid., 12th ed. p. 1164, No. 288.
Vaginulina legumen (Linné) Brady, 1884, Foram. 'Challenger,' p. 530, pl. lxvi. figs. 13-15.
Ditto. (Linné) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 98, pl. ix. figs. 29, 30.

Cristellaria Lamarck.

114. (H-A) *Cristellaria crepidula* Fichtel and Moll.

113. *Cristellaria lata* Cornuel sp.

277. *Cristellaria Marcki* Reuss.

Cristellaria Marcki Reuss, 1860, Sitz. k. Akad. Wiss. Wien., vol. xl. p. 212, pl. ix. fig. 4 *a*, *b*.
Cristellaria Marckii (Reuss) Burrows, Sherborn and Bailey, 1890, Journ. R. Micr. Soc., p. 12, pl. xi. fig. 5 *a*, *b*.

278. *Cristellaria scitula* Berthelin.

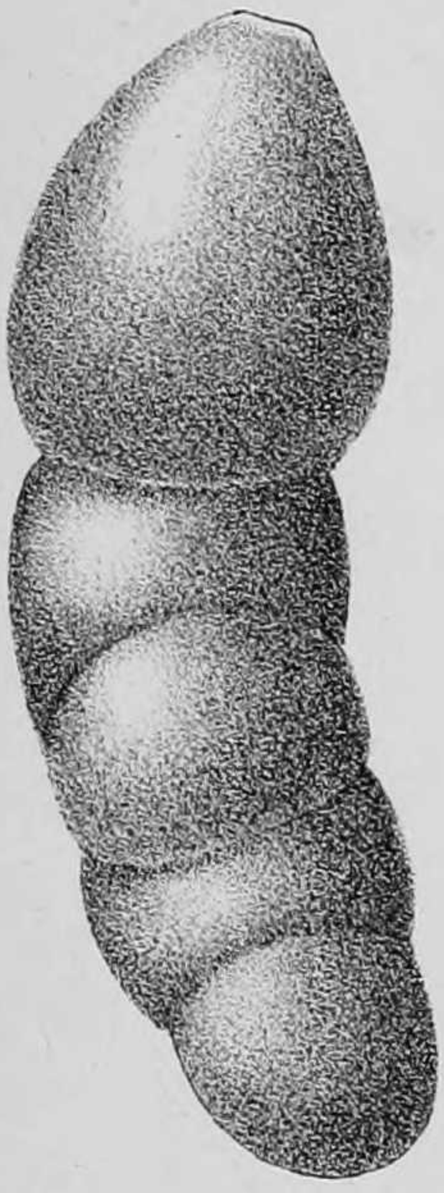
Cristellaria scitula Berthelin, 1880, Mém. Soc. Géol. France, vol. i. mém. 3, p. 54, pl. iii. fig. 3, *a*–*c*.
Ditto. (Berthelin) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 114, pl. xii. figs. 35, 36, 37.

This pretty little form belongs to the *crepidula* group, but the early spiral portion is very slightly developed; the later chambers are produced in a straight Marginuline series.

EXPLANATION OF PLATE X.

Fig. 1.—*Ellipsoidella pleurostomelloides* sp.n. Large type of shell. × 100.
„ 2.—Ditto. Ditto. × 100.
„ 3.—Ditto. Ditto. × 100. The last chamber broken.
„ 4.—Ditto. Small type of shell. × 100.
„ 5.—Ditto. Ditto. × 100.
„ 8.—Ditto. Ditto. × 100.
„ 9.—Ditto. Ditto. × 100.
„ 6.—Ditto. Large type of shell. The last three chambers laid open to show central column and the aperture, which is alternately on either side of the column in successive chambers. × 100.
„ 7.—Ditto. View of aperture when shell is viewed from the top.
„ 10.—Ditto. A small and imperfect specimen, viewed in balsam, as a transparent object. × 100.
„ 11.—Ditto. A fragment, in balsam, viewed as a transparent object. × 100. This differs from the other specimens in the fact that the column is curved in opposite directions in successive chambers, and is apparently not continued to the top of the chamber.

Note.—Owing to the infiltration of calcareous matter, and possibly subsequent chemical changes in fossilization, it was very difficult to distinguish the internal structure of the balsam specimens, owing to their opacity.

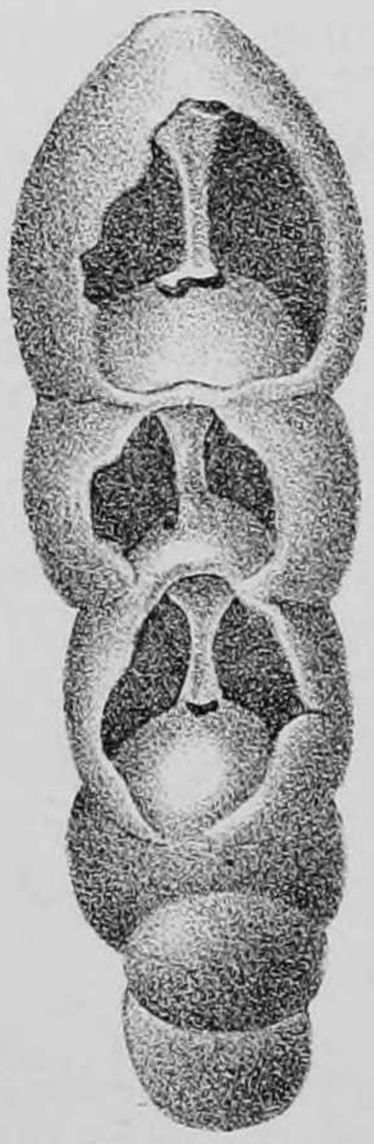


1

2

3

4



6

5

10

8

7

9

11

West, Newman lith.

279. (H-A) *Cristellaria recta* d'Orbigny.

Cristellaria recta d'Orbigny, 1840, Mém. Soc. Géol. France, vol. iv. mém. 1, p. 28, pl. ii. figs. 23–25. Facsimile in Science Gossip, 1870, p. 107, fig. 110.

280. *Cristellaria acutauricularis* Fichtel and Moll sp.

Nautilus acutauricularis Fichtel and Moll, 1803, Test. Micr., p. 102, pl. xviii. figs. *g–i*.
Cristellaria acutauricularis (Fichtel and Moll) Brady, 1884, Foram. 'Challenger,' p. 543, pl. cxiv. fig. 17.

281. (H-A) *Cristellaria navicula* d'Orbigny.

Cristellaria navicula d'Orbigny, 1840, Mém. Soc. Géol. France, vol. iv. mém. 1, p. 27, pl. ii. figs. 19, 20. Facsimile in Science Gossip, 1870, p. 107, fig. 108.
Ditto. (d'Orbigny) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 116, pl. xii. figs. 3, 4.

This species is but one of the innumerable forms of *C. acutauricularis* Fichtel and Moll.

282. (H-A) *Cristellaria triangularis* d'Orbigny.

Cristellaria triangularis d'Orbigny, 1840, Mém. Soc. Géol. France, vol. iv. mém. 1, p. 27, pl. ii. figs. 21, 22. Facsimile in Science Gossip, 1870, p. 107, fig. 109.
Ditto. (d'Orbigny) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 117, pl. xii. figs. 5, 6.

283. (H-A) *Cristellaria convergens* Bornemann.

(Plate VIII. fig. 2.)

Cristellaria convergens Bornemann, 1855, Zeitschr. d. deutsch. geol. Gesellsch. vol. vii. p. 327, pl. xiii. figs. 16, 17.
Ditto. (Bornemann) Brady, 1884, Foram. 'Challenger,' p. 546, pl. lxix. figs. 6, 7.

116. (H-A) *Cristellaria rotulata* Lamarck.

284. (H-A) *Cristellaria vortex* Fichtel and Moll. sp.

(Plate VIII. fig. 3.)

Nautilus vortex Fichtel and Moll., 1803, Test. Micr., p. 33, pl. ii. figs. *d–i*.
Cristellaria vortex (Fichtel and Moll) Brady, 1884, Foram. 'Challenger,' p. 548, pl. lxix. figs. 14–16.

The single specimen found is intermediate between this species and its close ally *C. orbicularis* d'Orbigny, which is furnished with a prominent keel.

119. (H-A) *Cristellaria cultrata* Montfort.

Flabellina d'Orbigny.

285. *Flabellina pulchra* d'Orbigny.

(Plate VIII. fig. 6.)

Flabellina pulchra d'Orbigny, 1840, Mém. Soc. Géol. France, vol. iv. mém. 1, p. 25, pl. ii. figs. 12–14. Facsimile in Science Gossip, 1870, p. 106, fig. 105.

286. (H-A) *Flabellina Baudouiniana* d'Orbigny.

(Plate VIII. fig. 4.)

Flabellina Baudouiniana d'Orbigny, 1840, Mém. Soc. Géol. France, vol. iv. mém. 1, p. 24, pl. ii. figs. 8–11. Facsimile in Science Gossip, 1870, p. 106, fig. 104.

287. (H-A) *Flabellina rugosa* d'Orbigny.

(Plate VIII. fig. 7.)

Flabellina rugosa d'Orbigny, 1840, Mém. Soc. Géol. France, vol. iv. mém. 1, p. 23, pl. ii. figs. 4, 5, 7. Facsimile in Science Gossip, 1870, p. 106, fig. 106.
Ditto. (d'Orbigny) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 108, pl. x. figs. 5, 6, pl. xiii. figs. 1, 2.

288. (H-A) *Flabellina interpunctata* von der Marck.

(Plate VIII. fig. 5.)

Flabellina interpunctata von der Marck, 1858, Verh. Nat. Ver. preuss. Rheinb., vol. xv. p. 53, pl. i. fig. 5.

The characteristic surface markings are poorly represented in our specimen.

Sub-family 3. **Polymorphininae.**

Polymorphina d'Orbigny.

120. *Polymorphina lactea* Walker and Jacob.

124. *Polymorphina sororia* Reuss.

Uvigerina d'Orbigny.

289. *Uvigerina canariensis* d'Orbigny.

Uvigerina canariensis d'Orbigny, 1839, Foram. Canaries, p. 138, pl. i, figs. 25–27.
Ditto. (d'Orbigny) Brady, 1884, Foram. 'Challenger,' p. 573, pl. lxxiv. figs. 1–3.

Recorded by Chapman from the Chalk of Taplow.

290. *Uvigerina pygmæa* d'Orbigny.

Uvigerina pygmæa d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 269, pl. xii. figs. 8, 9 : Modèle No. 67.
Ditto. (d'Orbigny) Brady, 1884, Foram. 'Challenger,' p. 575, pl. lxxiv. figs. 11–14.

One specimen (in which the phialine aperture is wanting) is somewhat doubtfully referred to this species, which has not previously been recorded from the Chalk.

Sagrina Parker and Jones.

291. *Sagrina cretacea* **sp. n.**

(Plate VIII. figs. 8–10.)

Test minute, smooth, wedge-shaped, compressed and excavated laterally, the edges of the chambers rounded, regularly scalloped, and undercut. The shell commences with a few Uvigerine chambers, followed by 3 to 5 pairs of chambers arranged in a regular biserial manner, the last chamber terminating in a produced phialine neck. The outer edge of each chamber is raised into a slight keel from which the surface of the chambers sinks away towards the sutures and median line of the shell, which is consequently the thinnest part of the test. Length 0·2 to 0·3 mm. Breadth 0·15 mm.

This pretty little species may be regarded as an isomorph of *Bolivina obsoleta* (Eley sp.) to which it bears a superficial resemblance in contour and markings. Its nearest ally is apparently *Sagrina aspera* * (Marsson), with which it agrees in size and to some extent in the arrangement of chambers, differing, however, in texture of the shell, which in Marsson's species is rough or prickly. The undercutting of the chambers, which is so marked in the British specimens, is also absent in Marsson's species. Marsson's figure shows only seven chambers in a section of the test, which is megalospheric. Our species may possibly be the microspheric form.

Sagrina cretacea is probably a widely distributed and typical Chalk fossil. It certainly occurs in the Chalk of Kent (Keston) and Herts (Watford) and Rottingdean (Sussex), and will probably be found wherever closely searched for in the Middle and Upper Chalk. Its small size and resemblance to other species are no doubt the reasons for its having so long evaded observation.

Sub-family 4. Ramulininæ.

Ramulina Rupert Jones.

292. (H-A) *Ramulina aculeata* Wright.

Dentalina aculeata d'Orbigny 1840, Mém. Soc. Géol. France, vol. iv., mém. 1, p. 13, pl. i. figs. 2, 3. Facsimile in Science Gossip, 1870, p. 81, fig. 76.]

Ramulina aculeata (d'Orbigny) Wright, 1886, Proc. Belfast Nat. Field Club (1884–85), App. ix., p. 331, pl. xxvii. fig. 11.

Ditto. (Wright) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 135, pl ii. fig. 3.

* *Sagrina aspera*, Marsson, 1878, Mitth. Nat. Ver. Neu-Vorpommern u. Rügen, Jahrg. x. p. 157, pl. iii. fig. 26 *a–d*.

Sagrina aspera (Marsson) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 134, pl. xv. figs. 11, 12, 57.

The specimens agree with those described and figured by Wright under the name *Ramulina aculeata* d'Orbigny sp. Such specimens are abundant in most Chalk gatherings; they are invariably fragments, apparently of some comparatively large organism. It seems probable, therefore, that Wright's specimens have no connection with d'Orbigny's *Dentalina aculeata*, which, according to Brady, is "a common hispid Dentaline *Nodosaria*."* The cretaceous fossils should be known as *Ramulina aculeata* Wright.

Family VIII. GLOBIGERINIDÆ.

Globigerina d'Orbigny.

142. (H-A) *Globigerina bulloides* d'Orbigny.

143. (H-A) *Globigerina cretacea* d'Orbigny.

293. (H-A) *Globigerina marginata* Reuss sp.

(Plate IX. figs. 1–3.)

Rosalina marginata Reuss, 1849, Verstein. Bohm. Kreid., pt. i. p. 36, pl. xiii. fig. 47.
Ditto. (Reuss) Jones, 1853, Ann. Mag. Nat. Hist., ser. 2, vol. xii. p. 241, pl. ix. fig. 7.
Globigerina marginata (Reuss) Brady, 1884, Foram. 'Challenger,' p. 597, woodcut 17.
Ditto. (Reuss) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 171, pl. xxi. figs. 12–14.

This species passes by insensible degrees into its ally, the commoner *G. Linneana* d'Orb., by the simple process of a thickening of the outer peripheral edge.

144. (H-A) *Globigerina Linneana* d'Orbigny.

294. (H-A) *Globigerina æquilateralis* Brady.

(Plate VIII. figs. 11, 12.)

Globigerina æquilateralis Brady, 1879, Quart. Journ. Micr. Sci., vol. xix. N.S., p. 71.
Ditto. Brady, 1884, Foram. 'Challenger,' p. 605, pl. lxxx. fig. 18–21.
Ditto. (Brady) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 169, pl. xxi. figs. 9, 11, 21, 22, 23.

Recorded also by Chapman from the Chalk of Taplow.

* See Brady, 1884, Foram. 'Challenger,' vol. i. p. 587.

EXPLANATION OF PLATE XI.

Fig. 1.—*Ellipsoidella pleurostomelloides* sp.n. × 100. Specimen (attached to chalk matrix) laid open to show internal tube.
,, 2.—Ditto. Ditto.
,, 3.—*Pleurostomella subnodosa*. Facsimile of Reuss' figure.

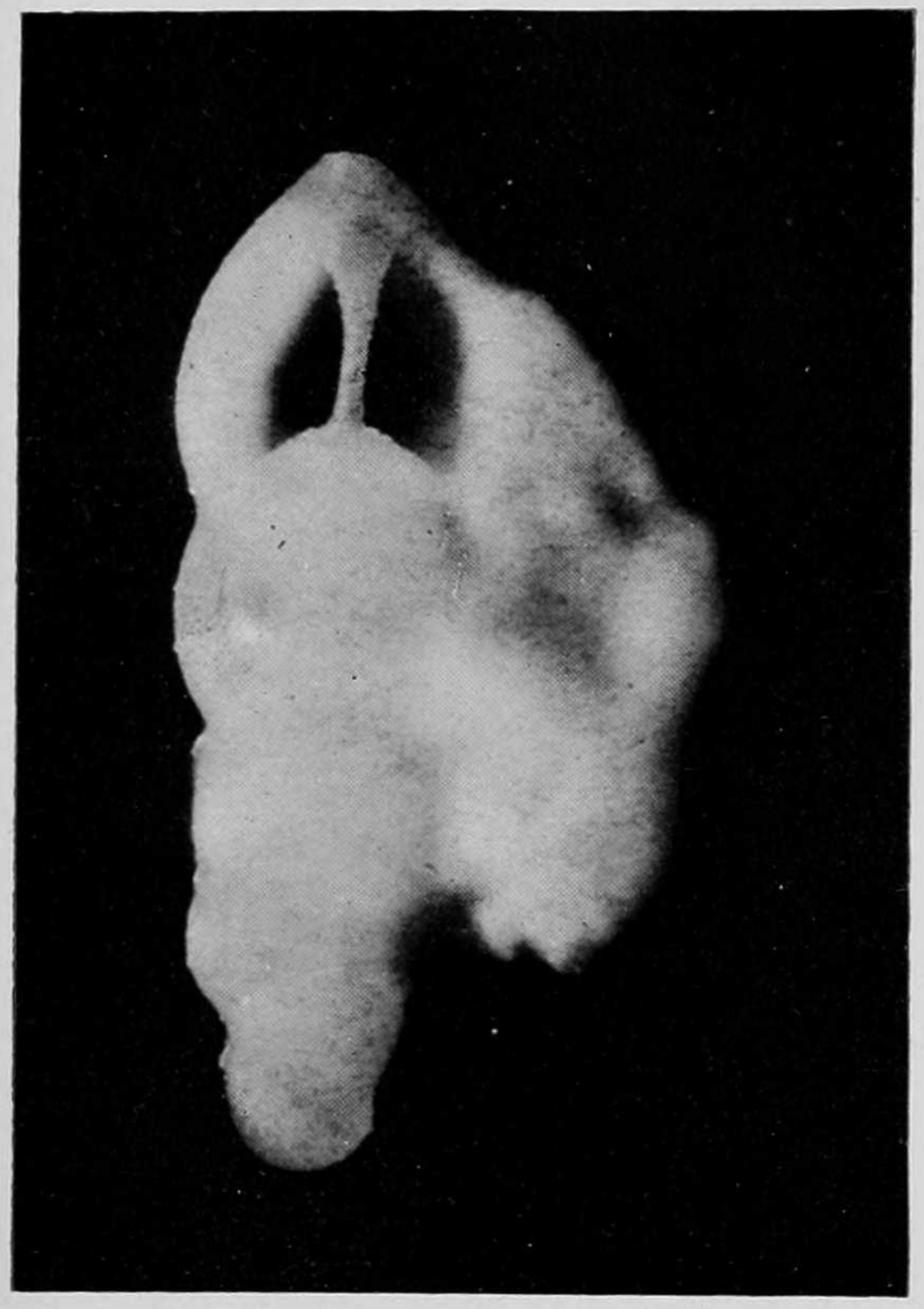


FIG. 1.

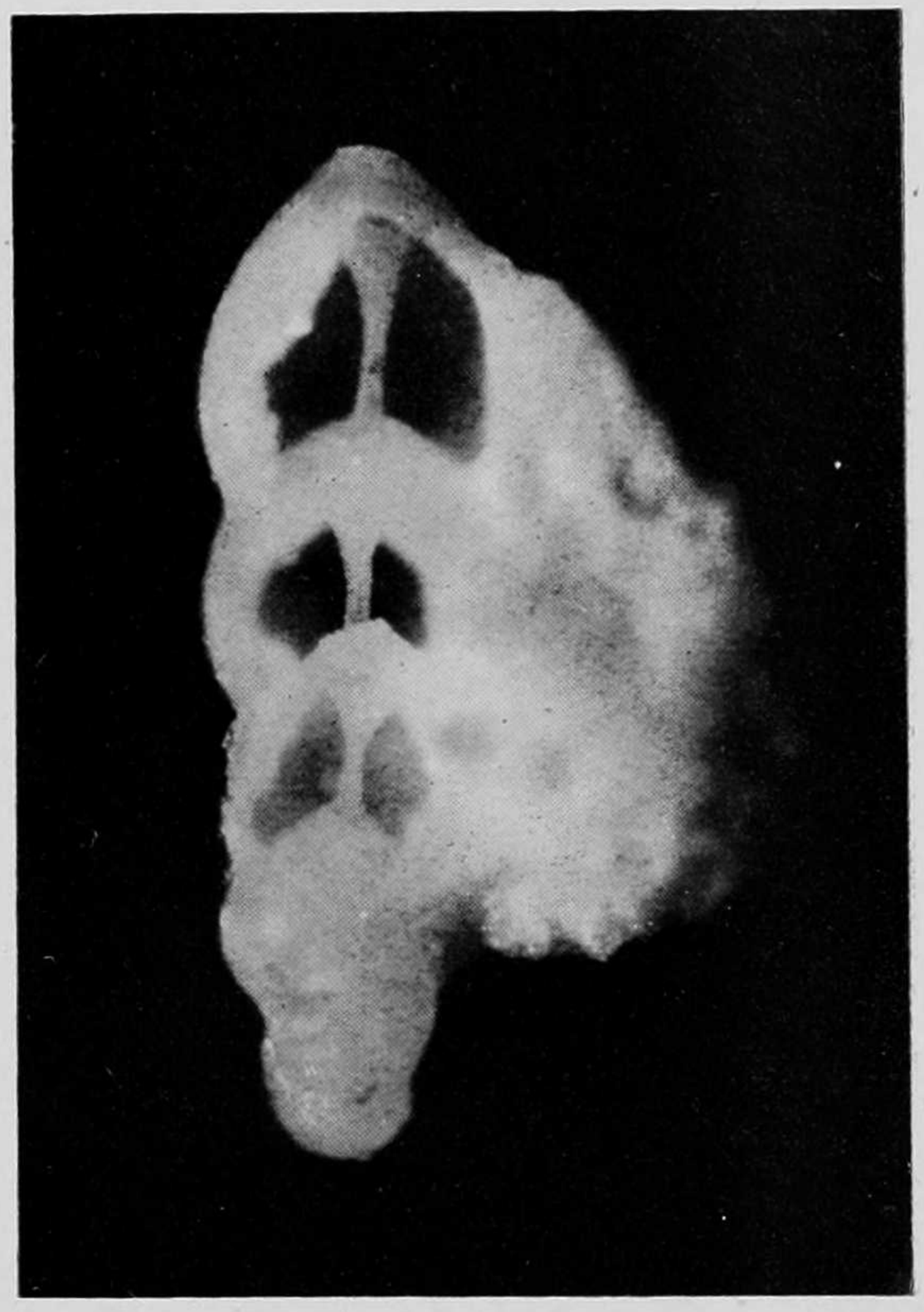


FIG. 2.

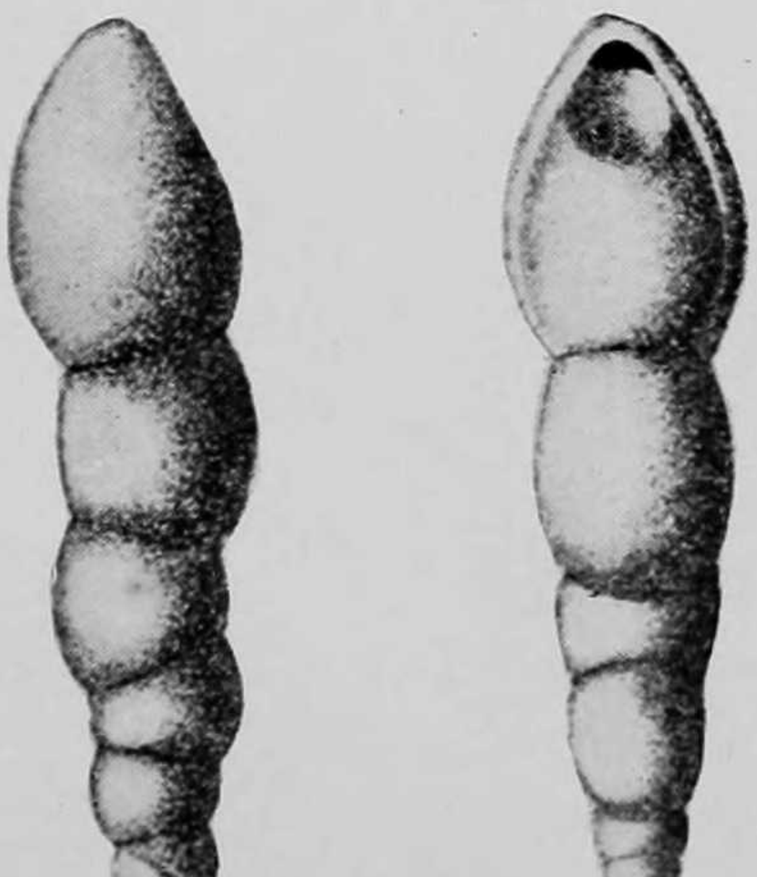


FIG. 3.

Orbulina d'Orbigny.

295. *Orbulina universa* d'Orbigny.

Orbulina universa d'Orbigny 1839, Foram. Cuba, p. 3, pl. i. fig. 1.
Ditto. (d'Orbigny) Brady, 1884, Foram. 'Challenger,' p. 608, pl. lxxviii. pl. lxxxi. figs. 8–26, pl. lxxxii. figs. 1–3.
Ditto. (d'Orbigny) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 173, pl. xxi. figs. 46, 47.

The solitary specimen which we have referred to this species is somewhat doubtful. It could with equal certainty be assigned to the arenaceous isomorph *Thurammina papillata* (Brady), as the surface bears several minute papillæ, which may, however, be adventitious. *T. papillata* has been recorded from Jurassic beds n Switzerland, but apparently not from the Chalk.

Sphæroidina d'Orbigny.

296. *Sphæroidina bulloides* d'Orbigny.

Sphæroidina bulloides d'Orbigny, 1826, Ann. Sci. Nat., vol. vii. p. 267, No. 1 Modèle No. 65.
Ditto. (d'Orbigny) Brady, 1884, Foram. 'Challenger,' p. 620, pl. lxxxiv. figs. 1–7.
Ditto. (d'Orbigny) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 173, pl. xxi. figs. 29, 30.

Family ROTALIDÆ.

Sub-family 1. Spirillininae.

Spirillina Ehrenberg.

149. (H-A) *Spirillina limbata* Brady.

(Plate IX. figs. 4, 5.)

There does not appear to be any previous record of this species from the Chalk, except the one in Heron-Allen's "Prolegomena."

Sub-family 2. Rotalinae.

Discorbina Parker and Jones.

153. *Discorbina turbo* d'Orbigny.

Truncatulina d'Orbigny.

176. (H-A) *Truncatulina lobatula* Walker and Jacob.

180. (H-A) *Truncatulina Haidingerii* d'Orbigny.

(Plate IX. figs. 6, 7.)

297. (H-A) *Truncatulina cordieriana* d'Orbigny sp.

Rotalina cordieriana d'Orbigny, 1840, Mém. Soc. Géol. France, vol. iv. mém. 1, p. 33, pl. iii. figs. 9–11. Facsimile in Science Gossip, 1870, p. 108, fig. 117.
Ditto. (d'Orbigny) Egger, 1899, Foram. Kreidemergeln der Oberbayerischen Alpen, p. 158, pl. xx. figs. 16–18.

Recorded in H-A as *Pulvinulina Cordieriana* d'Orbigny.

182. (H-A) *Truncatulina ungeriana* d'Orbigny sp.

(Plate IX. figs. 8, 9.)

Anomalina Parker and Jones.

185. (H-A) *Anomalina ammonoides* Reuss.

Pulvinulina Parker and Jones.

188. (H-A) *Pulvinulina punctulata* d'Orbigny.

192. *Pulvinulina Hauerii* d'Orbigny.

194. (H-A) *Pulvinulina truncatulinoides* d'Orbigny sp.

Recorded in H-A under its synonym *P. micheliniana* d'Orb. sp.

198. (H-A) *Pulvinulina elegans* d'Orbigny.

Rotalia Lamarck.

201. (H-A) *Rotalia orbicularis* d'Orbigny.

202. (H-A) *Rotalia soldanii* d'Orbigny.

203. (H-A) *Rotalia exsculpta* Reuss.

(Plate IX. figs. 10–12.)

298. (H-A) *Rotalia clementiana* d'Orbigny sp.

Rosalina clementiana d'Orbigny, 1840, Mém. Soc. Géol. France, vol. iv. mém. 1, p. 37, pl. iii. figs. 23–25. Facsimile in Science Gossip, 1870, p. 155, fig. 140.

Family X. NUMMULINIDÆ.

Sub-family 2. Polystomellinae.

Nonionina d'Orbigny.

208. *Nonionina depressula* Walker and Jacob sp.

Not previously recorded from the Chalk.

209. *Nonionina umbilicatula* Montagu sp.

Recorded, under its synonym *N. soldanii* d'Orb., by Egger from the Bavarian Chalk.

213. *Nonionina boueana* d'Orbigny.

Recorded by Egger from the Bavarian Chalk.

Journal of the
Royal Microscopical Society

CONTAINING ITS TRANSACTIONS AND PROCEEDINGS

AND

A SUMMARY OF CURRENT RESEARCHES RELATING TO

ZOOLOGY AND BOTANY

(principally Invertebrata and Cryptogamia)

MICROSCOPY, &c.

EDITED BY

R. G. HEBB, M.A. M.D. F.R.C.P.

WITH THE ASSISTANCE OF THE PUBLICATION COMMITTEE AND

J. ARTHUR THOMSON, M.A. F.R.S.E.
Regius Professor of Natural History in the University of Aberdeen

A. N. DISNEY, M.A. B.Sc.

FELLOWS OF THE SOCIETY

AND

A. B. RENDLE, M.A. D.Sc. F.R.S. F.L.S.
Keeper, Department of Botany, British Museum

HAROLD MOORE, B.Sc.
Woolwich Arsenal

G. H. K. MACALISTER, M.A. M.D. (Cantab.)
Assistant Bacteriologist Lister Institute

Minimis partibus, per totum Naturæ campum, certitudo omnis innititur quas qui fugit pariter Naturam fugit.—*Linnæus.*

FOR THE YEAR

1910

TO BE OBTAINED AT THE SOCIETY'S ROOMS,
20 HANOVER SQUARE, LONDON, W.
OF MESSRS. WILLIAMS & NORGATE, 14 HENRIETTA STREET, LONDON, W.C.
AND OF MESSRS. DULAU & CO., 37 SOHO SQUARE, LONDON, W.