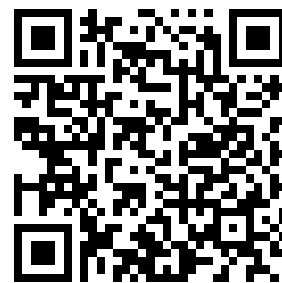


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A MONOGRAPH  
OF  
BRITISH  
CRETACEOUS BRACHIOPODA.

BY  
THOMAS DAVIDSON,  
MEMBER OF THE GEOLOGICAL SOCIETY OF FRANCE.

PART II. 2

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TO THE BINDER.

The Vol. I of the 'BRITISH FOSSIL BRACHIOPODA' is completed in the volumes of the Palæontographical Society for 1851-2-3-4, and should be assembled and arranged in the following order :

Introduction.

Part I. Recent and Tertiary Brachiopoda (printed in the Volume for 1852).

„ II. Cretaceous Species (printed in the Volume for 1852 and 1854).

„ III. Oolitic and Liasic Species (published in the Volume for 1851 and 1852).

Appendix and Index.

NOTICE TO MEMBERS OF CORRECTIONS TO BE MADE BEFORE RE-BINDING.

Descriptions of Plates XXVIII and XXVIII\* to be substituted for the like numbers, in the 'Monograph of the Permian Fossils,' by Professor King.

Descriptions of Plates XVII and XVIII to be substituted for the like numbers, in the 'Monograph of the Oolitic Corals,' by Professor Milne Edwards and M. Jules Haime.



TAB. XVII.

CORALS FROM THE CORAL RAG.

*ISASTREA EXPLANATA* (p. 94).

Fig. 1. Side view of a specimen, in which the epitheca has been partly removed in order to show the mode of arrangement of the costæ; natural size.

1 *a.* Calicular surface of the same; natural size.

1 *b.* Calice, magnified.

1 *c.* Horizontal section, magnified.

1 *d.* Specimen, in which the calicular fossula has been filled up by a calcareous deposit that assumes the appearance of a tuberculose columella.

*ISASTREA GREENHOUGHII* (p. 96).

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TAB. XVIII.

CORALS FROM THE CORAL RAG.

THAMNASTREA ARACHNOIDES (p. 97).

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  - 1 *b*. Calicular surface of a young specimen, slightly magnified.
  - 1 *c*. Side view of a young specimen, the growth of which has been intermittent.
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  - 1 *e*. Variety having the calices disposed in almost parallel series, and placed at a greater distance than usual ; natural size.
  - 1 *f*. Some of the calices of this last variety, magnified.
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  - 1 *j*. (See 1 *g*, at the left-hand bottom corner.) A specimen, the calicular surface of which is slightly worn down ; natural size.
  - 1 *k*. A specimen much modified by the process of fossilization ; natural size.





PLATE XXVIII.

Fig.

1. *Platysomus striatus*, *Agassiz*. Young individual : *a*, scales magnified ; *b*, impressions of ditto. Marl-slate, Thrislington Gap. Museum of the Yorkshire Philosophical Society.
2. *Cœlacanthus caudalis*, *Egerton*. Marl-slate, Ferry Hill. Cabinet of Sir Philip de Malpas Grey Egerton, Bart., M.P., &c.



PLATE XXVIII.\*

Fig.

1. *Cœlacanthus granulosus*, *Agassiz*. Young individual. Cabinets of the Earl of Enniskillen, and Sir Philip de Malpas Grey Egerton, Bart., M.P., &c.
2. „ „ Magnified figure, showing the granulated character of the scales.



22. TEREBRATULA BIPLICATA, *Brocchi*, Sp. Plate VI, figs. 1—49, and Plate IX, fig. 40?

- ANOMIA BIPLICATA, *Brocchi*. *Conchologia fossile*, p. 469, pl. x, fig. 8, 1814.
- TEREBRATULA BIPLICATA, *Sowerby*. *Min. Con.*, vol i, p. 201, tab. 90, 1815, and vol. v, p. 53, tab. 437, fig. 2, 3, 1825.
- — *Parkinson*. *An Int. to the Study of Organic Remains*, p. 227, 1822.
- — — — *OBTUSA*, *Sow*. *Min. Con.*, vol. v, p. 53, tab. 437, fig. 4, 1825.
- — — — *BIPLICATA*, *DeFrance*. *Dic. des Sciences Nat.*, vol. liii, p. 151, 1828.
- — — — *Woodward*. *A Synoptical Table of Brit. Organic Remains*, p. 21, 1830.
- — — — and *T. OBTUSA*, *Brown*. *Illustrations of Fossil Conch. of Great Britain*, pl. lii, figs. 27, 28, and pl. liv, fig. 25, 1835.
- — — — *FABA*, *Sowerby*. (*in Fitton*). *Trans. Geol. Soc.*, vol. iv, p. 338, pl. xiv, tab. 10, 1836, (not *T. faba*, *Sow. d'Orbigny*, *Pal. Tran.*, vol. iv.)
- — — — *BIPLICATA*, (part) *Von Buch*. *Class. des Térébratules*, *Mém. Soc. Géol. de France*, vol. iii, p. 219, 1839.
- — — — *BIPLICATA* and *OBTUSA*, *Morris*. *Catalogue*, 1843.
- — — — *DUTEMPLEANA*, *D'Orbigny*. *Pal. Franç., Terrains Crétacés*, vol. iv, p. 193, pl. 511, figs. 1—8, 1847.
- — — — *BIPLICATA*, (part) *Bronn*. *Index Pal.*, p. 1230, 1848.
- — — — and *OBTUSA*. *Catalogue of the Terebratulæ*, in the *British Museum*, pp. 23, 24, 1853.
- — — — *Sharpe*, *Quart. Journ. Geol. Soc.*, vol. x, p. 191, 1843.

*Diagnosis.* Shell oblong, oval, somewhat pentagonal: ventral valve convex, and in general deeper than the dorsal one, which is more or less prominently biphlicated; beak short, rounded, incurved, and obliquely truncated by a circular foramen of moderate dimensions. Deltidium very narrow, and generally inconspicuous from the aperture being contiguous to the umbo of the dorsal valve: lateral margins flexuous, bisinuated in front; surface smooth, marked by concentric lines of growth, and at times obscurely striated on the sides; loop simple, not exceeding one third of the length of the socket valve. Dimensions variable; length 23, width 16, depth 11 lines.

*Obs.* It was not until after much consideration and repeated comparisons of more than three thousand examples, that I could make up my mind to refer to a single species the *biphlicated terebratulæ* illustrated in Plate VI. of the present monograph.

The term *Anomia biphlicata* was first introduced by *Brocchi* for a cretaceous terebratula from San Quirico, in Tuscany; no description was appended, but the figure then published represents a smooth, oblong oval, or somewhat pentagonal shell, 14 lines in length, by 9 in breadth, notched or biphlicated towards the front, with a slightly incurved beak, circular foramen and inconspicuous deltidium. Nothing more appears to be known of this Italian shell except that the same locality is mentioned for *Rh. vespertilio*.

One year after the publication of *Brocchi's* work, *Sowerby* described, under a similar denomination, a biphlicated terebratula, common in the *Gault* of Folkstone, and *Upper Green*

*Sand*, near Warminster, Cambridge, and other localities, and these have been generally admitted to be the types of *T. biplicata*.<sup>1</sup> M. D'Orbigny seems, however, to consider the Italian shell specifically distinct from our British one, not from a personal acquaintance with Brocchi's type, but from an assumption of his own; nor have I been more fortunate in my endeavours to obtain additional information regarding the San Quirico fossil, all we are therefore enabled to judge from, is the figure, and this so nearly agrees with many of the forms found in the *Upper Green Sand*, near Warminster, that strong doubts may be entertained whether the French author's opinion be really correct.<sup>2</sup> The illustrations furnished by M. D'Orbigny, (Pal. Franc., Terrains Crétacés, vol. iv. pl. 511, figs. 9—15,) resemble, in my opinion, the Italian figure far less than some of those of which he forms his *Ter. Dutempleana* (same work, Pl. 511, figs. 1—8,) and to this last, he justly refers Sowerby's figures of *Ter. biplicata*.

No species varies to a wider extent than the one under consideration, but, at the same time, it does not seem difficult to trace the links which connect by insensible gradation the most extreme variations hitherto observed; nor am I yet prepared to surrender the opinion expressed in page 53, viz. that passages may not be found similarly connecting these last to the *Ter. obesa* (Sow.).

Local conditions have materially influenced the regular development of this, as well as that of other forms; producing varieties and races, not always easily referable to their original type. Thus, when young, *Ter. biplicata* is perfectly oval, uniformly convex, and without trace of biplication, but as the animal advances in its development, the dorsal valve becomes more or less prominently biplicated, with a mesial sinus of variable depth and width extending between the plicæ; but, in some examples, the regular convexity of the dental valve is but slightly influenced by the *biplication* of the dorsal one. These differences may be observed in the numerous illustrations in Pl. VI, and especially in figures 5, 9, 17, 36, &c. Much variation is likewise produced in the general contour, by the lesser or greater approximation of the two plaits and their ridges, as well as by the different degree of convexity presented by the valves.

Two principal varieties may be mentioned.

1. The one abundantly found near Warminster, and in the Isle of Wight, of which

<sup>1</sup> Sowerby mentions the *Gault*, at Cambridge, as containing his *Ter. biplicata*, but it would appear that the shell, although common in the *clay band* of that name at Folkstone and in other localities, at Cambridge is only found in the *Upper Green Sand*. As justly observed by Mr. Deshayes, many other biplicated species from the oolitic and other formations have been confounded with the cretaceous type: thus Professor Bronn mentions as synonyms of *Ter. biplicata*, (Index Pal., p. 1230), the following forms which seem all specifically distinct. *Ter. bicanaliculata*, *T. maxillata*, *T. sella*, *T. Harlani*, *T. bisuffarcinata*, and *T. perovalis*. V. Buch has likewise erred in several of his supposed synonyms of this species, but was right in placing *Ter. faba* among them.

<sup>2</sup> In page 53 of this Monograph, published in 1852, I had so far sanctioned M. D'Orbigny's view by admitting the name *Ter. Dutempleana*; but subsequent and more complete investigations disposed me to consider that conclusion both premature and uncertain.

figs. 33 to 44, are examples. This form approaches most to the Italian figure, and should be looked upon as the more typical shape. M. D'Orbigny's illustration, Pal. Franc., Terrains Crétacés, vol. iv, Pl. 511, figs. 5, 6, 7, is likewise referable to this form. *Ter. faba*, Sow. is simply a dwarf *Terebratula biplicata* from the Upper Green Sand of Warminster.<sup>1</sup>

2. Those wider and more flattened shapes commonly met in the Gault of Folkestone, and Upper Green Sand of Cambridge, (Pl. VI, figs. 1 to 9, 12, 29, &c.) in these the two plaits are much more widely separated, and to it, M. D'Orbigny's illustration, Pal. Franc., Pl. 511, fig. 1, may likewise belong. This is the variety I had intended to retain as *Ter. Dutempleana* (p. 53) and No. 1, as *Ter. biplicata*, (Brocchi,) a view I now abandon for the reasons already specified.

*Ter. obtusa*, Sow. (Pl. VI, figs. 10, 11, 13, &c.) is only a variety of *Ter. biplicata*, or *Dutempleana*, in which the shell has extended more in width than in length, and wherein the biplication has either entirely disappeared (figs. 10, 11,) or exists simply in a rudimentary state, (figs. 13, 23), but that this is simply an unusual condition of the species has been amply proved by a series of upwards of a thousand examples collected by Mr. Carter, at Cambridge, and in which every passage may be traced uniting such extreme forms as figs. 3, 6, and 10.

It seems difficult, in the actual state of our knowledge, to specify with certainty the precise period at which *Ter. biplicata* made its first appearance, but, if some shells (Pl. IX, fig. 40) lately discovered by Mr. Mackie in the highest bed of the *Lower Green Sand* series at Folkstone, really belong to this species, they would be the oldest examples with which we are acquainted.

*Ter. biplicata* occurs in the *Gault* of Folkstone, the *Speeton Clay* of Yorkshire; and the *red chalk* of Hunstanton; it abounds in the *Upper Green Sand* of Cambridge, in the neighbourhood of Warminster, at Farringdon; and although less common, still seems to be represented in the Chalk marl and Lower Chalk of Cambridgeshire:—thus having a wide vertical range, extending almost through the entire cretaceous system.

On the Continent, it occurs at Wissant, in the *Gault*, and in many of the *Upper Green Sand* localities of Europe.

Plate VI, figs. 1 and 2. *Ter. biplicata* var. *Dutempleana*, D'Orb. from the *red chalk* of Hunstanton, in the Collection of Mr. Fitch.

„ figs. 3, 4, 5. A large specimen from the *Upper Green Sand* of Cambridge, in the Cabinet of Mr. Carter.

„ fig. 6. A remarkable example from the same locality and collection, showing traces of coloration.

<sup>1</sup> Professor Forbes states, in his catalogue of the *Lower Green Sand* fossils, Quart. Journ. Geol. Soc., vol. i, p. 346, “*T. faba* (Sow. in Fitton, t. xiv, fig. 11). The original specimen is in the Geological Society's collection, and is from the Upper Green Sand of Warminster; it appears to be a young or starved state of *T. biplicata*, or some allied species.”



- Plate VI, fig. 7. Interior of the dorsal or socket valve with its loop, from the same collection and locality; figures 10 to 28, and 31, are all from Mr. Carter's Collection, and neighbourhood of Cambridge.
- „ figs. 8, 9. Another Upper Green Sand specimen from Cambridge.
- „ figs. 10 to 13. Different examples and ages of the variety (*Ter. obtusa*, Sow.) from Upper Green Sand, of Cambridge.
- „ figs. 14 to 28. Other examples of different shapes and ages from the same bed and locality.
- „ figs. 29, 30. *Ter. biplicata* from the Gault of Folkstone.
- „ fig. 31. A specimen from the lower chalk near Cambridge.
- „ fig. 32. Another from the Lower Chalk of Lewes, in the Cabinet of Mr. Catt.
- „ fig. 33. An elongated example from Warminster, in the Museum of Practical Geology.
- „ figs. 34 to 42. *Ter. biplicata*, a short inflated variety from near Warminster, in the Collection of Mr. Cunnington.
- „ figs. 43, 44. id. (*Ter. faba*,) Sow.
- „ figs. 45 to 49. *Ter. biplicata?* stated to have been found in Lower Green Sand, near Devizes, by Mr. Cunnington.
- Plate IX, fig. 37. A specimen from the Upper Green Sand of Farringdon, in the Collection of Mr. Sharpe.
- „ fig. 40. A specimen of *Ter. biplicata?* from the highest bed of the Lower Green Sand series in the vicinity of Folkstone, Collection of Mr. Mackie.

23. TEREBRATULA PRELONGA, *Sowerby*. Plate VII, figs. 1, 2.

- TEREBRATULA PRELONGA, *Sowerby* (in *Fitton*.) Trans. of the Geol. Soc., vol. iv, p. 338, pl. xiv, fig. 14, 1836.
- BIPLICATA, var. ACUTA, *V. Buch.* Class. des Térébratules, Mém. Soc. Géol. de France, vol. iii, p. 220, 1834. (Not *T. biplicata*, Brocchi, nor Sow.)
- PRELONGA, *Brown*. Illust. of Fossil Conch., pl. liv, figs. 8, 10, 1838.
- BIPLICATA, *Leymerie*. Mém. Soc. Géol. de France, vol. v, p. 29, (not Brocchi,) 1842.
- PRELONGA, *Morris*. Catalogue, 1843.
- — *Forbes*. Quart. Journ. Geol. Soc., vol. i, p. 345, 1845.
- — *D'Orbigny*. Pal. Franç., Terrains Crétacés, vol. iv, p. 75, pl. 506, figs. 1—7, 1847, and Prodrôme, vol. ii, p. 85, 1850.
- — Catalogue of the *Terebratulæ* in the British Museum, p. 28, 1853.

*Diagnosis.* Shell of an elongated oval shape, with almost equally convex valves; beak prominent, not much incurved, obliquely truncated by a large circular foramen, partly

surrounded by, and widely separated from the hinge line by a deltidium in two pieces; beak ridges undefined, lateral margins flexuous, slightly raised and bisinuated in front. The *dorsal* or socket valve is biplicated towards the front; surface smooth, with a few concentric lines of growth. Loop short, not exceeding a third of the length of the dorsal valve; shell structure minutely punctated. Dimensions variable; length 18, width 12, depth  $9\frac{1}{2}$  lines.

*Obs.* This species appears to be readily distinguished from *Ter. biplicata* by its very elongated oval shape; the cardinal half becoming considerably lengthened, gives the shell a somewhat scuttle-shaped appearance: while, on the contrary, *T. biplicata* is more pentagonal and rounded near the beak; the last becoming incurved, with the foramen situated so close to the hinge line, as to render the deltidium almost inconspicuous. Some exceptional examples might perhaps be obtained connecting the two forms, but these not having yet been procured, we must continue to consider this species as distinct.

*Ter. praelonga* appears to characterise the *Lower Green Sand* (*Néocomien* of the French), while the *Ter. biplicata* chiefly occurs in the *Gault* and *Upper Green Sand*.

*T. praelonga* was well figured by Sowerby in 1836 from a specimen stated to have been found in the *Lower Green Sand* of Sandgate (Kent); it occurs likewise near Maidstone (Kent), and in other localities; but it is one of our rarer British species.

On the Continent, M. D'Orbigny mentions it from the Lower Néocomien beds of Baudrecourt, Bettancourt-la-Ferrée (Haute Marne), Morteau (Doubs), the neighbourhood of Castellane and Marolles (Aube), at Neuchâtel in Switzerland, &c.

Plate VII, fig. 1. Type example from the *Lower Green Sand* of Sandgate, figured by Sowerby in *Trans. Geol. Soc.*

„ fig. 2. A very fine specimen from a similar bed at Maidstone, in the Collection of Mr. Morris.

#### 24. TEREBRATULA SELLA, *Sowerby*. Plate VII, figs. 4—10.

- TEREBRATULA SELLA, *Sowerby*. *Min. Con.*, vol. v, p. 53, pl. 437, fig. 1, 1825.  
 — — *Fleming*. *A Hist. of British Animals*, vol. i, p. 371, 1828.  
 — — *Woodward*. *A Synoptical Table of Brit. Org. Remains*, p. 21, 1830, (marked Up. Oolite by mistake.)  
 — BIPLICATA (part), *V. Buch*. *Classification des Térébratules*, *Mém. Soc. Géol. de France*, vol. iii, p. 218, 1834.  
 — SELLA, *Brown*. *Illust. of Fossil Conch. of Great Britain*, pl. lii, figs. 31, 32, 1838.  
 — — *Ræmer*. *Kreid.*, p. 43, No. 41, 1840.  
 — BIPLICATA, *Ræmer*. *Ib.*, pl. vii, fig. 17, 1840.  
 — SELLA, *Leymerie*. *Mém. Soc. Géol. de France*, vol. v, p. 30, 1842.  
 — — *Morris*. *Catalogue*, 1843.  
 — — *Forbes*. *Quart. Journ. Geol. Soc.*, vol. i, p. 345, 1845.  
 — BIPLICATA, (part) *Bronn*. *Index Pal.*, p. 1230, 1848.

TEREBRATULA SELLA, *D'Orbigny*. Pal. Franç., Terrains Crétacés, vol. iv, p. 91, pl. 510, figs. 6—12, and Prodrôme, vol. ii, p. 120, 1850.

— — Catalogue of the Terebratulæ in the British Museum, p. 28, 1853.

*Diagnosis.* Shell of a sub-quadrangular or somewhat pentagonal shape, rather longer than wide. Valves almost equally convex, slightly flattened; beak short, not much incurved, and obliquely truncated by a foramen of moderate dimensions, partly margined by a wide and short deltidium in two pieces. *Dorsal* or socket valve more or less prominently biplicated; the front is considerably elevated, narrow, regularly arched or bisinuated; lateral margins flexuous; surface smooth, with a few concentric lines of growth. Loop short, not exceeding a third of the length of the socket valve. Dimensions variable:

length 15,	width 14,	depth 8 lines.
„ 15,	„ 12,	„ 9 „

*Obs.* Sowerby observes that “when young, this shell is rather trigonal, in consequence of the length of the sides and roundness of the front; as it grows older, it becomes squarer, the front being more produced as well as more elevated; the beak is very slightly curved; the length and breadth are very nearly equal; the edges always sharp.” But we may add, that the separation of the plaits, as well as the depth of the sinus between them, is very variable according to specimens, and is even at times almost entirely filled up.

Several authors, among whom we may quote Baron V. Buch and Professor Bronn, have considered the species under description to be only a variety or synonym of *Ter. biplicata*, but M. D'Orbigny justly remarks, that although individuals of *Ter. sella* are at times found bearing some of the external aspect of *T. biplicata*, they are commonly well distinguished by their beak, foramen, deltidium, and position of the plaits, the last being much more elevated and closer in *T. sella*, producing a biplicated mesial fold, and a deep sinus in the ventral or dental valve. It cannot be confounded with *Ter. praelonga*, which is a much more elongated or scuttle-shaped shell.

In England, *Ter. sella* abounds in the *Lower Green Sand* of Atherfield (Isle of Wight), at Reigate, Pluckley, Ashford, Sandgate, and Hythe; it is likewise (but rarely) found in the *Gault* of Maidstone, whence an undeniable example was obtained by Mr. Bowerbank; and it is probable that some individuals continued to exist in the lower beds of the *Upper Green Sand*, an opinion arrived at from the inspection of a few uncertain examples found at Warminster and Farringdon.

On the Continent, M. D'Orbigny mentions having found it in the Terrain Néocomien Supérieur and Aptien of Combles, Gargas, Renaud-du-Mont, aux Salles, Castellane, Marolles, &c.

Plate VII, fig. 4. A remarkably adult and characteristic example, from the Lower Green Sand of the Isle of Wight; British Museum.

„ fig. 5. From a bed of the same age, at Pluckley; in the Collection of Mr. Harris.

- Plate VII, fig. 6. From the Isle of Wight.  
 „ fig. 7. From Gault near Maidstone ; in Mr. Bowerbank's museum.  
 „ fig. 8. A specimen from the Isle of Wight, in the Geol. Society's Museum.  
 „ fig. 9. From the same locality, in the Collection of Mr. Morris.  
 „ fig. 10. A young shell ; Isle of Wight.

25. *TEREBRATULA TORNACENSIS*, Var. *RÆMERI*, *D'Archiac.* Plate VII, figs. 11—16, and Plate IX, figs. 1—8.

*TEREBRATULA TORNACENSIS*, *D'Archiac.* Mém. Soc. Géol. de France, vol. ii, 2d series, p. 318, pl. xviii, figs. 2—5, 1847.

- *RÆMERI*, *D'Archiac.* Ib., pl. xviii, fig. 6.
- *BOUEI*, *D'Archiac.* Ib., pl. xviii, fig. 7.
- *CRASSA*, *D'Archiac.* Ib., pl. xviii, fig. 8.
- *CRASSIFICATA*, *D'Archiac.* Ib., pl. xix, fig. 1.
- *RUSTICA*, *D'Archiac.* Ib., pl. xix, fig. 2.
- *BIPPLICATA*, *D'Orbigny* ? (not *Brocchi* nor *Sowerby*), Pal. Franç., Terrains Crétacés, vol. iv, pl. 511, figs. 9—15, 1847.
- *RÆMERI*, *Sharpe.* Quart. Journ. Geol. Soc., vol. x, p. 191, 1853.
- *KEYSERLINGII*, *Sharpe.* Ib.
- *REVOLUTA*, *Sharpe.* Ib. ?

*Diagnosis.* Shell variable in shape, somewhat pentagonal ; as long as or longer than wide ; valves almost equally convex or flattened. *Dorsal* valve more or less distinctly biplicated towards the front. *Ventral* valve with a mesial plait corresponding with the sinus of the opposite one. Beak produced, slightly incurved and truncated by a rather large circular foramen, partly edged by a deltidium of moderate dimensions ; beak ridges tolerably defined, with a flattened space between them and the hinge line ; lateral margins somewhat flexuous and bisinuated in front. External surface smooth, at times obscurely longitudinally striated and marked by numerous concentric lines of growth ; shell structure largely punctated. Loop short and simple, not exceeding a third of the length of the smaller valve. Dimensions very variable :

length 10,	width $8\frac{1}{2}$ ,	depth 5 lines.
„ 9,	„ 8,	„ 4 „
„ 8,	„ 8,	„ 3 „ &c.

*Obs.* The most common species in the Sponge Gravel or *Upper Green Sand* of Farringdon is that represented in Pl. VII, figs. 11—16, and Pl. IX, figs. 1—8, of the present Monograph ; it rarely exceeds 9 lines in length, with from 7 to 9 in breadth, is either elongated and moderately convex (Pl. VII, figs. 12, 13, 15, and Pl. IX, figs. 1, 2, 3, and 8), or as wide as long, and more or less compressed (Pl. VII, figs. 11, 13<sup>a</sup>, 14, and Pl. IX, figs. 4 to 7). These shells present every kind of variation, but they are connected by insensible passages, and unquestionably, in my opinion, belong to the same species.

The next point (and one which has given me, perhaps, more trouble than almost any other in this work) was the endeavour to find out to what species these shells really belonged, and it was not until after two excursions to Farringdon, and the minute examination of more than three hundred examples, collected in the same spot by Messrs. Sharpe, Lowe, Forbes, Waterhouse, Morris, myself, and others, that I at last determined to consider the shells above described as a *small race* or variety of *Terebratula Tornacensis*, D'Archiac; and, indeed, several of the forms found in that locality are only *dwarf races*; thus, *Terebratella Menardi* and *T. depressa*, Lamarck, have not there attained the full size of those species found in the *Upper Green Sand* of Mans (France), or the *Tourtia* of Belgium; and it appears evident that local conditions during the formation of the Farringdon deposits were unfavourable to the full development of many of the forms of Brachiopoda, and which is no doubt the true cause of the stunted growth observable in many of the species.

The next point to investigate is whether *T. Tornacensis* is the oldest denomination the species has received? and I am still uncertain if *Ter. phasiolina*, Lamarck<sup>1</sup> (published in 1819, but without figure), may not be a young state of Vicomte d'Archiac's species; but as doubts at present involve that question, we will give preference to the Vicomte's claims,<sup>2</sup> and endeavour to discuss the value of some of its probable synonyms.

M. D'Orbigny considers the following names to be synonyms or varieties of *Terebratula biplicata* (Brocchi):—*Ter. Tornacensis*, *Bouei*, *crassa*, *Robertoni*, *crassifcata*, *rustica*, *Boubei*, *Virleti*, *revoluta*, *sub-pectoralis*, *Keyserlingii*, and *Tchiatcheffii* (D'Archiac),<sup>3</sup> but I differ from the author of the *Palæontologie Française*, (as elsewhere stated<sup>4</sup>) in the following particulars. I am of opinion that *Ter. biplicata* (Brocchi) is the same shell as that of Sowerby, which M. D'Orbigny considers distinct; the last-named author considers *Ter. Tornacensis* equivalent to *T. biplicata* (Brocchi), and of *T. biplicata*, Sow., forms a new species, to which he has applied the name *T. Dutempleana*. We, therefore, both so far agree in the opinion that *perhaps* there may exist two species, but disagree as to which Brocchi's figure should belong. I admit with M. D'Orbigny that *Ter. Ræmeri*, *Bouei*, *crassa*, *crassifcata*, *rustica*, and perhaps *Ter. Murchisoni* and *Tchiatcheffii*, D'Archiac, may be only variations in age, &c., of *Ter. Tornacensis*; but I am not yet prepared to consider as such *Ter. Virleti* and *T. revoluta*, D'Archiac, and still less *Ter. Robertoni* and *T. sub-pectoralis* of the same author.

Mr. Sharpe and other palæontologists identify our Farringdon shell with *Ter. Ræmeri*; but after a lengthened examination, I was unable to find grounds of sufficient value for considering the last specifically different from *T. tornacensis*. It is true our British

<sup>1</sup> Animaux sans Vertèbres, vol. vi, No. 29, 1819.

<sup>2</sup> *Rapport sur les Fossiles du Tourtia*. Mém. Soc. Géol. de France, vol ii, 2d series, p. 316, &c., and plates xviii and xix, 1847.

<sup>3</sup> *Prodrome*, vol. ii, p. 172, 1850.

<sup>4</sup> See *Obs.* to our description of *Ter. biplicata*.

examples have not been hitherto obtained as large as the Belgian full-grown type, but this may be accounted for by the reasons already mentioned.

All our English examples of *T. biplicata* have the beak incurved, with the foramen close upon the umbo of the dorsal valve, so that the deltidium becomes inconspicuous and this seems likewise to have been the case with Brocchi's species, (if we are not misled by his figure),<sup>1</sup> while, on the contrary, in *T. tornacensis*, and in our Farringdon race, the deltidium is always more or less exposed, and the shell itself is also commonly wider in comparison to its length, than what we observe in the generality of our specimens of *T. biplicata*. Indeed, some of the Farringdon shells bear resemblance to some young examples of *Ter. maxillata*, Sow., so abundantly distributed in the Great Oolite of Hampton Cliff, near Bath. When quite young, *T. tornacensis* seems to be oval, with but a slight trace of biplication, in which condition it bears a great resemblance to many specimens of *T. biplicata* of a similar age. Viscount d'Archiac admits that his *Ter. Roemeri*, and *T. Bouei* may perhaps be only varieties of *T. tornacensis*; thus their close affinity had not escaped the scrutiny of that learned author.

The Sponge gravel of Farringdon is as yet our only British locality. On the Continent the species abounds in the *Tourtia* of Belgium, and in the *Upper Green Sand* of Mans, (France).

Plate VII, figs. 11 and 13. Wide examples from the *Upper Green Sand* of Farringdon, collection of Mr. Morris.

„ figs. 12 and 14. Other specimens, fig. 14 exhibiting a very thickened margin.

„ fig. 14\*. A malformation in the cabinet of Mr. Lowe, in which a very exceptional tendency to triplication may be observed. Malformations of this kind may likewise be seen, though very rarely in *T. biplicata* and *T. sella*, (Pl. VII, fig. 7.)

„ figs. 15 and 16. Elongated variety.

Plate IX, figs. 1 to 8. A series of specimens from the same locality, in the collection of Mr. Sharpe, figs. 4, 5, and 7, are referred by that author to *T. revoluta*, (d'Archiac), and fig. 8 to *T. Keyserlingii*, (d'Archiac),<sup>2</sup> fig. 3 bears also some resemblance to *Ter. Tchiatcheffii*.

<sup>1</sup> This observation had not escaped the notice of the celebrated author of the "*Progrès de la Géologie*," *Mém. Soc. Géol. de France*, vol. 2, 2d series, p. 317, 1847.

<sup>2</sup> These specimens were obligingly lent to me by Mr. Sharpe, with those names inscribed on his tablets.

26. *TEREBRATULA SULCIFERA*, (*Morris*). Plate VII, figs. 17—20.

*TEREBRATULA SULCIFERA*, *Morris and Dav.* Annals and Mag. of Nat. Hist., No. 133,  
vol. xx, p. 254, pl. xviii, fig. 7, 1847.

— — *D'Orbigny.* Prodrôme, vol. ii, p. 172, 1850.

— — A Catalogue of the Terebratulæ in the British Museum, p. 26,  
1853.

*Diagnosis.* Shell obovate, oval or somewhat pentagonal and ventricose; valves almost equally convex; beak short, thick rounded, moderately incurved, and truncated by a large circular foramen; deltidium partly concealed beneath the anterior portion of the aperture, which overlies, and nearly touches the umbo of the *dorsal* or socket valve; margins very sinuous, externally ornamented by numerous concentric ridges of growth, regularly disposed from the beak and umbo to the margin; loop short and simple, not exceeding a third of the length of the socket or dorsal valve. Dimensions variable. Length 22, width 16, depth 16 lines.

*Obs.* This species varies greatly in external aspect; some examples (figs. 17 and 18) are much inflated, while others (fig. 19) are more or less compressed, and somewhat triangular in shape; at times, the frontal line is almost straight, but in the generality of specimens this portion of the ventral valve indents the opposite one; the sulci are likewise more or less produced, and regular. It is readily distinguished from *Ter. semiglobosa*, by the large dimensions of its foramen, and from *T. obesa*, by its sulci, which are shorter and more inflated in appearance.

*Ter. sulcifera* occurs in the Lower Chalk of Cherry Hinton and Isleham, near Cambridge; at Hockwold, Norfolk, and in other localities.

Plate VII, fig. 17. A very large, and fine example, discovered by Mr. Bunbury, figured in the 'Annals and Mag. of Nat. Hist.,' as the type of the species.  
,, figs. 18, 19, and 20. Other specimens from the Lower Chalk of the neighbourhood of Cambridge, in the collection of Mr. Morris.

27. *TEREBRATULA SEMIGLOBOSA*, *Sowerby*. Plate VIII, figs 6—18.

*TEREBRATULA SEMIGLOBOSA*, *Sowerby.* Min. Con., vol. i. p. 48, tab. xv, fig. 9, 1813.

— *SUBUNDATA*, *Sowerby.* Ib., p. 47, pl. xv, fig. 7, 1813.

— *SUBROTUNDA* (part) *Sow.* Ib., tab. xv, figs. 1-2, 1813.

— *SUBUNDATA*, *W. Smith.* Strata identified by organised fossils, p. 10,  
Pl. iv, fig. 8, 1816.

— — *Lamarck.* An. sans Vert., vol. vi, p. 248, No. 13, 1819.

— *SEMIGLOBOSA*, *Lamarck.* Ib., p. 251, No. 27.

— — and *T. SUBUNDATA*, *Parkinson.* Trans. Geol. Soc., vol. v,  
1821.

— — *Mantell.* Geol. of Sussex, p. 209, 1822.

— — *Brong.* Env. de Paris, pl. ix, fig. 1, 1822.

— — *Fleming.* A Hist. of British Animals, vol. i. p. 369, 1828.

- TEREBRATULA SEMIGLOBOSA, *Schlotheim*. System Vers., No. 80, 1832.
- — *V. Buch*. Classification des Terebratules Mém. Soc. Géol. de France, vol. iii, p. 205, pl. xix, fig. 9, 1834.
- SUBUNDATA, *Deshayes*. Nouv. Ed. de Lamarck, vol. vii, p. 333, No. 13, 1836.
- SEMIGLOBOSA, *Hisinger*. Leth. Suec., p. 82, pl. xxiv, fig. 2.
- — *Bronn*. Leth Geog., pl. xxx, fig. 11, p. 657, 1837, and Index Pal., p. 1250, 1848.
- — *D'Orbigny*. Pal. Franç., Terrains Crétacés, vol. iv, p. 105, pl. 514, fig. 1—4, 1837, and Prodrome, vol. ii, p. 258.
- — *Brown*. Illustrations of Fossil Conch., pl. liv, fig. 45-46, 1838.
- — *Geinitz*. Char. Kreid., p. 16, 1839.
- — *Rœmer*. Die Vers. Nord. Kreid., p. 43, No. 42, 1840.
- ALBENSIS, *Leymerie*. Mém. Soc. Géol. de France, vol. iv, pp. 288, 289, 1841; ii, p. 29, tab. xv, figs. 2—4, 1842.
- SEMIGLOBOSA, *Leymerie*. Mém. Soc. Géol. de France, vol. v, 1842.
- — T. SUBROTUNDA, and T. SUBUNDATA, *Morris*. Catalogue, 1843.
- — *Reuss*. Bohem. Kreid., pl. xxvi, figs. 5—8, 1846.
- CARNEA, *Reuss*. Ib., pl. xxvi, figs. 9—11.
- BULLA, *J. de Sow*. in *Dixon*. Geol. and Fossils of the Tertiary and Cretaceous Formations of Sussex, p. 346, tab. xxvii, p. 11, 1850.
- SEMIGLOBOSA and T. ALBENSIS. A Catalogue of the Fossil Terebratulæ in the British Museum, p. 25, 1853.

*Diagnosis.* Shell variable in shape, inflated, circular, or elongated oval; *ventral* or dental valve, commonly the deepest, and uniformly gibbous; beak short, more or less incurved, and perforated by a small circular foramen, contiguous to the umbone of the opposite valve; deltidium in two pieces, commonly inconspicuous; beak ridges undefined; margins flexuous, straight, or bisinuated in front; the *dorsal* valve is uniformly convex or biplicated towards the frontal margin. External surface smooth, marked by concentric lines of growth; shell structure minutely punctate; loop short and simple, not exceeding a third of the length of the dorsal valve.

Dimensions very variable: length 21, width 18, depth 15 lines;

„ 11, „ 11, „ 9 „  
 „ 13, „ 11, „ 7 „  
 „ 16, „ 11, „ 11 „ &c.

*Obs.* In the first volume of the 'Mineral Conchology,' the names *Ter. subundata* and *T. semiglobosa*, were proposed for varieties of a single form; but most authors have preferred the last denomination on account of its having been applied to the adult and common condition in which the species is obtained. *T. subundata* is only a less convex or more depressed variety, and it appears likewise, probable, that *T. subrotunda* of the same author, may have been founded (at least in part) on a variety of *T. semiglobosa*; but



Sowerby is certainly in error while supposing that the same shell was common to the Chalk and Cornbrash. Baron V. Buch, and others, have likewise erroneously added to their synonyms of *T. semiglobosa*, the *T. intermedia* (Sow.), a Jurassic species, distinguished by shape and character.

Sowerby mentions that, in the true type of *T. semiglobosa*, the frontal margin is slightly "undulated with two risings" or plaits; but after inspecting a series of several hundred specimens from the Lower Chalk of Lewes, Chardstock, and other localities, it appeared evident that the front was at times almost straight or arched, without any defined biplication, and it was from shells presenting this last condition, that Mr. Leymerie founded his *T. albensis*.<sup>1</sup> *T. semiglobosa* is also distinguished from *T. carnea* (Sow.), this last being a much more depressed shell, with a uniform straight margin, a character observable only in young examples of the species under consideration. And it may be worthy of notice, that we rarely find both forms associated in the same bed or locality; where the one abounds the other seems wanting: thus, in the Upper Chalk of Norwich, Brighton, Meudon, &c., where *T. carnea* is common, *T. semiglobosa* is absent; while the inverse takes place in the Lower Chalk of Lewes, Gravesend, Chardstock, &c.

*Ter. bulla*, Sow., figured in pl. xxxii, of Dixon's work, is also only an unusually large and more elongated form of *T. semiglobosa*, possessing no other valid distinguishing feature.

The vertical range of this species appears to be greater than that of *Ter. carnea*; we first find it in the *Red Chalk* of Hunstanton, believed by some geologists to represent the age of the Gault: it abounds in the *Chalk Marl* and *Lower Chalk* of Lewes, Charing, Gravesend, Tytherleigh, Chardstock, and other localities. On the Continent, it is very common near Rouen, in the Dep. de l'Aube, &c.

Plate VIII, fig. 6. *Ter. semiglobosa*, from the Lower Chalk of the neighbourhood of Lewes (Sussex).

- |   |          |   |   |
|---|----------|---|---|
| „ | fig. 7.  | „ | from Gravesend.   |
| „ | fig. 8.  | „ | a remarkable variety, from Lewisham (Kent).   |
| „ | fig. 9.  | „ | Sowerby's original figure of <i>T. subrotunda</i> ; specimens very similar to this may be collected near Lewes. |
| „ | fig. 10. | „ | A large example from Lewes, in the collection of Mr. Catt.  |
| „ | fig. 11. | „ | another specimen ( <i>T. bulla</i> , Sow.), in the collection of Mr. Wetherell.                                 |
| „ | fig. 12. | „ | a specimen from the Chalk of Grays, in the cabinet of Mr. Morris.   |

<sup>1</sup> *Ter. albensis* is supposed by Prof. Bronn and M. D'Orbigny to be a variety of *T. obesa*, but the proportions of the foramen in the two forms is so different, as hardly to warrant such a conclusion.

- Plate VIII, fig. 13. *Ter. semiglobosa*, from the Lower Chalk of Charing (Kent), in the collection of Mr. Harris.
- „ fig. 14. „ a very elongated specimen, probably a malformation, from the Chalk of Gravesend, in the collection of Mr. Bowerbank.
- „ fig. 15. „ a specimen from Glyndebourn, near Lewes, (*T. albensis*, Leymerie).
- „ fig. 16. „ from the Lower Chalk of Charing, in the collection of Mr. Harris.
- „ fig. 17. „ from the Red Chalk of Hunstanton (*T. subundata*, Sow.), collection of Mr. Morris.
- „ fig. 18. „ a specimen from the Chalk, with quartz grains, Evershot (Dorsetshire), in the collection of Mr. Morris.

28. TEREBRATULA CARNEA, *Sowerby*. Plate VIII, figs. 1—4.

- TEREBRATULA CARNEA, *Sowerby*. Min. Con., vol. i, p. 47, tab. xv, figs. 5, 6, 1812.
- — *Lamarck*. An. sans Vert., vol. vi, p. 248, No. 14, 1819.
- — *Brongniart*. Desc. Géol. des Environs de Paris, pl. iv, fig. 7, 1822.
- — *Parkinson*. An Introd. to the Study of Organic Remains, p. 234, 1822.
- ELONGATA, *Sow*. Min. Con., vol. v, p. 49, tab. 435, figs. 1 & 2, 1825.
- OVATA, *Nilsson*. Petref. Suec., p. 34, pl. iv, fig. 3, 1827 (not *T. ovata*, *Sow*.).
- LENS, ? *Nilsson*. Ib., p. 35, pl. iv, fig. 6.
- CARNEA, *DeFrance*. Dic. d'Hist. Nat., vol. 53, 1828.
- — *Fleming*. A Hist. of British Animals, p. 369, 1828.
- — *Deshayes*. Encycl. Method., iii, p. 1028, No. 20, 1828.
- — and T. ELONGATA, *Woodward*. A Synoptical Table of Organic Remains, p. 21, 1830.
- — *Schlotheim*. Syst. Vers., No. 64, 1832.
- — *Mantell*. Geol. of the South-east of England, p. 127, 1833.
- — *Von Buch*. Classification et Descriptions des Terebratules, Mém. Soc. Géol. de France, vol. iii, p. 203, pl. xix, fig. 2, 1834.
- — *Bronn*. Leth. Geog., pl. xxx, fig. 13, p. 654, 1837.
- — *Pusch*. Polens Pal., p. 18, t. iii, fig. 12, 1837.
- SUBROTUNDA, *D'Orbigny*. Pal. Franç., Ter. Crétacés, vol. iv, 1837 (not *Sowerby*).
- OVATA, *Hisinger*. Leth. Suec., p. 82, pl. xxiv, fig. 3, 1837 (not *T. ovata*, *Sow*.).
- CARNEA, *Brown*. Illustrations of Fossil Conch. of Great Britain, pl. liv, figs. 30—33, 1838.

- TEREBRATULA CARNEA, *Geinitz*. Char. Kreid., p. 16, 1839.  
 — — *Ræmer*. Die Vers. Nord. Kreid., 1840 (but not all his  
 Synonymes).  
 — OVATA, *Ræmer*. Ib. (but not *T. ovata*, Sow.).  
 — CARNEA, *Morris*. Catalogue, 1843.  
 — — *D'Orbigny*. Russia and Oural, vol. ii, p. 494, pl. xliii, figs. 21  
 —25, 1845.  
 — — *Reuss*. Bohem. Kreid., p. 50, No. 14, tab. xxvi, figs. 10, 11,  
 1846 (but not all his Synonymes).  
 — — *D'Orbigny*. Pal. Franç., Ter. Crétacés, vol. iv, p. 103, pl. 515,  
 figs. 5—8, 1847, and Prodrôme, vol. ii, p. 258.  
 — — *Bronn* (part). Index Pal., vol. ii, p. 1232, 1848 (but not all  
 his Synonymes).  
 — — *Alth.* Geol. Lemberg (in Haidinger's Abhandl.), p. 258,  
 tab. xiii, fig. 8, 1850.  
 — — *Quenstedt*. Handb. de Petref., p. 473, tab. xxxviii, figs. 3, 4,  
 1851.  
 — — A Catalogue of the Terebratulæ in the British Museum, p. 21,  
 1853.

*Diagnosis.* Shell ovate, circular, elongated oval, or obtusely five sided, with somewhat depressed and almost equally convex valves; beak short, more or less incurved, and perforated by a small circular foramen, partly surrounded, and separated from the hinge line by a wide concave triangular deltidium, transversely wrinkled; margin nearly straight all round. Surface smooth, marked only by a few concentric lines of growth. Shell structure minutely punctated. Colour of a light or dull red. In the interior of the smaller or dorsal valve, the cardinal process is more or less produced; the loop short and simple, rarely exceeding a fourth of the length of the socket valve.

Dimensions very variable: length 17, width  $15\frac{1}{2}$ , depth 10 lines;

„ 17, „ 12 „ 9 „  
 „ 20, „ 19 „ 11 „ &c.

*Obs.* This well-known shell was first described and figured by Sowerby, under the name of *T. carnea*, on account of the fleshy red tinge presented by many specimens; and which is no doubt remains of the original colour, which was in all probability similar to that still observable in several recent Terebratulæ, such as *T. lenticularis* so abundantly found in the deep sea of Fauveau Straits, New Zealand. *T. carnea* varies more or less in external shape; to the lengthened example, Sowerby applied the name *T. elongata*.

Several Palæontologists, among whom we may mention M. D'Orbigny, have placed the so-termed *T. subrotunda* of Sowerby ('Min. Con.,' tab. xv, figs. 1 and 2), among the synonymes of *T. carnea*, but it is doubtful whether this determination be correct; the figure in the 'Min. Con.' represents a circular Terebratula bearing external resemblance to some varieties of *T. carnea*, but, as the locality and bed mentioned is "the hardest chalk about Hornisham, in Wiltshire," it seems probable that the illustration was not taken

from a specimen of *T. carnea*, but from a flattened variety of *T. semiglobosa*; and the author has rendered his species the more problematical, by adding, that his friend Mr. Meade had sent him specimens from the Cornbrash,  $1\frac{1}{4}$  inch in length! Dr. Mantell refers to *T. subrotunda*, Sow., a shell from Hamsey and Eastbourn (Sussex),<sup>1</sup> but Messrs. Waterhouse and Woodward, who have seen the original, have pronounced it to be simply a depressed young individual of *T. subundata* or *T. semiglobosa*, and agreeing with Sowerby's type. I may add, that I likewise possess specimens of *T. semiglobosa*, from Glyndebourn, near Lewes, quite as circular and depressed as the figure of *T. subrotunda* in the 'Min. Con.'

Some authors<sup>2</sup> have likewise erroneously described *T. ovata* (Sow.) as a synonyme of *T. carnea*, a mistake principally referable to Dr. Mantell,<sup>3</sup> who does not appear to have been acquainted with Sowerby's type, which was stated to occur at Chute, near Heytesbury, in Wiltshire, an Upper Green Sand locality, where no true specimen of *T. carnea* has been discovered.

The great resemblance *T. carnea* bears to some examples of the recent *T. vitrea*, did not escape the observation of the late Baron Von Buch;<sup>4</sup> but I am disposed to coincide with M. D'Orbigny, in the belief, that they are specifically distinct. *T. vitrea* never presents the colour with which we believe *T. carnea* was tinted.

The foramen in some examples is so small as hardly to afford space for the passage of a hair; but in the generality of individuals the aperture, although always small, is far from presenting such minute proportions.

In the neighbourhood of Norwich, a great number of internal siliceous or flint casts of this species have been collected by Mr. Fitch, on which the muscular and other impressions are beautifully represented.

Sowerby mentions that he found *Ter. carnea* in the soft Chalk of Towse, near Norwich, and from that locality many beautiful examples have been procured by Messrs. Fitch, Woodward, Image, and others; it likewise occurs at Trimmingham, Brighton, in Ireland, and in many other Chalk localities. On the Continent, it is very common in similar deposits at Meudon, near Paris; Halden, Westphalia, in Russia, &c.; but seems to be very rare in Lower Chalk beds and localities characterised by *T. semiglobosa*.

Plate VIII, fig. 1. A typical specimen of *T. carnea* from the Chalk of Trimmingham.

„ fig. 2. Interior of the larger or ventral valve.

„ fig. 2<sup>a</sup>. Interior of the smaller or dorsal valve, with the loop.

<sup>1</sup> Geol. of Sussex, p. 130.

<sup>2</sup> Among these, we may mention M. D'Orbigny (see 'Pal. Franç., Terrains Crétacés,' vol. iv, p. 103, 1847).—Dr. Bronn ('Index Pal.,' vol. ii, p. 1232).—See also Nilsson and Hisinger.

<sup>3</sup> Geology of Sussex, 1822.

<sup>4</sup> Mémoires de la Soc. Géol. de France, vol. iii, p. 204.

- Plate VIII, fig. 3. A lengthened variety, *T. elongata*, Sow., from the Chalk of Norwich, in the cabinet of Mr. Fitch.
- „ fig. 4. A large circular variety from the same locality, in the collection of the Rev. T. Image.
- „ fig. 5. Another example from the same locality.

29. *TEREBRATULA DEPRESSA*, Lamarck. Plate IX, figs. 9—24.

- TEREBRATULA DEPRESSA*, Lamarck. Hist. des An. sans Vert., vol. vi, p. 249, 1819,<sup>1</sup> and Dar. Notes on an examination of Lamarck's species of Fossil Terebratula, Annals and Mag. of Nat. Hist., vol. v, 2d ser., pl. xiii, fig. 15, 1850.
- *OVALIS*, Morris. Quart. Journal Geol. Soc., Nov., 1846 (not *T. ovalis*, Lamarck).
- *NERVIENSIS*, D'Archiac. Mém. Soc. Géol. de France, vol. ii, 2d ser., p. 313, pl. xvii, figs. 2—10, 1847.
- *VIQUESNELI*, D'Archiac. Ib., p. 316, pl. xviii, fig. 1.
- *DEPRESSA*, Bronn. (part). Index Pal., vol. ii, p. 1234, 1848.
- — *D'Orbigny*. Prodrome, vol. ii, p. 172, 1850.
- — *Sharpe*. Quart. Journ. of the Geol. Soc., vol. x, p. 191, 1853.

*Diagnosis.* Shell depressed, oblong oval, tapering at the beak; valves almost equally deep, externally smooth, and marked by a few concentric lines of growth. *Dorsal* or socket valve either regularly convex or interrupted by a mesial fold of moderate elevation; *ventral* valve with, or without, a shallow longitudinal depression; beak nearly straight, more or less produced, and truncated by a large circular foramen, partly margined by a wide deltidium, in one piece; beak ridges undefined, lateral margins moderately flexuous, frontal edge of the ventral valve indenting to a greater or lesser extent than that of the dorsal one. Loop short and simple, not exceeding a third of the length of the smaller or dorsal valve.

Dimensions variable: length 22, width 17, depth 14 lines;

„ 20, „ 20, „ 11 „

*Obs.* This Terebratula is one of our largest Cretaceous forms, varying very considerably in shape and comparative dimensions. When quite young it is much depressed, with the margins straight all round; but with age, the valves either continue to remain regularly convex without any defined mesial fold, or with one of moderate elevation. The beak is also more or less produced, and at times much elongated, with a large deltidium bearing resemblance to that peculiar to *Ter. longirostris* of Wahlenberg; but the Lamarckian species seems separable by its greater width, and by the almost total absence

<sup>1</sup> “*T. testa oblonga transversim dilatata, supra coarctata et obtusa, striis concentricis laevibus; nate producta non incurva: foramine magno.*”

of the longitudinal depression or biplication so strongly marked in adult examples of the Swedish type.

In Belgium, *T. depressa* is perfectly characterised, and abounds in the *Tourtia* of Tournay, Montignies-sur-Roc, and Gussignies, whence Lamarck obtained his specimens;<sup>1</sup> but in England, we are at present only acquainted with the single locality of Farringdon, where the race does not seem to have attained the large dimensions of the Belgian type. Our British examples are commonly shorter, and more stunted in their growth, and the mesial fold is at times more produced than in the generality of Belgian individuals.

*T. depressa* does not seem to have been yet discovered in France, no mention of it being made in the 'Palæontologie Francaise.'

In 1847, Viscount d'Archiac believed the species new, and named it *Terebratula nerviensis*.<sup>2</sup> In 1846, the same shell was mistaken by Mr. Morris, for *T. ovalis* (Lamarck), which last belongs to the Jurassic epoch, and is specifically distinct.<sup>3</sup> And in 1848 Professor Bronu considered *T. longirostris* to be a synonym of the Lamarckian *T. depressa*; an opinion in which I am unable to concur.

Many varieties might be noticed, but from these passing one into the other they do not in my opinion require distinguishing denominations. *Ter. Viquesneli*, D'Archiac, is one of them, it is found likewise at Farringdon, but appears to be simply a young state of the Lamarckian species.

Plate IX, fig. 9. One of the largest examples hitherto discovered in the Upper Green Sand of Farringdon. The valves are commonly found detached.

- „ fig. 10. A ventral valve, from the collection of Mr. Sharpe.
- „ fig. 11. A specimen drawn from two separate valves, in the collection of Mr. Sharpe.
- „ figs. 12—21. Different examples, ages, and varieties, of *T. depressa*; figs. 14 and 17 from the collection of Mr. Lowe; figs. 18 to 21, from that of Mr. Sharpe.
- „ figs. 22—23. A young specimen of *T. Viquesneli*, D'Archiac, from Farringdon, in the collection of Mr. Sharpe.
- „ fig. 24. A copy of the Belgian figure of *T. Viquesneli*, published by Viscount d'Archiac, for the sake of comparison.

<sup>1</sup> The original specimens are now in Baron Delessert's collection, and were figured by myself in the 'Annals' for 1850.

<sup>2</sup> This species was admirably described and figured by the distinguished French author in his "*Rapport sur les Fossiles du Tourtia*," 'Geol. Trans. France,' 1847.

<sup>3</sup> *Ter. Repeliniana*, D'Orb. ('Prodrôme,' vol. ii, p. 25, 1850), from the White *Coral Rag*, near Vurey (Isère), &c., bears more resemblance to *Ter. depressa* (Lamarck), than any other *Terebratula* with which I am acquainted.

30. *TEREBRATULA CARTERI*, *Dav.* Pl. VII, fig. 3.

*Diagnosis.* Shell elongated oval, or unequally five sided, and somewhat compressed; *ventral* valve deeper than the dorsal one, with a shallow longitudinal sinus corresponding with a mesial fold of moderate elevation; beak short, slightly incurved, and truncated by a foramen of moderate dimensions; deltidium almost inconspicuous. Surface smooth, marked by a few concentric lines of growth. Lateral margins slightly flexuous, with the ventral frontal edge indenting that of the dorsal valve. Loop unknown, but in all probability short and simple. Length 20, width 15, depth 10 lines.

*Obs.* I obtained this shell some years ago from the Gray Chalk, near Dover, and have been unable to identify it with any of the other British Cretaceous forms that have come under my observation, it bears much of the outward aspect of some Jurassic *Terebratulæ*, although perfectly identical with none of those with which I have compared it. I therefore take great pleasure in naming it after Mr. Carter, who has afforded such valuable assistance in the working out of the Cambridge *Upper Green Sand* species.

Plate VII, fig. 3. *Ter. Carteri*, from the Gray Chalk in the vicinity of Dover.

31. *TEREBRATULA ROBERTONI*, *D'Archiac.* Plate IX, fig. 25.

*TEREBRATULA ROBERTONI*, *D'Archiac*, Mém. Soc. Géol. de France, vol. ii, 2d series, p. 315, pl. xviii, fig. 2, 1847.

— — *Sharpe*, Quart. Journ. of the Geol. Soc., vol. x, p. 192, 1853.

*Diagnosis.* Shell of an elongated oval shape; valves regularly convex, the ventral one rather the deepest; surface smooth, marked by concentric lines of growth; beak moderately produced, incurved and truncated by a large circular foramen, partly margined by a short deltidium; *ventral* valve somewhat keeled; beak ridges undefined, lateral margins flexuous; the frontal edge of the ventral valve slightly indenting the opposite one. Loop unknown, probably short and simple. Length 11, width 8, depth  $5\frac{1}{2}$  lines.

*Obs.* Viscount D'Archiac states<sup>1</sup> that *Ter. Robertoni* differs from *T. depressa*, Lamarck (his *T. nerviensis*), by its more regularly rhomboidal form, unequal depth of the valves, almost entire absence of sinuosity in front, and above all by the inflated extremity of its prominent and incurved beak. M. D'Orbigny appears to consider *T. Robertoni* as a simple synonyme of *T. buplicata*;<sup>2</sup> but this appears far from being the case, since it does not present any trace of biplication, a character always more or less visible in Brocchi's species, and it differs likewise in external shape. *T. Robertoni* was found in the Sponge Gravel of the Upper Green Sand of Farringdon, by Mr. Lowe, it agrees exactly both in

<sup>1</sup> 'Rapport sur les Fossiles du Tourtia, p. 315.

<sup>2</sup> 'Prodrome,' vol. ii, p. 172.

shape and dimensions, with the type figured by Viscount D'Archiac, from the Tourtia near Tournay (Belgium). The same French author states to have likewise collected the species in a bed of *Upper Green Sand*, above the *Gault*, near Wissant (Pas-de-Calais), France.

Plate IX, fig. 25. *Ter. Robertsoni*, from Farringdon, in the collection of Mr. Lowe.

32. WALDHEIMEA (TEREBRATULA) CELTICA, *Morris*. Plate IX, figs. 32—35.

TEREBRATULA LONGA, *Rœmer*. Verst. Nordd. Ool., p. 50, pl. ii, fig. 11, 1836; Kreid., p. 44, No. 50, 1840. (Not *T. longa*, Zieten, 1832.)

— — *Morris*. Annals Nat. Hist., vol. xx, p. 255, pl. xix, fig. 1, 1847.

— FABA, *D'Orbigny*. Pal. Franç., Ter. Crétacés, vol. iv, p. 77, pl. xiv, figs. 10. (Not *T. faba*, Sow., Trans. Geol. Soc., vol. iv, p. 14, fig. 10, 1836.)

WALDHEIMEA CELTICA, *Morris*. MS. Catalogue of the Terebratulæ in the British Museum, p. 62, 1853.

*Diagnosis*. Shell oblong, elongated oval, ventricose posteriorly, becoming rather attenuated anteriorly, and subtruncate; valves nearly equally convex, ventral valve somewhat keeled; beak slightly produced, and obliquely truncated by a foramen of moderate dimensions, partly surrounded and separated from the hinge line by a small deltidium in two pieces; beak ridges more or less defined; *dorsal valve* most inflated near the umbo; margins even; surface smooth, marked only by a few concentric lines of growth. Loop elongated, reaching to near the frontal margin before becoming reflected. Shell structure punctated. Length 17, breadth 10, depth 8 lines.

*Obs*. This form was described and figured by Rœmer, in 1836, under the name of *T. longa*,<sup>1</sup> but Zieten had already made use of the same denomination to designate a Jurassic Terebratula from Donsdorf.<sup>2</sup>

In 1847, the species under notice, was discovered by Dr. Fitton and Mr. Morris, in hard ferruginous nodules of the Lower Green Sand at Horseledge and Yellowledge, near Shanklin Bay (Isle of Wight), and published under Rœmer's denomination; but Mr. Morris having subsequently found that the shell differed specifically from the Jurassic type, has proposed for it the name of *Ter. Celtica*.

M. D'Orbigny commits another mistake, while considering *T. longa* (Rœmer) the same as *T. faba* of Sowerby; but the author of the 'Palæontologie Française' was not probably aware that the so-termed *T. faba* (Sow.) is itself only a variety or dwarf example of the well-known *T. biplicata* (Brocchi), from the Upper Green Sand of

<sup>1</sup> Rœmer appears to have figured and described in his 'Die Verst. der Nord. Oolithen Gebirges,' 1836, a series of Fossils belonging to the Hils Conglomerate, but which he considered at that epoch, as Jurassic, among these, we find his *T. longa*. The author has subsequently corrected this mistake in his monograph of the Chalk of that country.

<sup>2</sup> 'Die Verst Wurtembergs, pl. xxxix, fig. 7.



Warminster, and therefore not only specifically and stratigraphically distinct from Røemer's *T. longa*, but belonging to a different section of the great genus *Terebratula*.

*T. Celtica* appears easily to be distinguished from other Cretaceous species by its peculiar elongated shape.

Røemer's specimens are said to be from the Hilsthorn of Elligser Brinkes.

Plate IX, figs. 32—34. Examples from the Lower Green Sand, near Shanklin Bay, Isle of Wight, in the collection of Mr. Morris; several fine specimens have also been collected in the same locality by Mr. S. Saxby, of Bonchurch.

33 WALDHEIMEA (TEREBRATULA) TAMARINDUS, *Sowerby*. Plate IX, figs. 26—31.

TEREBRATULA TAMARINDUS, *Sowerby*. Trans. of the Geol. Soc., vol. iv, p. 338, pl. xiv, fig. 8, 1836.

— — — *Morris*. Catalogue, 1843.

— SUBTRILOBATA, *Leymerie*. Mém. Soc. Géol. de France, vol. v, p. 12, pl. xv, figs. 7, 9.

— TAMARINDUS, *Bronn*. Index Pal., p. 1253, 1848.

— — — *D'Orbigny*. Pal. Franç., Terrains Crétacés, vol. iv, p. 72, pl. 505, figs. 1—10, 1847: Prodrome, vol. ii, p. 85, 1850.

WALDHEIMEA TAMARINDUS. A Catalogue of the Fossil Terebratulæ in the British Museum, p. 62, 1853.

TEREBRATULA TAMARINDUS, *Sharpe*. Quart. Journ. Geol. Soc., vol. x, p. 191, 1853.

*Diagnosis.* Shell very variable in shape, nearly orbicular, oval or obtusely five-sided; surface smooth, marked by a few concentric lines of growth. Valves almost equally convex, without either sinus or mesial fold; the *ventral* or perforated valve is generally the deepest; margin very obtuse and slightly flexuous, forming a small convex curve in front; beak moderately incurved, and truncated by a circular foramen, partly surrounded, and slightly separated from the hinge line by a deltidium in two pieces; beak ridges incurved, so as to approach the hinge margin. Loop elongated, reaching to near the frontal margin before becoming reflected. Shell structure largely punctated. Length 7, width 6, depth 4 lines.

*Obs.* The dimensions of *Ter. tamarindus* do not appear to have ever greatly exceeded seven lines in length. It occurs in the *Lower Green Sand* of the Isle of Wight; *Kentish Rag*, near Sandgate, and in the *Upper Green Sand* of Farringdon. On the Continent, it is mentioned, as occurring in the *Lower Nécomien* of Auxerre (Yonne), Bettancourt-la-Ferrée, at Wassy, Saint-Dizier, &c. It was also discovered by M. De Verneuil, in Spain. The margin is often considerably thickened. It is a rare British Cretaceous Fossil.

Plate IX, fig. 26. A specimen from the *Kentish Rag*, near Sandgate.

- Plate IX, figs. 27 and 28. Two examples from the *Upper Green Sand* of Farringdon, in the collection of Mr. Sharpe; this shell is one of the rarest in the locality.
- „ figs. 29 and 30. Two specimens from the *Lower Green Sand* of the Isle of Wight, from the collection of Mr. Morris.
- „ fig. 31. A pentagonal specimen, with a very thickened edge, Isle of Wight.

*Genus*—RHYNCHONELLA, *Fischer*, 1809.

*Obs.* This genus having been described in p. 93 of the “Introduction,” and in Part III, p. 65, it will not be necessary to repeat those details in the present Monograph.

The most active researches among the British Cretaceous *Rhynchonellæ* have not brought to light a single unpublished species, and so numerous are the varieties and passages from one form into another, that it is often almost impossible to draw up a diagnosis embodying the character of every variety. We have admitted the following fourteen species, as well as some few named varieties:—

{ { { { { { { { { { { {	1. RYNCHONELLA PLICATILIS, <i>Sow.</i>		9. RYNCHONELLA SULCATA, <i>Parkinson.</i>
	— var. OCTOPLICATA, <i>Sow.</i>		10. — MANTELLIANA, <i>Sow.</i>
	— var. WOODWARDII, <i>Dav.</i>		11. — CUVIERI, <i>D'Orb.</i>
	2. ? — LIMBATA, <i>Schloth.</i>		12. — MARTINI, <i>Mantell.</i>
	3. — COMPRESSA, <i>Lam.</i>		13. — GRASIANA, <i>D'Orb.</i>
	4. — LATISSIMA (LATA), <i>Sow.</i>		14. — LIMBATA, <i>Phillips.</i>
	5. — GIBBSIANA, <i>Sow.</i>		
	6. — PARVIROSTRIS, <i>Sow.</i>		
	7. — DEPRESSA, <i>Sow.</i>		
	— var. A.		
	— var. B.		
	8. — NUCIFORMIS, <i>Sow.</i>		

Some Palæontologists may, perhaps, consider *R. limbata*, Schl. (= *sub-plicata*, of Mantell) as only a variety of *R. plicatilis*, and it may be still a question whether *R. Grasiana* is more than the adult condition of *R. Martini*, Mantell. Mr. S. P. Woodward considers *R. octoplicata* as specifically distinct from *R. plicatilis*, and Mr. Sharpe admits *R. triangularis*, Wahl., among our British species.

34. RHYNCHONELLA PLICATILIS, *Sow.*, Sp. Plate X, figs. 37—42.

- var. OCTOPLICATA, *Sow.* Plate X, fig. 1—17.  
 var. WOODWARDII, *Dav.* Plate X, figs. 43—46.

- TEREBRATULA PLICATILIS, *Sowerby.* Min. Con., vol. ii, tab. 118, fig. 1, 1816.  
 — OCTOPLICATA, *Sowerby.* Ib., fig. 2, 1816.

## BRITISH CRETACEOUS BRACHIOPODA.

- TEREBRATULA PLICATILIS**, *Mantell*. Fossils of the South Downs, p. 210, 1822.
- **OCTOPLICATA**, *Brongniart*. Desc. Géol. des Environs de Paris, pl. 4, fig. 8, 1822.
- — and **PLICATILIS**, *Parkinson*. An Introduction to the Study of Organic Remains, p. 234, 1822.
- — *Dalman*. Vet. Acad. Handl., p. 53, 1827.
- **PLICATILIS**, *DeFrance*. Dic. Sc. Nat., vol. liii, p. 159, 1828.
- **OCTOPLICATA**, *Fleming*. A Hist. of British Animals, vol. i, p. 372, 1828.
- **PLICATILIS** and **T. OCTOPLICATA**, *Woodward*. A Syn. Table of Org. Remains, pp. 21 and 22, 1830.
- — *Deshayes*. Coq. Caractéristiques, p. 114, pl. ix, figs. 3, 4, 1831.
- — *Deshayes*. Ency. Meth., iii, p. 1026, No. 11, 1832.
- **OCTOPLICATA** and **T. PLICATILIS**, *Schlotheim*. Syst. Vers. Petref., 1832.
- — — *Mantell*. Geol. of the S. E. of England, p. 127, 1833.
- — *V. Buch*. Class. des Térébratules, 1834; and Mém. Soc. Géol. France, vol. iii, p. 147, pl. xv, figs. 18—24.
- **PLICATILIS**, *V. Buch*. (part). Ib., 1834; and ib., vol. iii, p. 153, tab. xv, fig. 24, 1838.
- — and **T. OCTOPLICATA**, *Deshayes*. Nouv. Ed. de Lamarck, vol. vii, p. 356—7, 1836.
- **OCTOPLICATA**, *Hisinger*. Leth. Suec., p. 79, pl. xxii, fig. 12, 1837.
- — *D'Archiac*. Mém. Soc. Géol. de France, vol. iii, p. 295, 1839.
- **PLICATILIS**, *Geinitz*. Charact. Petref. Kreid., p. 14, 1839.
- **OCTOPLICATA**, *Bronn*. Leth. Geog., pl. xxx, fig. 9, 1837.
- **PLICATILIS** and **T. OCTOPLICATA**, *Rœmer*. Die Vers. Nord. Kreid., p. 38, fig. 9, 1840.]
- **OCTOPLICATA**, *Geinitz*. Charat. Kreid., pl. xvi, fig. 16, 1840.
- **PLICATILIS** and **T. OCTOPLICATA**, *De Hagenow*. N. Jahrb. F. Mineral., 1842.
- — *Morris*. Catalogue, 1843.
- — *Geinitz*. Grundriss. die Vers., pl. xxi, fig. 3, 1844.
- — and **T. OCTOPLICATA**, *Reuss*. Bohem. Kreid., p. xxv, figs. 10—16, 1846.
- **OCTOPLICATA**, *D'Orbigny*. Russia and the Oural, vol. ii, p. 492, pl. xliii, figs. 15—17, 1845.
- RHYNCHONELLA PLICATILIS**, *D'Orbigny*. Pal. Franç., Ter. Crétacés, vol. iv, pl. 499, figs. 9—12; and Prodrôme, vol. ii, p. 257, 1850.
- TEREBRATULA OCTOPLICATA** and **T. PLICATILIS**, *Tennant*. A Strat. List. of Brit. Org. Remains, p. 47, 1847.
- — *Dixon*. Geol. of the Fossils of the Tertiary and Cretaceous Formation, pl. xxvii, fig. 16, 1850.
- **PLICATILIS**, *Kner*. Natur. Abhand., tab. v, figs. 5, 6, 1850.
- **OCTOPLICATA**, *Alth*. Ib., p. 255, 1850.

*Diagnosis.* Shell transversely oval, with its greatest width towards the centre; *ventral*

or *dental* valve less inflated than the opposite one, with a shallow sinus; beak short, acute, and moderately incurved; foramen small, almost contiguous to the umbo, and entirely surrounded by the deltidium and its tubular expansions; beak ridges well defined, leaving a flattened space or false area between them and the hinge line. *Dorsal* or *socket* valve, generally more gibbose than the opposite one, its uniform convexity being interrupted from about the middle of the valve to the front, by a widely slightly produced mesial fold. The hinge line of the ventral valve indents the lateral portions of the umbo; margins flexuous on approaching the front, become sharply bent at almost right angles, indenting to a considerable extent the frontal edge of the dorsal valve. Externally, each valve is ornamented by from fifty to sixty plaits; these commonly, on approaching their terminations, become flattened, and, as if divided by a narrow longitudinal split or depression. In the interior of the dorsal valve, two curved processes exist for the support of the spirally coiled extensile arms. Shell structure impunctate.<sup>1</sup>

Dimensions variable: length 12, width 15, depth 9 lines.

„ 11, „ 12, „ 12 „

*Var. OCTOPLICATA, Sow.* Plate X, figs. 1—17.

This variety agrees in general character with *R. plicatilis* (type), but differs more often by its plaits, which, on approximating, the front and lateral margins unite two by two, forming fewer and larger costæ; these last are also commonly acute, and not flattened or split, as is very often the case in the typical specimens of *R. plicatilis*.

*Var. WOODWARDII, Dav.* Pl. X, figs. 43—46.

TEREBRATULA GALLINA, *Woodward*. An Outline of the Geol. of Norfolk, tab. iv, fig. 12, 1833.

*Diagnosis.* Shell transversely oval: valves moderately convex, with a shallow sinus in the ventral, and slightly produced mesial fold in the opposite one. Externally each valve is ornamented by from 24 to 44 simple plaits, often split close to the margin; length 9, width 10 to 12, depth 6 to 7 lines.

*Obs.* It was justly observed by the author of the ‘Pal. Française,’<sup>2</sup> that Sowerby’s

<sup>1</sup> Dr. Carpenter has described and figured the remarkable shell structure observable in this species, in his very valuable memoir “On the Microscopic Structure of Shells.” (‘British Association’ for 1844, pl. xiv.) See also the “Introduction” to this work, pl. v, fig. 6.

<sup>2</sup> ‘Terrains Crétacés,’ vol. iv, p. 58, 1847; but prior to M. D’Orbigny, Dr. Mantell had stated 1822, that *R. octoplicata* was only a var. of *R. plicatilis*, “the specimens in my possession vary so much in the number of plica, and the convexity of the valves, and the characters of each are so equally blended, in many examples, that I have been obliged to consider them as only a variety of the same species (Fossils of the South Downs). Mr. Morris and Dr. Bronn have likewise arrived at similar conclusions, but we cannot admit all the synonyms mentioned by the learned German author, viz., *T. latissima*, *parvirostris*, *Martini*, and *nuciformis*.” Geinitz likewise looks upon *R. octoplicata*, as a var. of *R. plicatilis*, but erroneously adds *T. pisum*, Sow. and *T. Mantelliana*, Sow., two well-distinguished species.

descriptions and figures of *Ter. plicatilis* and *T. octoplicata* are so entirely similar, that no one is able to perceive in them distinguishing features. *R. plicatilis* varies to a considerable extent, as do all Brachiopoda, and it is not unusual to meet perfectly adult individuals of various dimensions as well as convexity, due, no doubt, to more or less favorable conditions of existence. After much examination I entertained a similar opinion to that already expressed by several Palæontologists, viz., that those examples in which, at a certain age, the plaits became united two by two near the front and lateral margins, could only constitute a simple variety of *Rh. plicatilis*, especially as a similar tendency is common to individuals of various forms, as for instance, *R. latissima*, Sow., &c. This complex plication does not always take place only in those examples in which the plaits are acute to the very edge. Nor do all specimens of true *Rh. plicatilis* present the split condition of the plicæ above described, although such may be the prevalent character in most examples. The term *octoplicata* is in itself essentially ill-chosen, from the positive fact that nothing is more variable than the number of plaits, and as an illustration of which I have figured in Pl. X a series of examples collected in the same locality by Mr. Fitch, with 3, 5, 6, 7, 8, and 9 plaits on the mesial fold, and specimens with exactly 8 plaits are by no means the most abundant. Although I have not yet obtained in England examples of *R. plicatilis* quite as large as some of its variety *octoplicata*, still in other countries typical specimens of *R. plicatilis* have been found equalling in dimensions any of those of the variety (Pl. X, figs. 1 and 3).

I must, however, here observe that Mr. S. P. Woodward differs from the conclusions we have arrived at, and is of opinion that *R. octoplicata* can be distinguished and should be preserved as a separate species from *R. plicatilis*. Associated with the shell last mentioned we often find another form, figured in 1833 by Woodward as *Tereb. Gallina* (Brong.),<sup>1</sup> but which, although somewhat similar in external contour to the Sowerby species, appears to possess a facies of its own, and, if not specifically distinct from *R. plicatilis*, would, at any rate, constitute a well-marked variety, being distinguished by fewer plaits, which are proportionally wide; with flattened ridges, and usually split near the margins.

Plate X, figs. 37 to 39. Typical example of *R. plicatilis*, from the Chalk of Brighton.

„ fig. 40. Front view of a very inflated individual, from the Kentish Chalk, in the collection of Mr. Bowerbank.

„ figs. 41, 42. An unusually expanded var., likewise from the Kentish Chalk.

„ figs. 1 to 11. A series of examples of the var. *octoplicata* (of authors), from the Norwich Chalk, in the collection of Mr. Fitch; figs. 1 and 3 are the largest British specimens I have seen.

„ figs. 12, 13. A young flattened example, from the Chalk at Royston (Cambridgeshire), in the British Museum.

„ fig. 16. A specimen, exhibiting spots attributed to colour? from the Chalk of Norwich.

<sup>1</sup> 'An Outline of the Geol. of Norfolk, pl. vi, fig. 12.—See likewise our Pl. X, figs. 43 to 46.

- Plate X, fig. 17. A fragment of the beak (enlarged) to illustrate the tubular expansion of the deltidium.
- „ fig. 14. Interior of the dorsal valve, from a specimen in the British Museum.
- „ fig. 15. Interior of the ventral valve, ib.
- „ figs. 43, 44. *Var. Woodwardii*, from the Chalk of Norwich, in the collection of Mr. Fitch.
- „ figs. 45, 46. Ib. From the Chalk of Charing, in the cabinet of Mr. Harris.

35. RHYNCHONELLA LIMBATA, *Schlotheim*, Sp. Pl. XII, figs. 1—5.

- TEREBRATULITES LIMBATUS, *Schlotheim*. Leonhard's Tash., vol. vii, p. 113, 1813; Petrk. i, 286, reference Faujas, Mont St. Pierre, pl. xxvi, fig. 4, 1799.
- TEREBRATULA SUB-PLICATA, *Mantell*. Fossils of the South Downs, p. 211, tab. xxvi, fig. 5, 1822.
- — *Woodward*. A Synoptical Table of Brit. Org. Remains, p. 22, 1830.
- LENTIFORMIS, *Woodward*. Geol. of Norfolk, tab. vi, fig. 11, 1833.
- SUBPLICATA and LENTIFORMIS, *Morris*. Catalogue, 1843.
- RHYNCHONELLA SUBPLICATA, *D'Orbigny*. Pal. Franç., Terrains Crétacés, vol. iv, p. 48, pl. 499, figs. 13—17 (under the false name of *Rhyn. dutempleana*), 1847.
- TEREBRATULA LIMBATA, *Bronn*. Index Pal., vol. 2, p. 1246, 1848.

*Diagnosis.* Shell more or less transversely oval; somewhat trigonal or circular when young; beak short, narrow, and incurved; foramen minute, close under the acute extremity of the beak, and entirely surrounded by the deltidium and its tubular expansions. A flattened space occurs between the beak ridges and hinge line: valves moderately convex, with a longitudinal sinus in the ventral valve, to which corresponds a mesial fold in the opposite one: external surface entirely smooth when young, and often remaining so to an advanced age: from 10 to 20 short rounded plates ornament the vicinity of the margin; 3 to 5 occupying the mesial fold and sinus.

Dimensions variable: length 9, width 12, depth 6 lines;

„ 8, „ 9, „ 5 „  
 „ 5, „ 5, „ 2½ „ (*T. lentiformis*, Woodward.)

*Obs.* Faugas St. Fond appears to have been the first author who figured this form, but without a name. In 1813, Schlotheim applied to it the denomination of *Terebratulites limbatus*, referring at the same time to Faugas's figure; this name is therefore the oldest we are acquainted with, and has a right to priority, as admitted by Prof. Bronn.

In 1822, the same species was described and figured by Dr. Mantell, under the name of *Ter. subplicata*, by which denomination it is known to the greater number of British and Foreign Palæontologists. Dr. Mantell states it to be well characterised by its smooth

surface and elevated plicated front. *Rh. limbata* is, however, very nearly related to *R. Octoplicata*, Sow., of which it may perhaps only constitute a marked variety, in which the greater portion of the surface is either entirely smooth, or indistinctly plicated, except towards the front and lateral margins. In 1833, a small race, almost completely circular in shape, and of the dimensions of a flattened pea, was named *Ter. lentiformis* by Woodward.

In the 'Pal. Franc.' vol. iv, p. 46, M. D'Orbigny considers the name *subplicata* to be a synonyme of *Rh. octoplicata*; but in p. 48 of the same work, he admits the species to be distinct, and in both cases refers to Dr. Mantell's name and figure. *Rh. limbata* abounds in the Upper Chalk of many localities, always associated with *Rh. octoplicata* (Sow.). It has been collected at Norwich, in Kent, Sussex, in Ireland, at Meudon and Chavot (France), &c. Cibly, in Belgium, is the locality from which Faugas's figured specimen was obtained, &c.

Plate XII, figs. 1, 2, 3. Specimens from the Norwich Chalk, in the collection of Mr. Fitch; fig. 1, enlarged.

„ figs. 4, 5. Young specimens, or a dwarf race (*Ter. lentiformis*, Woodward).

36. RHYNCHONELLA COMPRESSA, *Lamarck*, Sp. Pl. XI, figs. 1—5, and Pl. XII, fig. 25.

TEREBRATULA COMPRESSA, *Lamarck*. An. sans Vert., vol. vi, p. 256, No. 54, 1819; and *Davidson*, "Notes on an Examination of the Lamarckian Species of Fossil Terebratulæ," Annals and Mag. of Nat. Hist., June, 1850, pl. xv, fig. 54.

— DIFFORMIS, *Lamarck*. Ib., vol. vi, No. 48, 1819 (Encycl. Méth., pl. 242, fig. 5, 1789); and *Dav.* Ib., June, 1850, pl. xv, fig. 48.

— DIMIDIATA, *Sowerby*. Min. Con., tab. 277, fig. 5, 1821.

— — *Parkinson*. An Introd. to the Study of Organic Remains, p. 234, 1822.

— GALLINA, *Brong.* Desc. Géol. des Environs de Paris, p. 84, pl. ix, fig. 2, 1822.

— COMPRESSA, *DeFrance*. Dic. des Sc. Nat., vol. liii, p. 158, 1828.

— DIMIDIATA, *Fleming*. A Hist. of British Animals, p. 372, 1828.

— DIFFORMIS, *DeFrance*. Dic. Sc. Nat., vol. liii, p. 160, pl. v, fig. 3, 1828.

— DIMIDIATA, *Woodward*. Synoptical Table of Br. Organic Remains, p. 21, 1830.

— DIFFORMIS, *Deshayes*. Encycl. Meth., iii, p. 1029, No. 22, 1832.

— ALATA, *V. Buch*. Class. des Térébratules, Mém. Soc. Géol. de France, vol. iii, p. 150, pl. xv, fig. 21, 1834.

— COMPRESSA, *Deshayes*. Nouv. Ed. de Lamarck, vol. vii, p. 345, No. 54, 1836.

— DILATATA, *Sowerby*, in *Fitton*. Trans. of the Geol. Soc. of London, vol. iv, p. 343, pl. xviii, fig. 2, 1836.

— DIFFORMIS. *Des.* Nouv. Ed. de Lamarck, vol. vii, p. 343, No. 48, 1836.

— DIMIDIATA, *Morris*. Catalogue, 1843.

RHYNCHONELLA COMPRESSA, *D'Orbigny*. Pal. Franç., Ter. Crétacés, vol. iv, p. 35, pl. 497, figs. 1—6, 1847.

— DIFFORMIS, *D'Orbigny*. Ib., vol. iv, p. 41, pl. 498, figs. 6—9, 1847.

TEREBRATULA COMPRESSA, *Bronn*. Index Pal., p. 1233, 1848, (but not a Syn. of *T. limbata*.)

*Diagnosis.* Shell depressed, elongated oval, wider than long, angular at the cardinal, dilated towards the pallial, region, somewhat indented in front; the greatest width and depth lying towards the middle of the shell: valves unequally convex, the dorsal one generally the deepest, with a wide, slightly produced, and flattened mesial fold, occupying about one third of the width of the shell: in the *ventral* valve, a corresponding wide longitudinal sinus: beak acute, moderately produced, and incurved: foramen rather small, and entirely surrounded by the deltidium: beak ridges sharply defined, leaving a flattened space between them and the hinge line: externally each valve is ornamented by from 32 to 48 strong simple plaits, 8 to 11 of which compose the mesial fold and sinus.

Dimensions variable: length 17, width 23, depth 8 lines.

„ 13, „ 18, „ 10 „

*Obs.* This fine species was described by Lamarck, in 1819, from specimens derived from the Upper Green Sand of Mans (France): it varies greatly in degree of compression, some examples being considerably flattened, while others are more convex, and this last variety is the one commonly found both at Chute, near Warminster, and Cap-la-Heve, near Havre (France). A similar shell was described at a later period (1836) by Sowerby, under the name of *Ter. dilatata*, and *Ter. Gallina* (Brongniart) seems likewise to belong to the same type. *R. compressa* is not always regularly trilobed, but often unsymmetrical, from the mesial fold becoming totally or partially shifted either to the one or other side; the shell then appears divided, as in *Rh. inconstans*, into two portions, one half occupying a higher level than the other, or with one edge turned up and the other down; a malformation so common among the *Rhynchonellæ* that it cannot be made use of as a character of any specific importance: thus *Terebratula difformis*<sup>1</sup> (Lamarck), and *Ter. dimidiata* (Sowerby), are nothing more than irregularly developed examples of *R. compressa*, of which any one will become convinced who may examine the typical specimens in

<sup>1</sup> M. D'Orbigny seems to consider *Rhyn. difformis* (Lamarck) to be specifically distinct from *R. compressa* of the same author, and states p. 42, vol. iv, of the 'Pal. Franç.,' "Cette espèce (*R. difformis*) se distingue du *T. contorta* par ces côtes plus grosses. Lorsqu'elle est régulière, elle se rapproche du *R. compressa*, mais elle diffère par sa forme plus renflée encore, est plus courte, moins dilatée latéralement, c'est une espèce bien séparée, mais très variable dans sa forme." Lamarck observes, that his specimens of this shell were derived from the Green Sand of Cap-la-Heve (near Havre), and likewise from Mans. And in both localities I have had the opportunity of examining and collecting specimens, uniting these malformations by insensible passages to the regularly developed condition of *R. compressa*; and both in the French and British localities we find unsymmetrical individuals likewise more or less flattened, as is the case with well-shaped examples.



the Lamarckian and Sowerby collections, or from the study of a series of specimens derived from the localities in which *R. compressa* occurs.<sup>1</sup>

In England, *R. compressa* is found in the Upper Green Sand of Chute Farm, near Horningsham, at Halldown, in the Chloritic Marl of Chard, and other localities. On the Continent, it abounds at Havre, Mans, and la Flèche (Jarthe). M. D'Orbigny also states he has found it at Lattes, La Malle, and Escragnolles (Var.), at l'Île Madame, Ile d'Aix, and at the Pont des Barques (Charente Inférieure).

Plate XI, fig. 1. A well-shaped example, from the Upper Green Sand near Warminster, in the collection of Mr. Cunningham; it is identical in shape to some found at Havre.

„ fig. 2. A very large individual, from the same locality, similar to the one figured by Dr. Fitton as *T. dilatata*, Sow. (Geol. Trans., vol. iv, pl. xiv, fig. 2.)

„ fig. 3. Front view of a specimen from Chute Farm, in which the mesial fold is shifted to one side, from the cabinet of Mr. Cunningham.

„ fig. 4. A malformation from the Chloritic Marl of Chard, which entirely agrees with Sowerby's type of *Ter. dimidiata*.

„ fig. 9. Another similar example, from the Upper Green Sand near Warminster.

Plate XII, fig. 25. A specimen from the Chloritic Marl of Chardstock, in the collection Mr. Th. Walrond.

### 37. RHYNCHONELLA LATISSIMA (*lata*), Sow., Sp. Pl. XI, fig. 6—22, and Pl. XII, fig. 24.

TEREBRATULA LATA, Sow. Min. Con., vol. v, p. 165, tab. 502, fig. 1, 1825, changed afterwards (1829) to *Ter. latissima*, by the same author (not *Ter. lata*, Sow., Min. Con. vol. i, pl. 100, fig. 2, 1812).

— ALATA? Nilsson. Petrefacta Suecana, pl. iv, fig. 9, 1827.

— LATA, Sow. (in Fitton). Trans. Geol. Soc., vol. iv, pl. xiv, fig. 11, 1836.

— CONVEXA, Sow. Ib., pl. xiv, fig. 12, 1836.

— LATISSIMA, Rømer. Die Vers. Nord. Kreid., pl. vii, fig. 4, 1840.

— — Morris. Catalogue, 1843.

— — D'Archiac. Mém. Soc. Géol. de France, vol. ii, 2d ser., p. 330, pl. xxi, fig. 7, 1847.

— SCALDINENSIS. Ib., pl. xx, fig. 11.

<sup>1</sup> Some authors have attributed to this species *Rhyn. alata* (Lamarck, sp.); but as observed by MM. D'Orbigny, Deshayes, and myself, *T. alata* is nothing more than a synonyme of *Rhynchonella* (*Anomya*) *vespertilio* of Brocchi ('Conchologia Fossile,' 1814). Lamarck refers to pl. 245, figs. 2, *a*, *b*, of the 'Ency. Méthodique,' which figure certainly represents a shell identical with the one illustrated by the Italian author. *R. vespertilio*, at times, bears some resemblance to *R. compressa*, but is in general more regularly convex and trilobed, with a much deeper sinus, and a more elevated mesial fold.

- RHYNCHONELLA LATA, *D'Orbigny*. Pal. Franç., Ter. Crétacés, vol. iv, p. 21, 1847 (but perhaps not all his list of Synonymes).  
 TEREBRATULA PLICATILIS, *Bronn*. Index Pal., p. 1246, 1848 (but not *T. plicatilis*, Sow., nor the generality of Bronn's other synonymes).  
 — LATA, *Austen*. Quart. Journ. Geol. Soc., vol. vi, p. 477, 1850.  
 — LATISSIMA, *Sharpe*. Quart. Journ. of the Geol. Soc., vol. x, p. 192, 1853.

*Diagnosis.* Shell transversely oval or unequally five sided, with rounded angles: *ventral* or dental valve moderately convex: beak acute, slightly produced and incurved: foramen circular, entirely surrounded by the deltidium and its tubular projections: beak ridges well defined, leaving a flattened space between them and the hinge line: the regular convexity of the valve is interrupted by a sinus of moderate depth, commencing towards the middle and extending to the front. The *dorsal* or socket valve is either convex and regularly arched, or somewhat flattened, with a mesial fold not rising much above the uniform convexity of the shell. Externally, the surface of each valve is ornamented by from 50 to 80 plaits.

Length 12, width 16, depth 7 lines;  
 „ 10½, „ 12, „ 7 „  
 „ 9, „ 10, „ 6 „ &c.

*Obs.* The shells here described may perhaps only constitute a variety of *R. compressa*, Lamarck: but they seem to be distinguished by a less expanded, and in general more regularly transverse oval shape; also by the number and quality of their plaits, which are more numerous in the shells under notice than in the Lamarckian type, which does not appear to present the complex condition at times observable in *R. latissima* (Sow.). So much so, that some examples illustrated in my Pl. XI, figs. 19—22, have been by some authors supposed to belong to another species, viz., *R. antidichotoma* of Buvignier,<sup>1</sup> but after having examined a numerous series of specimens collected by Messrs. Sharpe, Lowe, Waterhouse, Cunningham, myself, and others, I was able to convince myself in a most satisfactory manner, that all the examples illustrated in Pl. XI, figs. 6—22, belonged to the same species. In the extensive series principally derived from Warminster and Farringdon, every possible variation in the plication may be perceived: in almost all, the plaits are few in number in the young, but soon augment at variable distances from the extremities of the beak and umbo by the intercalation of a fresh plait between those already formed. In many examples, the last as well as the original ones proceed uninterruptedly to the margin, while in others, some of the intercalated ribs are lost, or disappear between their immediate neighbours before reaching the front or margin, while in some cases only a few while in other examples almost every two of the plaits unite, and form a belt of larger costæ near the front and margin. All these complex characters are accu-

<sup>1</sup> This shell differs from *R. latissima* by its general shape and small foramen, which is widely separated from the hinge line by a largely developed deltidium; also to some extent by the character of its plaits. See Pal. Franc. Terrains Crétacés, vol. iv, p. 500, fig. 1—4.

rately illustrated in figures 6—22, and from them it may be observed, that in most cases only a few of the plaits here and there disappear or become united, while in others from 50 to 60 smaller ones may be counted towards the middle of the shell, and only from 30 to 35 larger ones near the margin. Certain conditions and localities seem to have favoured this kind of malformation; thus, few occur in the Upper Green Sand of Chute Farm, near Warminster, while they are more plentiful at Farringdon: exceptional examples of *R. latissima* bear some resemblance to *R. sulcata* (Parkinson), but this last is in general less transverse, and much more largely plicated, the number of the plicæ being likewise less numerous; but it would not be very difficult, I think, to find extreme and exceptional examples connecting *R. compressa*, Lam., with *R. latissima*, Sow., and the last to *R. sulcata*, Parkinson. However the generality of the individuals of each seems to be sufficiently distinguished by prevailing and peculiar characters to make it desirable, at least for the present, to describe each of them under a separate head. Young shells of *R. parvirostris* might also be confounded with others of the same age of *R. latissima*, although adults of both can be easily separated.

As in the case of *R. compressa*, *R. latissima* is at times more or less unsymmetrical from the mesial fold becoming shifted to the one or other side, this may be seen in Pl. XI, fig. 6, and to a greater extent in fig. 12.

In 1825, Sowerby described and figured the shells we are commenting upon by the name of *Ter. lata*, but in the index to the 'Min. Con.,' published at a subsequent period (1829), he changed his first denomination to that of *T. latissima*, from having observed that he had already made use of his former appellation for another species: the first term might strictly still be retained, because his original *Ter. lata* is only a synonyme of *Ter. ovoides*, while the second *Ter. lata* belongs to another form and even genus (*Rhynchonella*), but to avoid any possible confusion I have adopted Sowerby's later denomination.

In 1836, varieties of the same shell received from Sowerby the names *R. convexa* and *R. elegans*, but which names must be added to the synonymes. A few authors have likewise considered *R. latissima* to be synonymous with *R. alata*, Lamarck, but the last is only itself a synonyme of *R. vespertilio* (Brocchi), as has been already explained under *R. compressa*.

Dr. Bronn goes the length of considering *R. latissima* as simply a variety or synonyme of *R. plicatilis*, Sow., but in this opinion I believe the distinguished German author will find few supporters.

In England, *R. latissima* is essentially an *Upper Green Sand* species, abounding both at Chute Farm, near Warminster, Farringdon, &c.; while in France, according to M. D'Orbigny, it would be a *neocomien* shell; but I fear some mistake either in the identification with our British specimens, or with the age of the bed, has been committed, as I feel certain that Sowerby's type occurs in the Upper Green Sand of Mans, in France, as well as in the *Tourtia* of Belgium. One of M. D'Orbigny's illustrations ('Pal. Franc.' Pl. 491, fig. 8) completely agrees with some of our British Upper Green Sand examples,

and it is possible that the author of the 'Pal. Franc.' may have considered as belonging to the same species, shells named *R. parvirostris* and *R. Gibbsiana*, which appear with us distinct, and peculiar to the Lower Green Sand (Neocomien of the French).

The figures published by Viscomte D'Archiac of his *Rh. Scaldinensis* entirely agree with our typical examples of *R. latissima*, and much more closely so even than the figures he attributes to the Sowerby species. The celebrated author of the 'Histoire des Progrès de la Géologie,' mentions that his *Ter. Scaldinensis* numbers as many as 65 plaits, while Sowerby only mentions 40 to his *R. latissima*, but from what I have said above, it may be seen that the plaits in our British species vary very much, and are often as numerous as in *R. Scaldinensis* of the French author.

Plate XI, figs. 6, 7, 8, and 14. Different specimens and shapes of *R. latissima*, from the Upper Green Sand of Warminster.

- „ figs. 9, 10, 11. Young specimens, from same locality.
- „ fig. 12. Unsymmetrical and aged example, same locality.
- „ fig. 13. A malformation, from Warminster, from the cabinet of Mr. Cunnington.
- „ fig. 15. A ventral valve from Farringdon.
- „ fig. 16. A convex variety, same locality.
- „ fig. 17. Profile and front view of another Farringdon specimen, in the collection of Mr. Lowe. Fig. 17<sup>c</sup>, an enlarged illustration, to show exactly the complex condition of the plaits.
- „ fig. 18. A young specimen from Farringdon.
- „ figs. 19 and 20. A specimen from the same locality, in the collection of Mr. Lowe, in which the complex plication above described is well exemplified, and especially so in the enlarged figure 19<sup>c</sup>.
- „ figs. 21 and 22. Two other examples from the same locality, in the collection of Mr. Sharpe. *R. Antidichotoma*, Buv.? according to Mr. Sharpe.

Plate XII, fig. 24. A very remarkable example, from the Chloritic Marl of Chardstock, in the collection of Mr. Wiest.

38. RHYNCHONELLA SULCATA, *Parkinson*, Sp.? Plate X, figs. 18—36.

TEREBRATULA SULCATA, *Parkinson*. Trans. Geol. Soc., vol. i, p. 347, 1811, and vol. v, p. 57, 1821 (but neither figured nor described).

— — *Morris*. Catalogue, 1843.

RHYNCHONELLA SULCATA, *D'Orbigny*. Pal. Franç., Ter. Crétacés, vol. iv, p. 36, pl. 495, figs. 1—7, 1847.

*Diagnosis.* Shell transversely oval, wider than long; valves more or less unequally convex, *ventral* or dental valve in general the deepest, with a shallow longitudinal sinus to which a moderately produced mesial fold corresponds in the opposite one. Beak short,

acute, entire, and but little incurved; foramen small, surrounded by a deltidium in two pieces; beak ridges well defined, the hinge line not encroaching on that of the dorsal valve; lateral margins slightly flexuous; the frontal edge of the ventral valve indenting more or less that of the dorsal one. External surface ornamented by a number of simple radiating plaits, from 30 to 40 on each valve.

Length 12, width 15, depth 10 lines. (This species at times attains somewhat larger dimensions.)

*Obs.* In 1811, Parkinson simply mentioned the name *Terebratula sulcata*, without description or figure. And in another paper, read before the Geological Society in 1818, but published only in 1821, we find the same name repeated, as follows:

“FOSSILS IN THE BLUE MARL. *Terebratula sulcata*, found near Dover, Folkstone, and Cambridge,” but no figure or description is given, so that this appellation is in reality equivalent to a MS. denomination, and the author may have intended the shell for the one afterwards named *T. Mantelliana* by Sowerby, and which is found in those localities.

In the ‘Geology of Sussex,’ p. 130, 1822, Mantell likewise describes a Rhychonella by the name of *sulcata*, from the Chalk of Hamsey and Stoneham in Sussex, but also without figure, and to this species the name *T. Mantelliana* was subsequently appended by the author of the ‘Min. Con.,’ that of *Ter. sulcata* being retained for another shell found abundantly in the Upper Green Sand of Cambridge.

In 1843, Mr. Morris mentioned *Ter. sulcata* as from the Gault of Folkstone and Cambridge: and in 1847, M. D’Orbigny describes the Upper Green Sand Cambridge species as that of Parkinson; considering at the same time *Rh. Gibbsiana* (Sow.) a synonyme; but here the learned author of the ‘Pal. Franc.’ seems to be evidently mistaken. The *R. Gibbsiana* (Sow.) occurs, it is true, in the vicinity of Folkstone, Sandgate, Hythe, &c., but in another bed, viz., Lower Green Sand (Neocomien), and cannot, I believe, be confounded with the Upper Green Sand species, now so well known to collectors as the true (?) *R. sulcata* of Parkinson. In a catalogue of the *Lower Green Sand* fossils in the museum of the Geological Society,<sup>1</sup> Professor Forbes stated that *R. sulcata* occurs in the *Lower Green Sand* of Hythe, and mentioned as his var.  $\beta$ , *R. parvirostris* of Fitton, a view I can hardly admit. Professor Bronn,<sup>2</sup> while adopting the term *sulcata*, states it to be his opinion that *R. depressa* (Sow.), *inconstans*, *rostralina*, *plicatella*, and *multiformis* (Roemer), as well as *T. parvirostris* and *elegans* (Sow.) belong all to the same type; and although perhaps some of the shells mentioned may bear a resemblance to our Upper Green Sand species, neither *R. elegans*, *parvirostris*, nor *depressa* can I think, with propriety, be united to the Cambridge *R. sulcata*.

*Rh. Gibbsiana* is more triangular in its external aspect, its sinus and fold much more

<sup>1</sup> Quarterly Journal of the Geol. Soc., vol. i, p. 345, 1845.

<sup>2</sup> Index Pal., vol. ii, p. 1852; — 1848.

developed, and the plaits always smaller and more delicate than those observable on the Cambridge shell, which it has been agreed to term *R. sulcata*.

Few species vary more in external shape or detail than the one under consideration, as may be seen from the series of illustrations I have selected from among several hundred individuals assembled from a single locality by Mr. Carter. The mesial fold and sinus does not always occupy the middle of the shell, nor in all cases is it symmetrical, for out of ten examples eight or nine will have their fold and sinus shifted more to the one or the other side, as seen in figs. 23, 25, and 27 of our Plate, while in some examples the one half of the valve is more elevated than the other, being twisted indifferently to the right or to the left, as is so common to *Rh. inconstans*, and to those malformations of *Rh. compressa* to which Sowerby had applied the term *R. dimidiata*. The plaits are generally simple, but in some instances, although rarely, bifurcate here and there.

*Rh. sulcata* abounds in the *Upper Green Sand* near Cambridge, is less commonly met with in the neighbourhood of Warminster, and was found by Mr. Bean in the Speeton Clay of Yorkshire. Some rare examples have likewise been found in the Gault of Folkstone, and in the corresponding bed at Wissant, on the French coast. M. D'Orbigny mentions the species as abounding in his TERRAIN ALBIEN at Grandpré, and Fleville (Ardennes), Gérodot (Aube), at the Perte du Rhône (Ain), and Clausayes (Drome), &c.

Plate X, figs. 18—20, and 23—36. Illustrate a series of specimens from the Upper Green Sand of Cambridge, in the cabinet of Mr. Carter. Figs. 18, 21, are regular in shape, the others show some of its innumerable malformations. Figs. 15 and 36 are internal casts, on which the muscular and vascular impressions are well preserved.

„ figs. 21—22. From the Speeton Clay, in the collection of Mr. Bean.

39. RHYNCHONELLA MANTELLIANA, Sowerby, Sp. Plate XII, figs. 20—23.

TEREBRATULA MANTELLIANA, Sowerby. Min. Con., vol. vi, p. 72, tab. 537, fig. 5, 1825.

— — Fleming. A Hist. of British Animals, vol. i, p. 374, 1828.

— — V. Buch. Mém. Soc. Géol. de France, vol. iii, p. 154, pl. xv, fig. 26, 1838.

— — ? Geinitz. Char. Kreid., p. 15, 1839.

— — Morris. Catalogue, 1843.

RHYNCHONELLA MANTELLIANA, D'Orbigny. Pal. Franç., Ter. Crétacés, vol. iv, p. 40, 1847, (the illustrations given by this author, pl. 498, figs. 1—5, do not recall the common aspect of the Sowerby species.)

*Diagnosis.* Shell transversely obovate, rather wider than long; valves almost equally

convex, with a shallow longitudinal depression or sinus in the dental or ventral valve, which corresponds to a slightly produced mesial fold in the opposite one. Beak short, entire, not much incurved, foramen small, and entirely surrounded by the deltidium: lateral margins almost straight: the frontal edge of the ventral valve encroaches on that of the dorsal one. Externally each valve is ornamented by from 15 to 18 wide simple plaits, 3 or 4 forming the mesial fold. Dimensions very variable: length 7, width 8, depth  $4\frac{1}{2}$  lines.

*Obs.* This species was accurately described and figured by Sowerby, in the 'Mineral Conchology,' under the name of *Ter. Mantelliana*; and it is most probably one of the shells intended by Parkinson as the type of his *Ter. sulcata*, but as the last-named author neither described nor figured his form, Sowerby's denomination must be retained for the well-known species under consideration.

*Rh. Mantelliana* is commonly a small shell, of about the dimensions above given, but it has been found sometimes, although rarely, of larger dimensions, as proved by the fine specimen (Pl. XII, fig. 23) found in the Lower Chalk near Lewes, by Mantell, and it forms part of his collection in the British Museum; it abounds in the Lower Chalk and Chalk Marl between Dover and Folkstone, at Hamsey, and in many other localities, and has been collected, although much more rarely, in the Upper Green Sand of the neighbourhood of Warminster, and in the Chloritic Marl of Bonchurch (Isle of Wight), by Mr. S. H. Saxby. On the Continent, it occurs in beds of a similar age to those above mentioned, both in France and Belgium. *Rh. Mantelliana* is well distinguished from *Rh. Cuvieri*, by its larger and less numerous plaits, as well as by its greater width.

Plate XII, fig. 20 and 21. Two examples from the Gray Chalk of Folkstone and Hamsey.

- „ fig. 22. A specimen from the Upper Green Sand of Chute Farm, near Warminster, in the collection of Mr. Cunnington.
- „ fig. 23. A very large specimen, from the Lower Chalk of Lewes, in the Mantellian collection in the British Museum. It measures: length 10, width 11, depth  $6\frac{1}{2}$  lines.

40. RHYNCHONELLA CUVIERI, *D'Orbigny*. Plate X, figs. 50—54.

TEREBRATULA PISUM, *Geinitz*. Kreide, pl. xvi, fig. 18, 1840 (but not *Ter. pisum*, Sow.).

RHYNCHONELLA CUVIERI, *D'Orbigny*. Pal. Franç., Ter. Crétacés, vol. iv, p. 39, pl. 497, figs. 12—15, 1847.

*Diagnosis.* Shell small, transversely or longitudinally oval, length and width often the same: valves regularly convex, and of nearly equal depth, a shallow depression or sinus existing towards the front of the dental or *ventral* valve, to which a similar slight elevation corresponds in the opposite one; beak small, acute, and entire; foramen minute, completely surrounded and removed from the contiguity of the hinge line by a deltidium and

its largely expanded tubular expansions. The lateral margins are but slightly sinuous, the frontal edge of the ventral valve indenting that of the opposite one. Externally, each valve is ornamented by from 30 to 34 equal and simple plaits: length  $6\frac{1}{2}$ , width  $6\frac{1}{2}$ , depth 5 lines.

*Obs.* M. D'Orbigny mentions, that this species approaches *Rh. Grasiiana* by general aspect, but is not quite as wide, usually it possesses fewer plaits, and is more circular in shape: he found it at Fécamps, near Rouen (France), along with *Inoceramus problematicus*, or in other words, in his ETAGE TURONIEN; examples were likewise obtained from Cap-Blanc-Nez (Pas de Calais) and at la Fleche (Sarthe). In England it has been found by Mr. Baber, in the Chloritic Marl, with quartz grains, near Chard and Chardstock; it abounds in the Lower Chalk of Lewes, at Glynde Bourn (Sussex), and two specimens (probably from the same locality) are figured, without name or description, in Dixon's work, 'Geology and Fossils of the Tertiary and Cretaceous Formations of Sussex' (pl. xxvii, figs. 15, 16, 1850). It has likewise been procured by Mr. Carter in Chalk of a similar age near Cambridge, and in that near Norwich by Mr. Fitch.

Some examples are so uniformly convex as hardly to present any trace of sinus or mesial fold.

Plate X, figs. 50—52. Enlarged illustration of an elongated specimen from the Lower Chalk, near Cambridge, in the collection of Mr. Carter.

„ figs. 53, 54. A wider example from a bed of similar age at Glynde Bourn, near Lewes (Sussex.)

41. RHYNCHONELLA DEPRESSA, *Sow.*, Sp. Plate XI, figs. 28—32; and Plate XII, fig. 26.

ANOMITES TRIANGULARIS, *Wahlenberg??* Petrif. Tellures Suecana nova acta Soc. Scientiarum Upsaliensis, vol. viii, tab. iii, figs. 11—13, 1821.

TEREBRATULA DEPRESSA, *Sowerby*. Min. Con., vol. v, p. 165, tab. 502, 1825 (not *D'Orbigny*, Pal. Franç., vol. iv, pl. 491, fig. 17, 1847).

— — *Woodward*. A Synoptical Table of British Organic Remains, pl. xxi, 1830.

— — *V. Buch*. Class. des Térébratules, Mém. de la Soc. Géol. de France, vol. iii, p. 137, pl. xiv, fig. 6, 1838.

— — *Morris*. Catalogue, p. 133, 1843.

— — *Tennant*. A Strat. List of British Fossils, p. 47, 1847.

— — *Bronn* (part). Index Pal., vol. ii, p. 1234, 1848, (not all his Synonymes).

— — *Austen*. Quart. Journ. of the Geol. Soc., vol. vi, p. 477, 1850.

RHYNCHONELLA DEPRESSA, *Sharpe*. Quart. Journ. of the Geol. Soc., vol. x, p. 192, 1853.

— TRIANGULARIS, *Sharpe*. *Ib.*, p. 192, 1853.

*Diagnosis.* Shell depressed, triangular, wider than long, valves almost equally convex;



the *ventral* or dental one with a wide longitudinal sinus, to which corresponds a slightly raised mesial fold in the opposite or dorsal valve: beak acute, tapering and but slightly incurved, ridges sharply defined, leaving a wide flattened space or false area between them and the hinge line, which last indents the lateral portions of the umbo: foramen comparatively large, entirely surrounded, and more or less removed from the hinge line by the deltidium and its tubular prolongations; lateral margins moderately sinuous; the frontal edge of the ventral valve indents the opposite one to a lesser or greater extent. Externally, 17 to 30 plaits ornament each valve, 6 to 10 forming the mesial fold. Dimensions variable: length 8, width 9, depth 6 lines;

„ 7, „  $7\frac{1}{2}$ , „ 4 „

*Obs.* The shell above described has been distinguished and admitted by British geologists as *Ter. depressa* of Sowerby,<sup>1</sup> although misunderstood by several continental authors. It may, however, remain a question whether *R. depressa* be really distinct from the *Anomites triangularis* of Wahlenberg,<sup>2</sup> a point I have been unable to determine, from the figures published by the Swedish author not conveying a sufficiently satisfactory resemblance to Sowerby's species and specimens, being too circular, and exhibiting no trace of mesial fold or sinus, which is always visible in examples of similar dimensions of *R. depressa*. Nilsson<sup>3</sup> describes and reproduces Wahlenberg's figures, but does not throw further light on the contested question. The beak, foramen, and deltidium are both inaccurately and vaguely represented, for which reasons I did not consider it advisable to remove Sowerby's denomination until more positive evidence can be obtained by the inspection of Swedish specimens.

Mr. Sharpe considers that among the shells found at Farringdon, and referred by myself to *R. depressa*, the two species do occur, and may be distinguished; but after a minute study of all the specimens collected by that distinguished Palæontologist, as well as of those assembled in the locality by myself and others, I felt unable to arrive at a similar conclusion, from finding that all possessed (to my eyes) the same *essential* specific character. According to Mr. Sharpe, the young shell (Pl. XI, fig. 32) would represent *R. triangularis*, while the figs. 29 and 30, represent *R. depressa*; in these, however, we observe the same general shape, the same character of plication, with many of the plicæ augmenting by intercalation, and varying in number; a peculiarity common to specimens of every species

<sup>1</sup> "Triangular, depressed, regularly plaited, front elevated, lateral angles rounded, beaks produced, plaits 20; when so young that the front is hardly elevated, this shell is almost orbicular: in which circumstance it differs from the last (*Ter. lata*), the proportions of which do not vary much by age; the plaits are sharp, about eight of them are raised with the front. Found at Farringdon. ('Min. Con.,' vol. v, p. 165, tab. D ii, fig. 2.)

<sup>2</sup> 'Petri facta Telluris Suecana, Nova Acta Regiæ Societates Scientiarum Upsaliensis, vol. viii, tab. iii, figs. 11, 12, 13, 1821.

<sup>3</sup> 'Petri facta Suecana,' p. 36, tab. iv, fig. 10, 1827. "T. testa ovato-triangulari, longitudinaliter sulcata; sulcis et interstriis numerosissimis æqualibus; valva minore convexiore; rostro acutangula subrecto; margine superiore; bex sinuato. Locality—Balsberg," where it is stated to be rare.

of Rhynchonella, and, had space permitted, illustrations could have been introduced exhibiting every passage uniting such shells as figs. 28 and 30. In all, the umbo of the dorsal valve is much incurved, its extremity being to a lesser or greater extent concealed under the development or encroachment of the deltidium. On well preserved examples the concentric lines of growth are numerous and in close approximation, giving to the upper ridge of each plait a somewhat granulated appearance, but which is more deceptive than real, since these projections form part of an uninterrupted and continuous concentric line or ridge. In young individuals, no trace of sinus or mesial fold can be perceived, the frontal line being straight, but with age both the sinus and fold gradually appear, and always exist to a greater or lesser degree in adult individuals. Geinitz published two figures representing the exterior of the ventral valve of a shell he terms *Ter. Triangularis*,<sup>1</sup> and which in external contour appears to somewhat resemble our British examples, but the profile view would almost indicate a different species. M. D'Orbigny's figures<sup>2</sup> of his so-called *Rh. depressa* do not appear to resemble Sowerby's shells, and belong (I have little doubt) to a distinct species, although the description published in the 'Pal. Française,' would denote a shell different from that figured in his plate.

*R. depressa* abounds in the Upper Green Sand of Farringdon, along with *R. nuciformis*.

Plate XI, fig. 28. A specimen of *R. depressa*, Sow., from the Upper Green Sand of Farringdon, in the cabinet of Mr. Lowe, it presents 11 plaits on the mesial fold; 28<sup>b</sup> c are enlarged representations.

„ fig. 29. Another example from the same locality, in which the central plaits are narrower than the lateral ones.

„ fig. 30. A specimen with an unusually small number of plaits, from the collection of Mr. Sharpe; fig. 3<sup>c</sup>, enlarged.

„ fig. 31. A young individual, from the same locality.

„ fig. 32. A young and somewhat elongated example, believed by Mr. Sharpe to represent *R. triangularis*; fig. 32<sup>b</sup> a magnified illustration, from the collection of Mr. Sharpe.

Plate XII, fig. 26. A large transverse specimen, in which the beak is not so much produced as in those figured in Pl. XI, locality Farringdon.

In the Upper Green Sand of Warminster, in that of the Isle of Wight, and in equivalent beds at Chardstock, are found numerous examples of two forms represented in Pl. XII, figs. 28 and 30. They appear to constitute (if not separate species) well-marked varieties of *Rh. depressa* of Farringdon. I will therefore briefly mention them under the head of *varieties A and B*.

<sup>1</sup> 'Charact. der Schichten und Petref.,' pl. xix, figs. 1—3, 1842.

<sup>2</sup> 'Pal. Franç., Terrains Crétacés,' vol. iv, p. 18, pl. 491, figs. 1—7. M. D'Orbigny states that his specimens were obtained in the Terrain Néocomien of France.

*RHYNCHONELLA DEPRESSA*, *Var. A.* Pl. XII, fig. 30.

This shell presents much of the general contour of the type species, and especially of those examples in which the beak is short, with the foramen close to the hinge line (Pl. XII, fig. 26). Each valve is ornamented by from 20 to 22 large plaits, a few of which are due to intercalation: the surface is likewise covered by numerous concentric lines or ridges of growth, similar in character to those visible on well preserved Farringdon specimens. This variety has been found in the Green Chloritic Beds of Chardstock by Mr. Wiest, and in the Upper Green Sand of the neighbourhood of Warminster by Mr. Sharpe: length 5, width 6, depth  $3\frac{1}{2}$  lines.

Plate XII, fig. 30. A specimen from Chardstock; 30<sup>a, b</sup>, enlarged illustrations of the same.

*RHYNCHONELLA DEPRESSA*, *Var. B.* Pl. XII, fig. 28.

This variety is distinguished from the preceding one, as well as from typical examples of *R. depressa*, by a greater number of plaits, 45 to 48 ornamenting the surface of each valve; these are likewise intersected by small approximate concentric ridges of growth, visible only on well-preserved specimens. When young, the shape is triangular and identical to that of individuals of a similar age at Farringdon (Pl. XI, fig. 31). This shell has been collected by Messrs. Sharpe and Wiest in the same beds and localities along with the preceding variety (A); it appears distinguished from *R. nuciformis* by its more dilated and compressed appearance, and its plaits do not exhibit towards their extremities that split condition observable in so many examples of the last-named species. Dimensions variable.

Plate XII, fig. 28. From Chardstock, Upper Green Sand

„ fig. 28<sup>b, c</sup>. Enlarged illustration of the same.

„ fig. 28<sup>d</sup>. A young triangular individual.

I am still uncertain whether specimens similar to the one Pl. XII, fig. 29, should constitute a variety of the present species. It was found in the Upper Green Sand of Shaftesbury by Mr. S. P. Woodward, and I have picked up similar specimens in equivalent beds in Normandy (France). Some extreme examples of *R. depressa* and *R. nuciformis* can hardly be distinguished.

42. RHYNCHONELLA NUCIFORMIS (*Sowerby*, Sp.). Plate XI, figs. 23—27, and Plate XII, fig. 27.

TEREBRATULA NUCIFORMIS, <i>Sow.</i>	Min. Con., vol. v, p. 166, tab. 502, fig. 3, 1825.
—	— <i>Woodward.</i> A Synopt. Table of British Org. Remains, p. 21, 1830.
—	— <i>Morris.</i> Catalogue, 1843.
—	— <i>Tennant.</i> A Strat. List of British Fossils, p. 47, 1847.
—	— <i>Austen.</i> Quart. Journ. of the Geol. Soc., vol. vi, p. 477, 1850.
—	— <i>Sharpe.</i> Quart. Journ. of the Geol. Soc., vol. x, p. 192, 1853.

*Diagnosis.* Shell more or less transversely oval and inflated: valves unequally convex, the dorsal one more often the deepest: beak acute, moderately produced and incurved: foramen almost contiguous to the umbo, of moderate dimensions, and entirely surrounded by the tubular prolongations of the deltidium: between the beak ridges and hinge line exists a flattened space, which slightly indents the lateral portions of the umbo.

*The ventral or dental valve* presents a longitudinal depression or shallow sinus, to which, in the opposite valve, a mesial fold corresponds of variable elevation: externally each valve is ornamented with from 30 to 40 plaits, 7 to 12 occupying the mesial fold or sinus, the ridges of the plaits are more or less acute, but, on approaching the front and lateral margins, often become flattened, with a longitudinal indented line along their centre. Dimensions and relative proportions very variable: length,  $6\frac{1}{2}$ , width, 7, depth, 7 lines.

„	7	„	9	„	6	„
„	8	„	$8\frac{1}{2}$	„	6	„

*Obs.* *Rh. nuciformis* was stated by Sowerby to be a *globose shell, smaller than a hazelnut, the edges of the plaits being rounded, and near the front often with a sunk line upon them (loc. Farrington)*; and although distinguished in England from other *Rhynchonellæ*, has, on the Continent, been very generally confounded with other forms. M. D'Orbigny places it as a synonym of *R. depressa* (Sow. sp.),<sup>1</sup> but from which it appears to differ by its general shape, which is transversely or oblongly oval, and at times almost circular, with its plaits often split near the front and margins, as is so well exemplified in the Palæozoic *Rh. Wilsoni* and other similar forms. While *R. depressa* (Sow.), as its name implies, is a depressed shell with imbricated plaits, this last character not having been observed in true *R. nuciformis*. Prof. Bronn commits another mistake, by considering the shell we are describing to be the same as *R. plicatilis*,<sup>2</sup> from which it appears removed by more than

<sup>1</sup> The author of the 'Pal. Franç.,' does not appear to have been acquainted with Sowerby's *R. nuciformis* and *depressa*, for his figure of this last ('Pal. Franç.,' vol. iv, pl. 491, figs. 1, 7), does not agree with any of the examples found in England.

<sup>2</sup> 'Index Pal.,' vol. ii, p. 1246.

one character, as may be easily perceived by comparing the figures or examples of the two species.

*R. nuciformis* is not very rare in the Upper Green Sand of Farringdon; it also occurs in the Chloritic Beds of Chardstock, where it has been collected by Mr. Wiest, &c.

Plate XI, figs. 23 and 24. Two typical examples from the Upper Green Sand of Farringdon (collection of Mr. Sharpe); fig. 23<sup>a b c</sup>, are enlarged representations to show the character of the plaits.

„ fig. 25. A transverse and less gibbose specimen, from the same locality and collection.

„ figs. 26 and 27. Two other examples from Farringdon, in the cabinet of Mr. Lowe.

Plate XII, fig. 27. From the Upper Green Sand of Niton, Isle of Wight, in the collection of Mr. S. H. Saxby.

43. RHYNCHONELLA MARTINI, *Mantell*, Sp. Plate XII, figs. 15, 16.

TEREBRATULA MARTINI, *Mantell*. Geol. of Sussex, p. 131, 1822.

— PISUM, *Sowerby*. Min. Con., vol. vi, p. 70, tab. 536, figs. 6, 7, 1826.

— — *Fleming*. A Hist. of British Animals, vol. i, p. 374, 1828.

— — *Woodward*. A Synop. Table of British Org. Remains, p. 21, 1830.

— — *V. Buch*. Class. des Térébratules, Mém. de la Soc. Géol. de France, vol. iii, p. 148, pl. xv, fig. 18 *bis*, 1838.

— BREVIROSTRIS, *Ræmer*. Die Vers. Nord. Kreid., pl. vii, fig. 7, 1840.

— MARTINI, *Morris*. Catalogue, 1843.

RHYNCHONELLA PISUM, *D'Orb*. Prodrome, vol. ii, p. 171, 1850.

*Diagnosis*. Shell sub-orbicular, longer than wide, nearly square in front: valves almost equally convex, with the greatest depth at a short distance from the beaks, a slight longitudinal depression existing towards the front of either valve: no regular sinus nor mesial fold: margin nearly straight all round or slightly raised in front: beak short, acute, and moderately incurved, with a flattened space between the beak ridges and hinge line: foramen small, contiguous to the umbo, and entirely surrounded by a deltidium and its tubular prolongations: externally each valve is ornamented by from 30 to 40 delicate plaits, intersected by numerous concentric lines of growth. Length  $4\frac{1}{2}$ , width 4, depth  $2\frac{1}{2}$  lines.

*Obs*. *R. Martini* is a small shell, never greatly exceeding the dimensions above stated, and more often not as large. The plaits are narrow, delicate, and augment here and there by intercalation: the numerous, closely packed, and slightly raised concentric lines of growth gives to the ridges of the plaits a granulated aspect, which is more deceptive than real.

This species was, for the first time, named and described by the celebrated author of

the 'Geology of Sussex,'<sup>1</sup> and although unfigured at that period, may be easily identified, being a shell well known to British geologists. In 1826 Sowerby figured and described the same species under the new appellation of *Terebratula pisum*, the same as had been given some years before by Mantell to a similar shell, mentioning Hamsey as his locality; and it seems singular that the greater number of subsequent authors preferred the Sowerby denomination, and it was only in 1843 that Mr. Morris, in his 'Catalogue,' reestablished Mantell's claims, by placing *T. pisum* as a synonym. *Ter. brevisrostris* (Roemer, 1840) has no better claims, being identical, both in shape and character with the Mantellian type. V. Buch adopts Sowerby's name, stating that the species does not appear to differ essentially from *R. octoplicata* of the same author! but this will require confirmation before being admitted, as the species seems to be little known to continental authors, he mentions several localities.

*R. Martini* abounds in the Chalk Marl and Grey Chalk of Hamsey and Folkstone, it has likewise been obtained from the "Chalk detritus" of Charing (Kent) by Mr. Harris; and some rare individuals have also been discovered in the Upper Green Sand of Horningsham, near Warminster, associated with another small species, which has since been termed *Rh. Grasiana* by M. d'Orbigny; the last-named shell seems to differ from the true *R. Martini* by its greater breadth and gibbosity, as well as by the frontal margin of the ventral valve greatly indenting that of the dorsal one. Mr. S. P. Woodward seems inclined to consider *R. Grasiana* as the adult state of *R. Martini* an opinion which may perhaps prove to be correct, but which I do not yet consider sufficiently demonstrated, from never observing among the numerous examples of *R. Martini*, found at Hamsey and Folkstone, specimens presenting the characters assigned to *R. Grasiana*: it may, therefore, for the present, be desirable to describe both separately; but if future observers should decide on the two being considered as one, then M. d'Orbigny's name will require to be placed as the synonym, on account of Mantell's priority, and it is but just to observe that, while proposing his name, *R. Grasiana*, the distinguished French Palæontologist did not omit to remark that, "*perhaps his species is the T. pisum of Sow., but which he was unable to affirm, on account of the differences which he remarks between his specimens and those figured by Sowerby*" ('Pal. Franc.' *Ter. Cret.*, vol. iv., p. 38); but, although fully admitting the difficulty, still specimens of the true *R. Martini*, perfectly agreeing with the figures published by Sowerby of *T. pisum*, occur in France, and have been collected more than once, both by M. Bouchard and myself, at Cap Blanc Nez, near Calais.

<sup>1</sup> Page 131, "*Ter. Martini*, subscrotiform, longitudinally striated, margin finely serrated; both valves slightly depressed in front, beaks very small. This is a minute and delicate species, scarcely 0·3 inch either in length or width; each valve is marked with upwards of 30 longitudinal striæ, and both equally convex. The margin is finely serrated by the terminations of the striæ, and is nearly straight in front, the sides are not waved, as in the last species (*T. sulcata*), named after W. Martin. Locality—Hamsey."

- Plate XII, fig. 15. A typical example (fig. 15 *a, b*, enlarged) from the Grey Chalk in the vicinity of Folkstone, I avail myself of this occasion to thank Mr. Mackie for the opportunity he has kindly afforded me in the examination of an extensive series of this and other species from his locality.
- „ fig. 16. A specimen from the Chalk Detritus of Charing (Kent), in the collection of Mr. Harris :—fig. 16<sup>a</sup> is an enlarged illustration, to show how the plaits augment at times by intercalation ; this is, however, an extreme case, as in the generality of specimens the plaits appear more regular.
- „ fig. 16<sup>d</sup>. A specimen from the Upper Green Sand of Chute, near Warminster ; from the cabinet of Mr. Cunnington.

44. RHYNCHONELLA GRASIANA, *D'Orbigny*. Plate XII, figs. 17, 19.

RHYNCHONELLA GRASIANA, *D'Orbigny*. Pal. Franç., Ter. Crétacés, vol. iv, p. 497, figs. 7—11, 1847.

*Diagnosis*.—Shell transversely oval, somewhat obtusely five-sided ; slightly indented in front. Valves unequally convex, the *dorsal* or socket one commonly the deepest, without a produced prominent mesial fold. In the *ventral valve* a wide longitudinal sinus of moderate depth, extends from near the centre of the valve to the front, where the margin indents considerably that of the opposite valve ; beak short, acute ; foramen small, and entirely surrounded by the large tubular expansions of the deltidium ; a flattened space exists between the beak ridges and hinge line, which last slightly indents the lateral margins of the umbo. Externally each valve is ornamented by from 46 to 56 small plaits, at times augmented by the intercalation of smaller ones at various distances from the beak and umbo. Length 5, width 5, depth 3 lines.

*Obs.* We need not repeat the observations relative to this form noticed under *R. Martini* (Mantell) ; but it would appear that some French examples have attained larger dimensions than any hitherto obtained from our British localities ; thus a well formed specimen from the Basse Alpes (for which I am indebted to M. d'Orbigny), measures, length 7, width 7, depth 5 lines ; and I have seen a few even exceeding those measurements. The author of the 'Pal. Franc.' justly observes, that certain examples of this species somewhat resemble *R. Cuvieri* (D'Orb.) in their external contour, but may be distinguished by the greater number of plaits, position of the foramen, and less sinuous margins.

*R. Grasiana* abounds in the Upper Green Sand of Chute, near Warminster, in Ferruginous Beds of the same age near Clifton Hampden (Mr. Sharpe's collection), and in the Chloritic beds of Chardstock. In France, it is found in the Upper Green Sand near Havre (Seine Inf.), and in the neighbourhood of Grasse.

- Plate XII, fig. 17. A specimen, natural size, from the Upper Green Sand of Chute Farm, near Warminster.
- „ fig. 18. Another example, greatly enlarged.
- „ fig. 19. A specimen from the same locality, in the British Museum.
- „ fig. 19<sup>d</sup>. Magnified illustration, to show the large development of the tubular expansions of the deltidium.
- „ fig. 19<sup>e</sup>. A very transverse and fine example from the Upper Green Sand, near Warminster, in the collection of Mr. Sharpe.

45. RHYNCHONELLA PARVIROSTRIS, *Sow.* Sp. Plate XII, figs. 13—14.

TEREBRATULA PARVIROSTRIS, *Sowerby, in Fitton.* Trans. Geol. Soc., vol. iv, 2d ser., pl. xiv, fig. 13, 1836.

— — *Morris.* Catalogue, 1843.

— — *Forbes.* Cat. of Lower Green Sand Fossils, Quart. Journ. Geol. Soc., vol. i, p. 345, 1845.

*Diagnosis.* Shell imperfectly tetrahedral, wider than long; valves unequally convex; beak narrow, slightly incurved, tapering rapidly to an acute point; foramen rather small, contiguous to the hinge line, but entirely surrounded by a deltidium; beak ridges well defined, a flattened space existing between them and the hinge line. Near to the extremity of the beak commences a deep longitudinal sinus, which extends to the front; the middle portion of the valve presents a somewhat concave curve, from the plaits being bent upwards near their extremities. The *dorsal* or socket valve is more inflated than the opposite one, with a produced mesial fold, which rises rapidly to within a short distance of the front, where it bends downwards to meet the edge of the sinus of the ventral valve. Externally, from 35 to 40 plaits ornament each valve, 8 to 10 of these forming the mesial fold and sinus. Dimensions variable: length 8, width 10, depth  $6\frac{1}{2}$  lines.

*Obs.* Adult individuals of this species seem well distinguished from other Cretaceous *Rhynchonellæ* by the peculiar bend of their valves and plaits; the hinge line is likewise less oblique, and more obtuse than what is seen in the generality of species; young examples are, however, much depressed, and not always readily to be distinguished from specimens of *R. latissima*, *Sow.*, of a similar age.

*R. parvirostris* is found in the Lower Green Sand of Shanklin (Isle of Wight), where it has been obtained by many Palæontologists.

In 1845, Professor Forbes considered *R. parvirostris* to be a variety of *R. sulcata* (Parkinson); but I could not trace a sufficient resemblance to admit the conclusion arrived at by that distinguished Palæontologist.

Plate XII, fig. 13. An adult individual, from the Lower Green Sand of the Isle of Wight.

„ fig. 14. A younger shell, from the same bed and locality.



46. RHYNCHONELLA GIBBSIANA, *Sow.* Sp. Plate XII, figs. 11, 12.

- TEREBRATULA GIBBSIANA, *Sowerby.* Min. Con., vol. vi, p. 72, tab. 537, fig. 4, 1829.  
 — GIBBSII, *Woodward.* A Synoptical Table of British Organic Remains,  
 p. 21, 1830.  
 — GIBBSIANA, *Morris.* Catalogue, 1843.

*Diagnosis.* Shell somewhat obtusely triangular, generally wider than long, with a moderately developed mesial fold in the *dorsal* valve, to which corresponds a sinus in the *ventral* one; beak acute, not much produced or incurved; foramen rather small, and surrounded by a deltidium; beak ridges sharply defined, with a flattened space between them and the hinge line, margins sinuous, the frontal edge of the ventral valve greatly indenting that of the opposite one. Each valve is exteriorly ornamented by from 45 to 50 small delicate plaits, 10 or 12 of these occupying the mesial fold and sinus. Dimensions variable, the greatest depth near the umbo; length  $7\frac{1}{2}$ , width 9, depth 5 lines;

„ 8 „ 8 „  $4\frac{1}{2}$  „

*Obs.* M. d'Orbigny considers this shell to be a variety of *R. sulcata*, but I do not feel prepared to admit that conclusion; *R. Gibbsiana* appears to me to be a much more triangular shell, with a deeper sinus, and externally ornamented by smaller or more delicate plaits; it seems peculiar to the *Lower Green Sand*, of Sandgate, Hythe, Pluckley, Peasmarsh, as well as at Sandown and Atherfield, Isle of Wight, (collection of Mr. S. Saxby). Some exceptional specimens found at Hythe bear resemblance to *R. latissima*, *Sow.*

The author of the 'Pal. Française,' moreover states, that the reference to this species published by Professor Forbes in his 'Catalogue of the Lower Green Sand Fossils' is incorrect; but on what grounds this assertion is made, I am at a loss to understand; it would, on the contrary, appear to me, that the French author had himself erroneously identified our British type, which he refers to his TERRAIN ALBIAN, which is not the age of our fossil in the vicinity of Folkstone, or other British localities.

Professor Bronn seems to be still further from the mark, while stating, in his 'Index Palæontologicus,' that *R. Gibbsiana* is nothing more than a variety or synonyme of *R. plicatilis*, *Sow.*!

Plate XII, fig. 11. A specimen from the *Lower Green Sand* of Sandown, Isle of Wight.

„ fig. 12. A rather enlarged example, from the Lower Green Sand, at Pluckley, in the collection of Mr. Harris.

„ fig. 12<sup>c</sup> Another specimen, nat. size, from Hythe.

47. RHYNCHONELLA LINEOLATA, *Phillips*, Sp. Plate XII, figs. 6—10.

- TEREBRATULA LINEOLATA, *Phillips.* Geol. of Yorksh., vol. i, p. 178, pl. ii, fig. 27, 1835.  
 — LINEOLATA, *Morris.* Catalogue, 1843.

TEREBRATULA SUBLINEARIS, *Münster?* MS. (Cambridge Museum.)<sup>1</sup>

— LINEOLATA, *Bronn.* Index Pal., p. 1240, 1848.

— — *D'Orbigny.* Prodrome, vol. ii, p. 120, 1850.

*Diagnosis.* Shell ovate, more or less elongated; unequally convex and flattened; *ventral* valve commonly the deepest, with a slight and shallow longitudinal sinus; beak acute, moderately incurved; foramen small, circular, and surrounded by a deltidium. The *dorsal* valve is regularly convex to within a short distance of the front, where the surface exhibits either two or more plaits, with a mesial depression along the middle; externally, each valve is ornamented by numerous minute longitudinal striæ, which sometimes dichotomise near their extremities, or unite towards the front and lateral margins, forming a series of larger ribs; the lateral margins are but slightly flexuous, the frontal edge of the ventral valve indenting more or less that of the dorsal one.

Dimensions variable: length 8, width  $7\frac{1}{2}$ , depth 6 lines;

„ 4, „ 4, „ 3 „

*Obs.* This remarkable species was insufficiently figured and named (but not described) by Professor Phillips, from an unusually large example (Pl. XII, fig. 6,) obtained by Mr. Bean, in the Speeton Clay of Knapton, Yorkshire. The original type, still in the possession of Mr. Bean, was kindly forwarded for my examination, and I at once perceived that it belonged to the genus *Rhynchonella*; the external surface is entirely covered by delicate longitudinal striæ, 7 or 8 occupying the breadth of a line.

<sup>1</sup> Both Münster and Goldfuss have given many MS. names to species of Brachiopoda in the shape of catalogues, as well as to specimens in the Museum of Bonn; but these can claim no right to priority, never having been described nor figured, but in some cases having been adopted and referred to by Palæontologists. It may not prove devoid of interest to add some particulars kindly communicated by Dr. F. Rømer, of Bonn.

In a catalogue intitled *Verzeichniss der Versteinerungen welche in der Kreis-Naturalien-Sammlung zu Bayreuth Vorhanden sind Bayreuth im September, 1833*, 8vo, pp. 115, Count Münster names the following species, the majority of which are only MS. denominations:

- P. 44. *Ter. septemplicata*, from the Jurassic Limestone of Ebermannstadt.
- P. 45. *Ter. striato-plicata*, from the Jurassic Limestone of Streitberg.
- P. 46. *Ter. alaria*, from the ferruginous Oolite of Rabenstein and Thurnau.
- P. 47. *Ter. canaliculata*, from the Jurassic Limestone of Würgau.
- *Ter. pentaëdra*, from the Jurassic Limestone of Oberfellendorf.
- P. 48. *Ter. nana*, from the Jurassic Limestone of Streitberg.
- *Orbicula? dubia*, and *O.? semilunaris*, from Streitberg and Obermönchan.
- *Crania? paradoxa*, ibidem; *C.? pileus*, and *C. obscura*, Streitberg.
- P. 73. *Ter. pentagona, subovoïdes, angularis*,
- P. 74. *Ter. striato-plicata, semiplicata, subdecussata, quadrifida, Delthyris acuticosta*, } from the Lias of Franconia.
- Del. speciosa*,
- P. 101. *Ter. Schlotheimii, sublata, subelongata*, from the Productus Limestone of Regnitzlosau.
- *Ter. coiculam*, from the Dev. Limestone of Elbersreuth.
- *Ter. gracilis, reflecta*, ibidem.
- P. 102. *Ter. subcrumena*, from the Dev. Rocks of Geroldsgrün.
- *Atrypa dubia, subcurvata*, from the Dev. Rocks near Hoff, in Franconia.
- *Atrypa glabra, A. rugosa*, from the Productus Limestone of Regnitzlosau.
- *Gypidia pelargonata*, ibidem.
- P. 103. *Delthyris alata, Lept. polymorpha*, from the Productus Limestone near Hoff.
- P. 104. *Lept. concentrica, aculeata, linearis, setosa, subrucosa, speluncaris*, from the Productus Limestone of Regnitzlosau.

GOLDFUSS added a long list of names of Brachiopoda (many of which can be only made out by com-

In the *Upper Green Sand* of Cambridge, a dwarf race of the same species has been plentifully collected by Mr. Carter, and appears to agree in all essential characters with the Speeton Clay specimen, except in dimensions. Mr. Carter considers the shell denominated *Ter. sülllinearis*, by Count Münster, in the Cambridge Museum, to be specifically distinct from the one found in the Cambridge Upper Green Sand.

I collected the same shell in the *Tourtia*, near Tournay, in Belgium, it is exactly similar, but a little larger than those commonly met with at Cambridge; the last are also comparatively much more coarsely striated than the single example I have seen from Knapton, where the species would appear to be very rare.

Plate XII, fig. 6. The original type specimen from the Speeton Clay of Knapton.

„ fig. 6<sup>44</sup>. Are enlarged illustrations.

„ figs. 7, 8, 9. Specimens of a dwarf race from the *Upper Green Sand* of Cambridge, in the collection of Mr. Carter. These illustrations are enlarged, the vertical line indicates the natural size.

#### ARGIOPE.

In p. 16 of the present Monograph, will be found described as *Argiope decemcostata*, Römer, Sp., a shell common to the Chalk of England, France, Belgium, Prussia, &c.; but after the publication of the first portion of this monograph, I was informed by M. de Hagenow, that he still doubted the shells I had figured (Pl. III, figs. 1, 13), as

paring the originals in the Museum of Bonn), in the *Handbuch der Geognosie*, von H. T. de la Beche: *nach der zweiten Auslage des Englischen originals bearbeitet*, von H. von Dechen, Berlin, 1832. These are:

- P. 382. *Ter. impressa*, from the white Jurassic Marls at Hohenzollern, Stufnberg Urach.  
 P. 523. *Lept. convoluta, furcata, capillata, minuta*, from the Dev. Limestone of the Eifel.  
 — *Lept. striata, pectinata*, from the Dev. Greywacke of Coblenz.  
 — *Lept. loevis*, from the Carb. Limestone of Visé.  
 P. 524. *Lept. corrugata, considea*, ibidem.  
 P. 525. *Orthis radiata*, Eifel; *O. costata*, Kentucky; *O. granulosa*, Catskill Mountains; *O. fasciculata*, Eifel; *O. nodosa*, Eifel; *O. undulata*, Albany.  
 — *Delthyris microptera*, Eifel, Gloucestershire, Herefordshire; *D. compressa* (*D. triangularis*, Sow.), Bamsberg, Derbyshire; *D. heteroclyta* (*Calceola heteroclyta*, Def.), Eifel; *D. macroptera*, Eifel, Catskill Mountains.  
 P. 526. *Delt. ceptoptera*, Eifel; *D. pachyoptera*, N. York; *D. dorsata*, Straberg; *D. bisulcata*, Visé; *D. canalifera* (*Ter. aperturata*, Schl.; *T. canalifera*, Sow.), Bamsberg; *D. canaliculata*, Bamsberg; *D. polymorpha*, Ratingen; *D. incisa*, Ratingen, Moskau; *D. symmetrica*, England; *D. curvata* (*Ter. curvatus*, Schl.), Eifel; *D. bicipitata*, *D. radiata*, *D. thecaria*, Ratingen; *D. striatula* (*Ter. striatulus*, Schl.), Eifel.  
 P. 527. *D. vestita* (*Ter. vestitas*, Schl.), Ratingen; *D. concentrica*, ibid.; *D. imbricata* (*T. imbricata*, Sow.) ibid.; *Gypidia gryphoides* (*Uncites Gryphus*, Def.), Paffrath; *G. loevis*, ibid.; *Strigocephalus striatus*, Eifel; *Atrypa nitida*, Lake Simcoe.  
 P. 528. *Ter. triloba*, *T. canaliculata*, *T. quinquelatera*, *T. dichotoma*, *T. pentagona*, *T. Wahlebergii*, *T. subglobosa*, *T. bifida*, *T. clavata*, from the Eifel; *Ter. Dalmanni*, Carb. Limestone of Ratingen; *T. Anygdale*, Eifel; *T. complicata*, Dev. Rocks of Irelohn.

The only Brachiopoda described and figured by Goldfuss are those published in his great work, 'Petrefacta Germaniæ.'

belonging to the Essen species; that they were identical with those he had published in 1842, under the names of *Orthis (Argiope) Bronnii* and *O. (Argiope) Buchii*. This view may probably prove correct, and I may have been led into error from having placed too much value on the fact, that many individuals of the Chalk species possess ten costæ, and thus so far agreeing with Rømer's Green Sand species. In 1852, I was acquainted with no other British species or specimens of *Argiope* lower down than the Soft or Upper Chalk, but since that period, I have been able to examine several others from the *Lower Chalk* of Kent and *Upper Green Sands* of Warminster and Cambridge. It will therefore be desirable to reconsider our British Cretaceous Argiopes.

48. ARGIOPE MEGATREMA, *Sowerby*, Sp. Plate XII, figs. 31—32, and 34—36.

TEREBRATULA MEGATREMA, *Sowerby*, in *Fitton*. Trans. Geol. Soc., vol. iv, 2d series, p. 343, pl. xviii, fig. 3 (read in 1827, printed in 1836.)

— — *Morris*. Catalogue, 1836.

— DECEMCOSTATA, *Rømer*. Vers. Nord. Kreid, p. 41, tab. 13, 1840.

— MEGATREMA, *Bronn*. Index Pal., p. 1241, 1848.

— — *D'Orbigny*. Prodrome, vol. ii, p. 172, 1850.

— — A Cat. of the Terebratulæ in the British Museum, p. 56, 1853.

— DECEMCOSTATA, *Dr. Fr. Rømer*. Die Kreid, Westphalans, p. 71, 1854.

*Diagnosis.* Shell transversely obovate, or obtusely pentagonal; valves almost equally and moderately convex, deepest near the umbo; beak produced, nearly straight, truncated by an oblique and large foramen; beak ridges defined, leaving between them and the hinge line a more or less developed triangular area; hinge line as long or shorter than the greatest width of the shell. The external surface of each valve is ornamented by from ten to twelve ribs, with flattened interspaces between. The costæ correspond in each valve, a few smaller ones being intercalated between the larger ones near the frontal margin. In the interior of the *dorsal valve*, the loop first fixed to the base of the dental sockets is folded into two lobes, and attached to a single mesial plate.<sup>1</sup> Length  $2\frac{1}{2}$ , width 3, depth  $1\frac{1}{2}$  lines.

*Obs.* So rare is this little shell, that for many years I was unable to trace a single example; and it was only during a recent visit to the Bristol Institution Museum, that I had the good fortune to discover in that collection one example, which proved, on examination, to agree with the shell described and figured by Sowerby, in the 'Geological Transactions;' it is a true *Argiope*, not a *Terebratula*, as generally supposed. Rømer's figure of *A. decemcostata*, Pl. XII., fig. 35, and another, fig. 36, furnished by M. de Hagenow, might at first sight indicate a distinct species on account of the length of the hinge line and area, but having recently received from Dr. Fr. Rømer a specimen collected

<sup>1</sup> The interior of this species has been admirably described and figured by M. Suess, in his excellent memoir entitled 'Ueber die Brachial-Vorrichtung bei den Thecideen,' pl. iii, fig. 1 (Aus dem Decemberhefte des Jahrganges, 1853) der Sitzungsberichte der mathem-naturw. Classe der kais Akademie der Wissenschaften (xi Bd., s. 991), besonders abgedruckt.

by himself at Essen, I became convinced that this long hinge line was exceptional, and that the true characters of the species are similar to those assumed by *A. megatrema*, Sow., or intermediate between figs. 32 and 34, five or six examples of the last having been discovered by Mr. Carter in the Upper Green Sand near Cambridge.

- Plate XII, fig. 31. The original figure of *Terebratula Megatrema*, Sowerby, from the 'Geological Trans.,'<sup>1</sup> vol. x.—Fig. 31<sup>a</sup>. An enlarged illustration.
- „ fig. 32. A specimen from the Upper Green Sand of Warminster, in the Bristol Institution Museum.—Fig. 32<sup>a b</sup>. Enlarged figures.
- „ fig. 34. A British example, from the Upper Green Sand of Cambridge, in the collection of Mr. Carter.—34<sup>a b c</sup>, enlarged. This specimen shows the intercalated ribs.
- „ fig. 35. Rœmer's published figure of *Ter. decemcostata* considerably enlarged, from the Green Sand of Essex, and introduced here to facilitate comparison.
- „ fig. 36. Another example from the same locality, drawn by M. de Hagenow.—36<sup>a</sup>, enlarged illustration.

ARGIOPE BRONNII, *De Hagenow*, Sp. Plate III, figs. 1—13, and Plate XII, figs. 37, 38.

(Described as ARGIOPE DECEMCOSTATA, *Rœmer*, in p. 16 of the present Monograph.)

ORTHIS BRONNII, *V. Hag.* Neuv. Jahrb. F. Mineral, pl. ix, fig. 7, 1842.

— BUCHII, *V. Hag.* Ib., pl. ix, fig. 8, 1842.

TEREBRATULA DUVALII, *Dav.* London Geol. Journal, p. 113, pl. xviii, figs. 15—18, 1847.

MÉGATHYRIS CUNEIFORMIS, *D'Orb.* Pal. Franç., Ter. Crétacés, vol. iv, p. 147, pl. 521, figs. 1—11, 1847.

Having already fully described this species, I will simply remark that it is found in the Upper Chalk of Northfleet, Gravesend, Meudon (France), and in Prussia. It possesses in general fewer ribs than the Upper Green Sand species, and its dorsal valve is likewise less convex. M. de Hagenow having kindly presented me with specimens of both his *A. Bronnii* and *A. Buchii*, I was able to convince myself that they belong to a single species, identical in shape and character with those found in England and France; and to facilitate comparisons, I have reproduced, in Plate XII, the original published figures of M. de Hagenow's two species.

Plate XII, fig. 33. Illustrates the only specimen of *Argiope* hitherto discovered in the *Lower Chalk* of Kent (British Museum).

„ fig. 33<sup>a</sup>. A magnified illustration of the same.

<sup>1</sup> Sowerby describes his species, as follows:—*Ter. megatrema*: moderately convex, transversely obovate, with a few distinct ribs. The beak is large and produced with a very large perforation, whence the name.

49. CRANIA CENOMANENSIS, *D'Orbigny*. Plate XII, figs. 40, 41.

CRANIA CENOMANENSIS, *D'Orbigny*. Pal. Franç., Ter. Crétacés, vol. iv, p. 138, pl. 524, figs. 1—4, 1847.

— — — *Sharpe*. Quart. Journ. of the Geol. Soc., vol. x, p. 193, 1853.

*Diagnosis.* Shell unsymmetrical, transversely oval: *lower* or *ventral* valve thick, and almost flat, attached to marine objects by a large portion of its external surface; interiorly a raised margin surrounds the shell, four principal muscular impressions occupy the posterior half of the inner disk, the posterior adductor pair are large and oval, slightly produced, and placed obliquely close to each other and to the cardinal edge. The anterior adductor impressions are almost approximate at their base, and situated close to the centre of the shell, with their outer extremities directed upwards, so that a lozenge-shaped depression remains between the four large impressions above described; towards the centre of the shell there likewise exists a small elongated projection, the remaining portion of the inner disk exhibiting distinct imprints of the vascular system. The *dorsal* or upper valve is thin, conical, or patelliform; the vertex sub-central, rough externally. The interior is deep, with a thin concave border, which fits upon and over the raised margin of the opposite valve, a small inner ridge surrounds the shell at a short distance from the edge. The posterior adductor scars are oval and widely separate; the anterior pair are placed near the centre of the valve, and in contact at their base, with their outer extremities directed upwards and towards the cardinal angles of the valve.

Dimensions variable: length 4, width 5;

„ 4½, „ 7, height 2 lines.

*Obs.* The only British specimens of this species I have been able to examine were discovered by Mr. Sharpe in the Upper Green Sand or gravel, of Farringdon, and belong to one upper and lower valve of two different individuals. The ventral valve (Pl. XII, fig. 40) is very flat, with a serpula covering a portion of its outer surface, and this is likewise the first example of the attached valve hitherto discovered, M. d'Orbigny being only acquainted with the dorsal one (Pl. XII, fig. 41), with which Mr. Sharpe's specimen perfectly agrees; I must, therefore, dissent with the last-named gentleman, who considers his upper valve to belong perhaps to the large chalk *Crania*, found at Ciply, in Belgium, termed *C. Parisiensis* by Mr. Sharpe,<sup>1</sup> but which appears to me specifically distinct from the species which bears that name.

Plate XII, fig. 40. *Lower valve* from Farringdon, in the collection of Mr. Sharpe.

„ fig. 40<sup>a</sup>. Enlarged illustration.

„ fig. 41. *Upper valve* from the same locality and collection; 41<sup>a</sup>, enlarged.

<sup>1</sup> Quart. Journal Geol. Soc., vol. x, p. 192, 30th Nov., 1853.



TABLE ILLUSTRATING THE GEOLOGICAL DISTRIBUTION OF THE  
BRITISH CRETACEOUS BRACHIOPODA.

Genus or Sub-genus.	Species.	Author.	Date.	Reference to the Plates and Figures in this Monograph.  (Part II.)	Lower Green Sand.	Speeton Clay.	Gault.	Red Chalk.	Upper Green Sand.	Farrington Sponge Gravel.	Chlor. Marl or Chalk with Silic. grains.	Lower Chalk or Chalk Marl.	Chalk.
					*	*	*	*	*	*	*	*	*
Lingula truncata . . .		Sowerby	1827	pl. i, figs. 27, 28, and 31	*								
„ sub-ovalis <sup>1</sup> . . .		Davidson	1852	pl. i, figs. 29, 30 . . .	*				*				
Crania Parisiensis . . .		Defrance	1819	pl. i, figs. 1—7 . . .	*				*				
„ Ignabergensis <sup>2</sup> . . .		Retzius	1781	pl. i, figs. 8—14 . . .	*				*				
„ cenomanensis . . .		D'Orbigny	1847	pl. xii, figs. 40—41 . . .	*				*				
Thecidium Wetherellii <sup>3</sup> . . .		Morris	1851	pl. i, figs. 15—26; & pl. xii, fig. 39 . . .	*				*				
Argiope megatrema . . .		Sowerby	1836	pl. xii, figs. 31—36 . . .	*				*				
„ Bronnii <sup>4</sup> . . .		De Hagenow	1842	pl. iii, figs. 1—13; & pl. xii, figs. 37, 38 . . .	*				*				
Magas pumila . . .		Sowerby	1816	pl. ii, figs. 1—10 and 23 ?	*				*				
Terebratella Menardi <sup>5</sup> . . .		Lamarck	1819	pl. iii, figs. 34—42 . . .	*				*				
„ pectita . . .		Sowerby	1818	pl. iii, figs. 29—33 . . .	*				*				
Trigonosemus elegans . . .		Kœnig	1825	pl. iv, figs. 1—4 . . .	*				*				
„ incertum <sup>6</sup> . . .		Davidson	1852	pl. iv, fig. 5 . . .	*				*				
Terebrirostra lyra . . .		Sowerby	1818	pl. iii, figs. 17—28 . . .	*				*				
Megerlia lima <sup>7</sup> . . .		Defrance	1828	pl. iv, figs. 15—28; and pl. v, figs. 1—4 . . .	*				*				
Terebratulina striata . . .		Wahlenberg	1821	pl. ii, figs. 18—28 . . .	*				*				
„ gracilis, and var. rigida . . .		Schlotheim	1813	pl. ii, figs. 13—16 . . .	*				*				
Terebratula? capillata? <sup>8</sup> . . .		Sowerby	1829	pl. ii, fig. 17 . . .	*				*				
		D'Archiac	1847	pl. v, fig. 12 . . .	*				*				

<sup>1</sup> This species has been found by Mr. S. H. Saxby, in the Blue Rag of the Upper Green Sand series, at Bonchurch (Isle of Wight).

<sup>2</sup> Erroneously spelt Egnabergensis, in p. 11. This is *Numulus minor* of Stobæus, 1732.

<sup>3</sup> Several ventral or attached valves of a *Thecidium*, considered to belong to *T. Wetherelli* (Pl. XII, fig. 39), have been collected by Messrs. Sharpe, Wright, Morris, and myself, in the Sponge Gravel of Farrington. They have been found adhering to valves of *Ter. depressa* (Lamarck), to the *Actinopora papyracea*, *Manon Farringtonensis*, &c. Specimens with both valves are found in the Chalk of Brighton.

<sup>4</sup> This shell has (according to M. de Hagenow) been erroneously described and figured in this Monograph, under the name of *Arg. decemcostata* (p. 16, and Pl. III, figs. 1—13), but corrected again in p. 102. Although I do not yet consider the question finally settled.

<sup>5</sup> Several examples of this shell have been found by Mr. Wiest, in the Chloritic bed of Chardstock, along with *T. pectita*; the last-named species has likewise been found by Mr. S. H. Saxby, in the *Chloritic Marl* of the Isle of Wight.

<sup>6</sup> In 1852, only one example was known, but since that period several others have been discovered in the neighbourhood of Chardstock, by Mr. Wiest.

<sup>7</sup> In p. 40, I proposed to establish a *Sub-genus KINGINA* for the reception of this and other similarly organised forms, based upon certain modifications, in the shape and attachment of the apophysary skeleton or loop; but from its having been subsequently observed that these differences were not essentially distinct from what we find in Professor King's sub-genus *Megerlia*, I am ready to abandon my former view, as it is always incumbent to simplify the nomenclature, when it can be achieved without serious effects.

<sup>8</sup> M. de Koninck has informed me, that this species was named *Spondylus undulatus*, by Geinitz, in 1839, and figured in the 'Die Vers. von Kieslingswalda,' pl. vi, fig. 8, 1843. I have seen the original example, now at Liege, in M. de Koninck's collection, and it is certainly the same shell as subsequently described by the name of *T. capillata*, by Viscount d'Archiac.



Genus or Sub-genus.	Species.	Author.	Date.	Reference to the Plates and Figures in this Monograph.  (Part II.)	Lower Green Sand.	Speeton Clay.	Gault.	Red Chalk.	Upper Green Sand	Farrington Sponge Gravel.	Chlor. Marl or Chalk with Silic. grains.	Lower Chalk or Chalk Marl.	Chalk.
Terebratula?	ovata . . .	Sowerby	1812	pl. iv, figs. 6—13 . . .	..	..	..	..	..	..	..	..	..
"	? rugulosa . . .	Morris	1847	pl. iv, fig. 14 . . .	..	..	..	..	..	..	..	..	..
"	? squamosa . . .	Mantell	1822	pl. v, figs. 5—11 . . .	..	..	..	..	..	..	..	..	..
"	? oblonga . . .	Sowerby	1826	pl. ii, figs. 29—32 . . .	*	..	..	..	..	..	..	..	..
"	obesa . . .	Sowerby	1823	pl. v, figs. 13—16 . . .	..	..	..	..	..	..	..	..	..
"	biplicata . . .	Brocchi	1814	pl. vi, figs. 1—49; and pl. ix, figs. 37 and 40?	?	*	*	*	*	*	*	?	..
"	prælonga . . .	Sowerby	1836	pl. vii, figs. 1, 2 . . .	*	..	..	..	..	..	..	..	..
"	sella . . .	Sowerby	1823	pl. vii, figs. 4—10 . . .	*	..	*	..	..	..	..	..	..
"	Tornacensis? var. Roemeri . . .	D'Archiac	1847	pl. vii, figs. 11—16; and pl. ix, figs. 1—8 . . .	..	..	..	..	..	..	..	..	..
"	sulcifera . . .	Morris	1847	pl. vii, figs. 17—20 . . .	..	..	..	..	..	..	..	..	..
"	semiglobosa and varieties . . .	Sowerby	1812	pl. viii, figs. 6—18 . . .	..	..	..	*	*	..	..	..	..
"	carnea . . .	Sowerby	1812	pl. viii, figs. 1—5 . . .	..	..	..	..	..	..	..	..	..
"	Robertoni . . .	D'Archiac	1847	pl. ix, fig. 25 . . .	..	..	..	..	..	..	..	..	..
"	depressa . . .	Lamarck	1819	pl. ix, figs. 9—24 . . .	..	..	..	..	..	..	..	..	..
"	Carteri . . .	Davidson	1854	pl. vii, fig. 3 . . .	..	..	..	..	..	..	..	..	..
Waldheimea	celtica . . .	Morris	1853	pl. ix, figs. 32—35 . . .	*	..	..	..	..	..	..	..	..
"	tamarindus . . .	Sowerby	1836	pl. ix, figs. 26—31 . . .	..	..	..	..	*	..	..	..	..
Rhynchonella	plicatilis . . .	Sowerby	1818	pl. x, figs. 37—42 . . .	..	..	..	..	..	..	..	..	..
"	var. octoplicata . . .	Sowerby	1818	pl. x, figs. 1—17 . . .	..	..	..	..	..	..	..	..	..
"	var. Woodwardii . . .	Davidson	1854	pl. x, figs. 43—46 . . .	..	..	..	..	..	..	..	..	..
"	limbata <sup>1</sup> . . .	Schlotheim	1813	pl. xii, figs. 1—5 . . .	..	..	..	..	..	..	..	..	..
"	compressa . . .	Lamarck	1819	pl. xi, figs. 1—5; and pl. xii, fig. 25 . . .	..	..	..	..	..	..	..	..	..
"	latissima . . .	Sowerby	1825	pl. xi, figs. 6—22; and pl. xii, fig. 24 . . .	..	..	..	..	..	..	..	..	..
"	depressa . . .	Sowerby	1825	pl. xi, figs. 28—32; and pl. xii, fig. 26 . . .	..	..	..	..	..	..	..	..	..
"	var. A . . .	Davidson	—	pl. xii, fig. 30 . . .	..	..	..	..	..	..	..	..	..
"	var. B . . .	Davidson	—	pl. xii, fig. 28 . . .	..	..	..	..	..	..	..	..	..
"	sulcata . . .	Parkinson	1811	pl. x, figs. 18—36 . . .	..	*	*	..	..	..	..	..	..
"	Mantelliana . . .	Sowerby	1826	pl. xii, figs. 20—23 . . .	..	..	..	..	..	..	..	..	..
"	Cuvieri . . .	D'Orbigny	1847	pl. x, figs. 50—54 . . .	..	..	..	..	..	..	..	..	..
"	nuciformis . . .	Sowerby	1825	pl. xi, figs. 23—27 . . .	..	..	..	..	..	..	..	..	..
"	Martini . . .	Mantell	1822	pl. xii, figs. 14—16 . . .	..	..	..	?	..	..	..	..	..
"	Grasiana . . .	D'Orbigny	1847	pl. xii, figs. 17—19 . . .	..	..	..	..	..	..	..	..	..
"	parvirostris . . .	Sowerby	1836	pl. xii, figs. 13, 14 . . .	..	*	..	..	..	..	..	..	..
"	Gibbsiana . . .	Sowerby	1826	pl. xii, figs. 11, 12 . . .	..	*	..	..	..	..	..	..	..
"	lineolata . . .	Phillips	1836	pl. xii, fig. 6 . . .	..	..	*	..	..	..	..	..	..
"	var. . .	—	—	pl. xii, figs. 7—10 . . .	..	..	..	..	..	..	..	..	..

<sup>1</sup> This is the *sub-plicata* of Mantell, and it may still remain a question whether it should not merely constitute a var. of *R. plicatilis* or *octoplicata*, Sowerby.



## SUPPLEMENTARY OBSERVATIONS ON THE STRATIGRAPHICAL DISTRIBUTION OF THE SPECIES.

The general results in the present Monograph differ from those published by several distinguished contemporaneous authors; it will therefore be necessary to explain the cause of this apparent difference of opinion.

The most recent Catalogue of *British Cretaceous Brachiopoda*, is that published in 1847, by Mr. Tennant,<sup>1</sup> in which forty-nine specific names have been enumerated; but a critical examination has led me to place about twenty<sup>2</sup> of these, either among the synonyms of species already mentioned, or as hitherto undiscovered in Great Britain; so that the entire list published by the above-mentioned author would not exceed some *thirty species*.

It has been stated in the fifth volume of the 'Histoire des Progrès de la Géologie' (p. 109, 1851), that fifty-two species of Brachiopoda have been recorded as existing in *British Cretaceous Strata*: the learned author mentioning at the same time that his results and identifications are chiefly based on those already published in Mr. Morris's 'Catalogue of British Fossils' (1843).

<sup>1</sup> 'A Stratigraphical List of British Fossils,' p. 47, 1847. In January, 1854 (the period at which my Table had been completed, see 'Bull. Soc. Geol. de France,' vol. xi), the new edition of Mr. Morris's 'Catalogue' had not appeared.

<sup>2</sup> These are:

- |  |  |
|--|--|
| 1. <i>Crania ovalis</i> , Woodward = <i>C. Ignabergensis</i> , Retzius.                | 13. <i>Terebratula elongata</i> , Sowerby = <i>T. carnea</i> , Sow.          |
| 2. „ <i>spinulosa</i> , Neilsson (not hitherto found in England).                      | 14. „ <i>faba</i> , Sowerby = (dwarf) <i>T. biciplicata</i> , Brocchi.       |
| 3. „ <i>striata</i> , Sowerby = <i>C. Ignabergensis</i> .                              | 15. „ <i>obliqua</i> , Sowerby (not Cretaceous).                             |
| 4. <i>Lingula ovalis</i> (a Jurassic shell).   | 16. „ <i>octoplicata</i> , Sowerby = var. of <i>R. plicatilis</i> , Sowerby. |
| 5. <i>Orbicula lævigata</i> , Deshayes (not a Brachiopod).                             | 17. „ <i>pentagonalis</i> , Phillips = var. of <i>T. striata</i> , Wahl. ?   |
| 6. <i>Terebratula brevirostris</i> , Roemer = <i>Rhynchonella Martini</i> , Mantell.   | 18. „ <i>quadrata</i> , Sowerby = <i>T. oblonga</i> , Sowerby.               |
| 7. <i>Magas truncata</i> , Sowerby = var. of <i>M. pumila</i> , Sowerby.               | 19. „ <i>rigida</i> , Sowerby = var. of <i>T. gracilis</i> , Schlotheim.     |
| 8. <i>Terebratula crysalis</i> , Schlotheim — young of <i>T. striata</i> , Wahlenberg. | 20. „ <i>rostrata</i> , Sow. (a Jurassic shell).                             |
| 9. „ <i>convexa</i> , Sowerby = <i>R. (lata or) latissima</i> , Sowerby.               | 21. „ <i>striatula</i> , Mantell = <i>Ter. striata</i> , Wahlenberg.         |
| 10. „ <i>dilatata</i> , Sowerby = <i>R. compressa</i> , (var.) Lamarck.                | 22. „ <i>subrotunda</i> , Sowerby = var. of <i>T. semiglobosa</i> , Sow.     |
| 11. „ <i>dimidiata</i> , Sowerby = <i>R. compressa</i> , (var.) Lamarck.               | 23. „ <i>subundata</i> , Sowerby = var. of <i>T. semiglobosa</i> , Sow.      |
| 12. „ <i>elegans</i> , Sowerby = <i>R. latissima</i> , Sowerby.                        |  |

Viscount d'Archiac has accordingly presented us with the following Table :

Distribution of the Class according to Viscount d'Archiac.	Number of the Genera.	Number of the Species.	Upper Chalk ( <i>Craie Blanche</i> ).		Lower Chalk and Chalk Marl ( <i>Craie Tuffeau</i> ).	Upper Green Sand.	Gault.	Lower Green Sand.	Green Sand of Devonshire.	Species common to the Upper Chalk and to the Chalk Marl.	Species common to the Upper Chalk and to the Upper Green Sand.	Species common to the Chalk Marl and to the Upper Green Sand.	Species common to the Upper Green Sand and to the Gault.	Species common to the Gault and Lower Green Sand.	Species common to the Upper Green Sand to the Gault, and to the Lower Green Sand.	Species common to the Upper Green Sand and to the Lower Green Sand.
BRACHIOPODA . .	5	52	18	11	10	5	22	5	5	—	2	—	1	2	3	
<i>And I now place into corresponding Columns the results arrived at during the publication of the present Monograph.</i>																
According to Mr. Davidson.	Genera or Sub-Gen.	about	14 or 15	15	28 or 30	7 or 8	8	—	7	6	8	6	1	2	2 or 3	
BRACHIOPODA . .	13	49														

Although fifty-two species are recorded in the French author's table, and only forty-nine in our own, still in reality the last number greatly exceeds that presented by the Viscount, because, at least twenty-two to twenty-four of his names are synonyms, while my list contains a number of species new to England, and mentioned in no other publication. But I must at the same time hasten to announce, that notwithstanding all the care, researches, and consultations undertaken in the identifications of the species, I have not always arrived at results which can be considered finite, and possibly forty-five good species may comprise all that have been hitherto discovered in *British Cretaceous Strata*.

Much additional investigation will likewise be required before the exact stratigraphical repartition of certain forms can be definitely established ; and to arrive at this most important geological desideratum, it will be necessary to settle in a definite manner the comparative age of certain beds above the Gault in the Isle of Wight, at Cambridge, Farringdon, Chardstock, and in a few other localities.

Thus, according to the generality of British geologists, the *Farringdon Sponge Gravel* would belong to the age of the *Lower Green Sand* ; by myself, to that of the *Upper Green Sand* or *Tourtia* ;<sup>1</sup> and by Mr. Sharpe, more modern than the Chalk, or in other words, to the *Upper Maestricht (Cretaceous) beds* and Pisolitic Limestone of Laversine (France).

<sup>1</sup> See 'Bull. de la Soc. Geol. de France,' vol. xi, Feb. 1854. I believe this view is likewise sanctioned by Mr. S. P. Woodward.

And as the stratum in question contains some twelve or more species of Brachiopoda, by casting these into one or other deposit, the number of forms peculiar to each is necessarily materially modified. This will in great measure explain why in my table only eight species are recorded from the *Lower Green Sand*, while there would exist twenty-two, according to Viscount d'Archiac and others.

I mentioned in 1852 (page 2 of this Monograph), "that the age of the *Farrington beds* may yet afford a subject of discussion, although several geologists state them to be *Lower Green Sand*." Since then, Mr. Sharpe has renounced his share in the views entertained by Messrs. Austen, Forbes, and others,<sup>1</sup> and has lately published a very interesting memoir,<sup>2</sup> wherein he exposes his present opinion, which is chiefly founded upon the examination of 111 species he had been able to assemble from that celebrated locality. But as these results are not in accordance with those of other geologists, and differ likewise with my own, I will endeavour in a few short observations to explain wherein we disagree.

Mr. Sharpe records his palæontological inferences in the following table :

	Sponges.	Bryozoa.	Brachiopoda.	Lamelli-branchiata.	Echinodermata.	Sundries.	Total.
Species peculiar to the deposit . . . . .	4	1	1?	3	4	1	14
Maestricht Sands . . . . .	2	3	4	3	—	—	12
Upper Chalk . . . . .	1	20	3	5	—	3	32
Lower Chalk . . . . .	1?	2	3	2	—	4	12
Upper Green Sand, including Tourtia . . . . .	11	17	11	—	—	3	50
Gault . . . . .	—	1	1?	2	—	1	5
Lower Green Sand <sup>3</sup> . . . . .	—	4	2	3	3	1	13
Total number of Species examined . . . . .	16	44	19	18	7	7	111

<sup>1</sup> Quarterly Journal of the Geol. Soc., vol. vi, p. 454, 1850.

<sup>2</sup> *Ib.*, vol. x, p. 176, Nov., 1853.

<sup>3</sup> Mr. Sharpe mentions the following Lower Green Sand species as occurring in the *Farrington Gravels* :

"*Reptomulticava micropora*.

„ *collis*, also found in the White Chalk.

"*Heteropora cryptopora*, also found in the Maestricht Sand.

"*Proboscina marginata*.

"*Terebratula tamarindus*.

„ *oblonga*, also found in the Upper Green Sand.

"*Ostrea macroptera*, also in the Gault and Upper Green Sand, and perhaps in the Chalk.

"*Pecten Dutemplii*, also in the Upper Green Sand.

"*Pecten interstriatus*, perhaps identical with *P. Dutemplii*.

"*Serpula quinque-angulata*.

And further observes, "that the examination of the whole list of species, or that of the families separately, gives the results, that the Farringdon Gravels contain species hitherto thought characteristic of every bed, from the Lower Green Sand to the Maestricht Sand inclusive; but that those referable to species found elsewhere, above the Gault, predominate nearly ten to one in the number of species, and still more so in that of individuals; so that we need only consider to what part of the Cretaceous series above the Gault this deposit belongs.

"This conclusion limits our choice to the *Upper Green Sand*, or to a place altogether above the *Chalk*; for no one could seriously propose to place it on a level with the *Chalk*. . . . . That nowhere is there any trace of gravel nor any ferruginous bed in the *Upper Green Sand* of this part of England. Very few of the organic remains of Farringdon which are referable to the *Upper Green Sand* are found in that deposit in this neighbourhood; Warminster being the nearest spot which affords any large numbers of these species, and then only in the uppermost bed of the formation; but for the counterparts of the greater number we must travel to the *Tourtia* of Belgium, or to *Essen* in *Westphalia*.<sup>1</sup> That it might lead to erroneous results if we drew our conclusions from the *Bryozoa*, . . . . . their geological range in this country being little known, but the remaining classes furnish safe grounds of comparison: of these, the *Farringdon Gravel* contains thirty-three species, found either in the *Upper Green Sand*, the *Tourtia*, or in the *Craie Chloritée* of France; but of these thirty-three species, only thirteen are known in the *Upper Green Sand* of England, and most of them range upwards into higher strata." The author concludes "that we are driven step by step, by the exhaustion of all other alternatives, to class the *Farringdon Sponge Gravel* as more modern than the *Chalk* (but not in the *Tertiaries*); other relics of the *Upper Cretaceous* deposits being found in the *Limestones of Faxoe*, the *Calcareous Sands and Sandstones of Maestricht*, *Ciply*, and the *Pisolitic Limestones of Laversine and Vigny*."

The attentive examination of Mr. Sharpe's table of species will, in my humble opinion,

"*Salenia punctata*, of Atherfield.

"*Goniopygus peltatus*, of Switzerland.

"*Diadem dubium*,                    ,,

Besides these, I picked up in the locality, an Urchin, which Dr. Wright states to be unquestionably the *Nucleolites Neocomiensis*, Ag. It is a little larger than the type specimens, and much larger than the French ones; but its characters are so well marked, that it cannot be mistaken.

Several *Oolitic Fossils* have been long since detected in the *Farringdon Gravel Beds*, but which Mr. Sharpe justly regards as strangers brought in the fossil state to the locality. There are *Coral Rag* and *Kimmeridge Clay Fossils*, over which the *Farringdon Gravel* appears to extend.

<sup>1</sup> In the fourth volume of the new edition of Bronn's '*Lethea. Geog.*,' p. 25, &c., the *Green Sand of Essen* is considered to be parallel to the *Tourtia and Chalk Marl?* of *Sussex*. See also Dr. Fr. Roemer, *Memoir, die Kreid Westphalens*, 1854. Wherein the following *Brachiopoda* are mentioned, several of which are common to our *English Upper Green Sand* under other names: *Thecidea digitata*, Bronn.; *Th. hippocrepis*, Goldf.; *Th. hieroglyphica*, Goldf.; *Ter. gallina*, Brong.; *T. latissima*, Sow.; *T. paucicosta*, Roemer; *T. nuciformis*, Sow.; *T. Beaumonti*, d'Arch; *T. auriculata*, R.; *T. radians*, R.; *T. nerviensis*, d'Archiac; *T. Tornacensis*, d'Arch.; *T. pectoralis*, R.; *T. arcuata*, R.; *T. canaliculata*, R.; *T. decemcostata*, R.

go far to bias many in favour of the view here taken, viz., that the *Farringdon Sponge Sand* and *Gravel* has greater claims to the age of the *Upper Green Sand* than to any other hitherto mentioned, for out of the 111 species, fifty are allowed to be forms of that period, besides fourteen stated to be peculiar to the locality. Any one who visits the quarries of Little Coxwell, will arrive at the conclusion, that the *Sponges* and the *Brachiopoda* (almost all *Upper Green Sand* or *Tourtia* forms) are the *truly abundant and characteristic fossils of the locality*, and that the sprinkling from other classes are *the rarities*, and should not therefore supersede the higher claims of the first. Among the *Brachiopoda*, two only, *Ter. tamarindus* and *T. oblonga*, are, properly speaking, *Lower Green Sand* fossils, but the last has also been found *as an exception* in the *Upper Green Sand*, near Warminster; and so very rare are these two species at Farringdon, that during two long days' search, I was unable to obtain a *single fragment*, nor do I believe that in all the collections, half-a-dozen examples could be assembled, while specimens of most of the other species may be collected by thousands.<sup>1</sup>

Mr. Sharpe publishes the following list of species :

- |   |  |
|---|--|
| 1. <i>Terebratula depressa</i> , Lamarck.   | 11. <i>Terebratella Menardi</i> , Lamarck.   |
| 2. „ <i>nerviensis</i> (var. F), D'Archiac. | 12. <i>Rhynchonella latissima</i> , Sowerby. |
| 3. „ <i>Boubei</i> , D'Archiac.             | 13. „ <i>depressa</i> , „                    |
| 4. „ <i>Roemeri</i> , „                     | 14. „ <i>nuciformis</i> , „                  |
| 5. „ <i>Keyserlingi</i> , „                 | 15. „ <i>triangularis</i> , Wahlenberg.      |
| 6. „ <i>biplicata</i> , Sowerby.            | 16. „ <i>antidichotoma</i> , ? Buv.          |
| 7. „ <i>tamarindus</i> , „                  | 17. <i>Crania cenomanensis</i> , D'Orbigny.  |
| 8. „ <i>oblonga</i> , „                     | 18. „ <i>Parisiensis</i> , ? Defrance.       |
| 9. „ <i>revoluta</i> , D'Archiac.           | 19. <i>Thecidia Wetherellii</i> , Morris.    |
| 10. „ <i>Robertoni</i> , „                  |  |

Having also had the opportunity of examining several hundred specimens from the locality, in addition to all those assembled by Mr. Sharpe, and kindly placed by that gentleman at my disposal for publication, I am tempted to suggest a few alterations to Mr. Sharpe's list, having considered it a duty throughout this work to frankly express the results of my own investigations, which are also open to correction and criticism. Thus, according to my impression, the *Brachiopoda* hitherto obtained from Farringdon would belong to the following species :

1. *Crania cenomanensis*, D'Orbigny. *One upper valve* (*C. Parisiensis* of Mr. Sharpe's list), which perfectly agrees with the type specimens from the *Upper Green Sand* of Mans (France), described by M. D'Orbigny; one lower valve (referred by Mr. Sharpe to *C. cenomanensis*), but as it is the only *lower valve* hitherto discovered, I cannot so positively affirm that it belongs to D'Orbigny's species, although it probably is so.

<sup>1</sup> Generally in single valves; bivalve examples are less abundant. It was evidently a littoral deposit accumulated in water much agitated, the dislocation of the valves of the *Brachiopoda*, and fractured condition of the test of the *cidaris*, &c., as well as the rolled state of the gravel, attest sufficiently its formation.

2. *Thecidium Wetherellii*, Morris? (not abundant). This identification is founded on the examination of several *ventral* or *dental valves* found adhering to *Tereb. depressa* (Lamarck), Brioza, &c. The characteristic or *dorsal valve* not having hitherto been discovered in the locality, the identification may still be considered incomplete, although there is every probability of its being the same as that described by Mr. Morris from the Chalk of Kent.
3. *Terebratella Menardi*, Lamarck, sp. (common). This *Upper Green Sand* species has also been discovered (by Mr. Wiest) in the *Scaphites bed* at Chardstock, in company with other well-known *Upper Green Sand* Brachiopoda; but I differ with Mr. Sharpe in his assertion that Leymerie's var. *oblongata* ('Mém. Soc. Geol. France,' vol. v, pl. 15, fig. 12) is found at Farringdon. *T. Menardi* (*T. truncata*, Sow.), from Little Coxwell, is a less developed race, but perfectly agrees in character with the true Lamarckian type found at Mans (France).
4. *Terebratula biplicata* (Brocchi). Not abundant, but exactly similar to those so common in the *Upper Green Sand* of Warminster, and the *Chloritic Marl* of the Isle of Wight.
5. „ *Tornacensis*, var. *Ræmeri*? D'Archiac (very common). Mr. Sharpe's views on this point differ somewhat from my own. That gentleman considers Viscount d'Archiac's *T. Ræmeri* specifically distinct from the same author's *T. Tornacensis*; but I agree with M. d'Orbigny and others while stating that *T. Ræmeri* is only a difference of age or variety of *T. Tornacensis*, and am of opinion that the shells described by Mr. Sharpe as *T. Ræmeri*, from Farringdon, are nothing more than a dwarf race or variety of the full-grown *T. Tornacensis*; this view may perhaps prove erroneous, as well as that of my placing *T. Boubei*, *Keyserlingi*, and *revoluta* of Mr. Sharpe's list, among the varieties of *T. Tornacensis*.
6. „ *depressa*, Lamarck (common; a well-known Tourtia species). *T. Nerviensis*, var. *E* of Mr. Sharpe's list, appears to me to be nothing more than a variation due to age.
7. „ *Robertoni*, D'Archiac (rare). A Tourtia shell.
8. „ *tamarindus*, Sow. *Very rare*, only hitherto known in Lower Green Sand.
9. „ *oblonga*, Sow. Equally rare, and, properly speaking, a *Lower Green Sand* fossil.



10. *Rhynchonella latissima*, Sow. (abundant). A well-known *Upper Green Sand* shell, plentiful at Warminster and at Chardstock, also in the Tourtia, &c. *R. antidichotoma*, Buv., of Mr. Sharpe's list, is nothing more than a variety or accident in the plication of Sowerby's shell.
11. „ *depressa*, Sow. This species has been likewise obtained from the *Upper Green Sand* near Warminster, Chardstock, the Isle of Wight, &c., and varies greatly in shape and number of the plaits.

It may, perhaps, be *Rh. triangularis* of Wahlenberg, but I feel unable to concur in the opinion expressed by Mr. Sharpe that both Wahlenberg's and Sowerby's species occur at Farringdon, if they be distinct.

12. *Rhynchonella nuciformis*, Sow. (not quite so common as *R. depressa*), is a well-known *Upper Green Sand* shell, and is found both at Chardstock and in the Isle of Wight, &c.

I have not, therefore, been able to recognise positively more than twelve out of Mr. Sharpe's nineteen species, but admit, at the same time, that there did exist among the specimens obtained some few valves which might admit of doubt; but the material in our possession was not sufficiently perfect to warrant a positive identification. No locality seems (palæontologically speaking) more anomalous than Farringdon, and from the problematic condition of its sands and gravel, is worthy of still further investigation.

The only well authenticated British *Lower Green Sand* species I have been able to examine, are:

- |  |   |
|--|---|
| 1. <i>Lingula truncata</i> , Sowerby (p. 6).     | 5. <i>Terebratula celtica</i> , Morris (p. 73).     |
| 2. <i>Terebratula oblonga</i> , Sowerby (p. 51). | 6. „ <i>sella</i> , Sowerby (p. 59).                |
| 3. „ <i>prælonga</i> , Sowerby (p. 58).          | 7. <i>Rhynchonella Gibbsiana</i> , Sowerby (p. 98). |
| 4. „ <i>tamarinus</i> , Sowerby (p. 74).         | 8. „ <i>parvirostris</i> , Sowerby (p. 97).         |

But, besides these eight, imperfect examples of one or two doubtful shells were placed into my hands, which I was unable to identify.

In the Catalogue of *Lower Green Sand* fossils, published by Professor Forbes,<sup>1</sup> mention is not made of other species, if we except those quoted from Farringdon, and which have been found in no authenticated *Lower Green Sand* locality with which I am acquainted. Mr. S. H. Saxby, who has minutely explored the Cretaceous strata of the Isle of Wight, informs me (while placing his whole collection at my disposal for examination) that “Brachiopoda are by no means prominent in *Lower Green Sand* catalogues; indeed there are only two species that can be termed common, viz., *T. sella* and *R. parvirostris*, and these, especially the former, in such profusion as only Brachiopoda know how to lavish. It is, moreover, not a little remarkable that the *Cracker bed*, which furnishes the most

<sup>1</sup> ‘Quarterly Journal of the Geol. Soc.,’ vol. i, p. 345, 1845.

characteristic and beautiful fossils of the series, is totally barren of them; I never knew of the occurrence of the least trace of a Brachiopod for the first hundred and fifty feet as we ascend, except in the five or six feet of *Perna bed* at the base. In the upper beds, to the depth of more than 200 feet, nearly 300 perhaps, there is a great dearth of fossils of any description; I have, however, obtained a specimen of *Rh. Gibbsiana* from the uppermost portion. The nodular beds of Horseledge and Black Gang Chine present a very curious analogy with the Cracker nodules, in the repetition of ferruginous casts of those fossils which we saw in the latter as delicate shells, and which in very many instances do not seem to appear between these points in the series, a distance of perhaps 500 feet. Now, the *Horseledge* or *Yellow Ledge* beds contain *Lingula truncata*, *Ter. celtica*, *T. tamarindus*, *T. sella*, and *Rh. parvirostris*, while the Crackers are apparently deficient of these species."

It is, therefore, evident that the *Lower Green Sand* in England contains the *minimum*, and not the *maximum* of species.

THE GAULT and its dependencies dispose but of few species of Brachiopoda, and these no where numerically abundant, and, with the exception of *T. sella*, appear specifically different from those common to the Lower Green Sand.

The following is a list of the forms I have hitherto been able to examine:

1. *Terebratulina striata*, Wahl., var. *pentagonalis*, Phillips. One example from the Speeton Clay.
2. „ *gracilis*, Schl., var. Common, according to Mr. C. B. Rose, in the *Blue Gault* of West Norfolk.
3. *Terebratula capillata*? D'Archiac (rare). Three or four examples from the *Red Chalk* of Hunstanton Cliffs (Norfolk).
4. „ *biplicata*, var. Sow. Occasionally met with, but nowhere abundantly, in the *Speeton Clay*, *Gault*, and *Red Chalk*.
5. „ *sella*, Sow. (very rare). In the *Gault* near Maidstone.
6. „ *semiglobosa*, Sow., var. *subundata* (rare). In the *Red Chalk*;<sup>1</sup> and this appears to be the first appearance of the species which continues to be represented in each successive deposit up to the Chalk.
7. *Rhynchonella sulcata*, Parkinson. A few rare examples from the *Speeton Clay* and *Gault*.
8. „ *lineolata*, Phillips, sp. A single specimen from the Speeton Clay of Yorkshire.

Over the GAULT, in natural succession, we arrive at a very variable series of sandy and marly beds, with occasional bands of limestone, known under the appellations of *Upper Green Sand*, *Chloritic Marl*, *Tourtia* and *Craie et Sables Chlorités* by the French; and it is in the direct succession or equivalents in different localities of the layers forming this series of beds, between the *Gault* and the *Chalk Marl*, that some further investigation

<sup>1</sup> Mr. C. B. Rose states that the *red bed*, (improperly called *Chalk*), occupies the place of the *Gault* lying immediately upon the Lower Green Sand; the fossils are similar to those met with in other *Gault* districts (see 'Ed. Phil. Journal,' Nov. and Dec. 1835, and Jan. 1836): at Hunstanton Cliff the *red bed* measures about 3 feet 10 inches.



is required: but viewing all the beds as one whole, we recognise therein from twenty-eight to thirty species, or the *maximum* of specific and numerical development of the Brachiopoda in the Cretaceous system in Great Britain.

In the Isle of Wight two well-separated beds may be traced above the Gault. First, the *Upper Green Sand*, from which Mr. S. H. Saxby procured *Lingula sub-ovalis* (Dav.), a *Terebratula*, probably *T. squamosa* (Mantell), *Ter. biplicata*, var. (Sow.), *Rh. nuciformis* (Sow.), and *R. depressa* (Sow.). The second bed is termed the *Chloritic Marl*, and from which the same gentleman obtained *Ter. biplicata* (Brocchi), *T. pectita* (Sow.), *Rh. Grasiiana* (D'Orb.), *R. compressa* (Lamarck), and *R. Mantelliana* (Sow.). The fossils from both being identically similar to those so abundantly found in the neighbourhood of Warminster.<sup>1</sup>

One of the most interesting localities in England for the study of the beds under notice is the neighbourhood of Chard and Chardstock, and I am particularly indebted to Mr. J. Wiest for the following details.

"The formations about to be described are situated chiefly, if not exclusively, on each side of the valley of the Kit, and consist of the following beds taken in the descending order:"

- I. LOWER CHALK without flints, from two to thirty feet in thickness at different places; its fossils are those common to that deposit and age.
- II. CHALK MARL or *Discoidean stratum*, from two to three feet in thickness, representing a homogeneous mass, with fine siliceous and chloritic grains; it spreads out more equally than No. I, but does not appear to be present where the last attains a considerable thickness. *Am. Mantelli*, *Discoidea cylindrica*, and *Ananchites subglobosa*, are amongst its fossils.
- III. The SCAPHITES BED, harder than I and II., and, before becoming exposed to air and damp, a compact accumulation of fossils, from three to nine inches in thickness; siliceous grains, more numerous and rough than in II, are interspersed in the mass. *Scaphytes*, *Nautilus triangularis*, Montfort, = *Fleuriusianus*, *N. lævigatus*, *Am. varians*, *A. obtectus*, and *Galerites*, are amongst its fossils.
- IV. GREEN BED, near Chardstock, distinctly separated from III, forms a hard compact mass of rocks, with abundant siliceous and chloritic grains; from six inches to three feet in thickness, and containing the greatest variety of fine fossils. *Nucleolites Morrisii*, *N. lacunosus*, *Ter. lyra*, and other Upper Green Sand fossils characterise that deposit.
- V. CRUSTACEAN STRATUM, less cemented than IV, with siliceous grains predominant; one to three feet in thickness. It contains a few *Terebratulæ*, *Pectens*, but chiefly remains of Crabs.

<sup>1</sup> Consult also the valuable 'Memoirs on the Geology of the Isle of Wight,' &c., by Dr. Fitton, Professor Forbes, and others, published in the 'Transactions and Quarterly Journal of the Geol. Soc. of London.'

VI. NAUTILUS LÆVIGATUS LAYER, a loose sand, nearly one foot in thickness, and containing but few fossils. *N. lævigatus* is also found in the Farringdon Sand and Gravel.

These details were accompanied by a numerous collection of all the Brachiopoda peculiar to the locality, and after minute examination, I have referred the individuals to the following species. The stratigraphical distribution is given on Mr. Wiest's authority.

	I.	II.	III.	IV.	V.
<i>Terebratula semiglobosa</i> , Sowerby . . . . .	..	*	*	* ?	
„ <i>squamosa</i> , Mantell . . . . .	*	*	*		
„ <i>rugulosa</i> , Morris . . . . .	..	*	*		
„ <i>ovata</i> , Sowerby . . . . .	..	..	..	*	
<i>Megerlia lima</i> , DeFrance . . . . .	..	..	..	*	
<i>Terebratella Menardi</i> , Lamarck . . . . .	..	..	*		
„ <i>pectita</i> , Sowerby . . . . .	..	..	..	*	*
<i>Terebrirostra lyra</i> , Sowerby . . . . .	..	..	..	*	*
<i>Trigonosemus incerta</i> , Davidson . . . . .	..	*	* ?		
<i>Rhynchonella latissima</i> , Sowerby . . . . .	..	*	*	*	
„ <i>compressa</i> , Lamarck . . . . .	..	*	*	*	
„ <i>depressa</i> , Sowerby, var. <i>A.</i> and <i>B.</i> . . . . .	..	..	..	*	
„ <i>nuciformis</i> , Sowerby . . . . .	..	..	..	*	*
„ <i>Grasiana</i> . . . . .	..	..	..	*	*
„ <i>Cuvieri</i> . . . . .	..	*	*		

Chardstock is, therefore, a particularly interesting locality; it exhibits the British equivalents of the *Craie chloritée* of France and the *Tourtia* of the Belgians. II and III entirely agrees in mineral composition, external aspect, and palæontological contents, with the *Craie Chloritée* of the Mont St. Catherine, near Rouen (France), and in both localities we find *Ter. rugulosa*, *T. squamosa*, as well as the generality of fossils peculiar to that age. III constitutes by its fossils a natural passage into IV, which last contains the greatest number of species common to the *Upper Green Sand* of Warminster; Havre (France), and the *Tourtia* of Belgium; among the Brachiopoda we may mention *Ter. lyra*, *T. ovata*,<sup>1</sup> *T. pectita*, *Meg. lima*, *Rh. latissima*, *R. compressa*, *R. Grasiana*, *R. depressa*, and *R. nuciformis*.

In England, the neighbourhood of Warminster has yielded by far the greatest number of Upper Green Sand Brachiopoda, it contains—

<sup>1</sup> I have found *Ter. ovata*, *M. lima*, and *Rhyn. lineolata*, in the *Tourtia* near Tournay, species not recorded in Viscount D'Archiac's memoir.

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>1. <i>Lingula sub-ovalis</i> (rare).</li> <li>2. <i>Argiope megatrema</i> (very rare).</li> <li>3. <i>Terebratella pectita</i> (common).</li> <li>4. <i>Terebrirostra lyra</i> (not abundant).</li> <li>5. <i>Megerlia lima</i>.</li> <li>6. <i>Terebratulina striata</i> (var.).</li> <li>7. <i>Terebratula squamosa</i>.</li> <li>8.     ,,     <i>ovata</i> (common).</li> <li>9.     ,,     <i>obesa</i>.</li> </ol> | <ol style="list-style-type: none"> <li>10. <i>Terebratula biplicata</i> (very common).</li> <li>11.     ,,     <i>oblonga</i> (very rare).</li> <li>12. <i>Rhynchonella compressa</i>.</li> <li>13.     ,,     <i>latissima</i> (common).</li> <li>14.     ,,     <i>depressa</i>, var. <i>A</i> and <i>B</i>.</li> <li>15.     ,,     <i>sulcata</i>.</li> <li>16.     ,,     <i>Grasiana</i> (common).</li> <li>17.     ,,     <i>Mantelliana</i>.</li> </ol> |
|---|---|

At Cambridge, immediately above the Gault, we find a bed of *Upper Green Sand*, from which Mr. Carter has obtained—

- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>1. <i>Argiope megatrema</i>, Sow., = (<i>decemcostata</i>, Roemer) (rare).</li> <li>2. <i>Megerlia lima</i> (not very common).</li> <li>3. <i>Terebratulina gracilis</i>, var. <i>rigida</i>.</li> </ol> | <ol style="list-style-type: none"> <li>4. <i>Terebratula biplicata</i>, var. <i>Dutempleana</i> and var. <i>obtusata</i> (common).</li> <li>5. <i>Rhynchonella sulcata</i> (common).</li> <li>6.     ,,     <i>lineolata</i>.</li> </ol> |
|---|--|

Other similar British localities have yielded species, but no where different from those already enumerated. Nor have I yet been able to obtain any specimen of Brachiopoda from the celebrated Blackdown beds, although several species have been more than once erroneously mentioned as from that locality.<sup>1</sup>

From the CHALK MARL and LOWER CHALK we have obtained—

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>1. <i>Crania Ignabergensis</i> (rare).</li> <li>2. <i>Magas pumila</i> (rare).</li> <li>3. <i>Terebratula squamosa</i>.</li> <li>4.     ,,     <i>obesa</i>.</li> <li>5.     ,,     <i>biplicata</i> (rare).</li> <li>6.     ,,     <i>sulcifera</i>.</li> <li>7.     ,,     <i>semiglobosa</i> (common).</li> <li>8.     ,,     <i>Carteri</i> (rare).</li> </ol> | <ol style="list-style-type: none"> <li>9. <i>Terebratulina striata</i>.</li> <li>10.     ,,     <i>gracilis</i>.</li> <li>11. <i>Argiope Bronnii</i> (1 example).</li> <li>12. <i>Rhynchonella plicatilis</i>.</li> <li>13.     ,,     <i>Mantelliana</i>.</li> <li>14.     ,,     <i>Cuvieri</i>.</li> <li>15.     ,,     <i>Martini</i>.</li> </ol> |
|---|---|

And from the CHALK WITH FLINTS—

- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>1. <i>Crania Parisiensis</i>.</li> <li>2.     ,,     <i>Ignabergensis</i></li> <li>3. <i>Thecidia Wetherellii</i>.</li> <li>4. <i>Argiope Bronnii</i>.</li> <li>5. <i>Magas pumila</i>.</li> <li>6. <i>Trigonosemus elegans</i> (rare).</li> <li>7. <i>Megerlia lima</i>.</li> <li>8. <i>Terebratulina striata</i>.</li> </ol> | <ol style="list-style-type: none"> <li>9. <i>Terebratulina gracilis</i>.</li> <li>10. <i>Terebratula obesa</i>.</li> <li>11.     ,,     <i>carnea</i>.</li> <li>12.     ,,     <i>semiglobosa</i>.</li> <li>13. <i>Rhynchonella plicatilis</i>.<br/>var. <i>octoplicata</i>.<br/>var. <i>Woodwardii</i>.</li> <li>14.     ,,     <i>limbata</i> (<i>sub-plicata</i>).</li> </ol> |
|---|--|

And perhaps one or two others which I was unable to determine, so that eight or nine species pass from *Lower* and *middle Chalk* into the *Chalk with flints*.

<sup>1</sup> Mr. Sharpe is of opinion that Blackdown Sands are older than the Upper Green Sand ('Quart. Journ. of the Geol. Soc.,' vol. x, p. 187, 1853).

For collecting the last-mentioned species, the following localities may be named. Norwich, Swaffham, Gravesend, Northfleet, Cambridge, Brighton, Lewes, Folkstone, &c.

France is infinitely richer than Great Britain in Cretaceous Brachiopoda, and this will be easily accounted for when we remember that the ETAGE NÉOCOMIEN (of which our *Lower Green Sand* only constitutes a small part) occupies a considerable portion of France, where it acquires vast thickness and importance, contains there likewise the maximum of Cretaceous species, and in it are found all those beautiful forms which materially help to make up the eighty-nine species or varieties which have been figured and described by M. d'Orbigny in the fourth volume of the 'Paléontologie Française, Terrain Crétacées;' but it is much to be regretted that the distinguished author had not been better acquainted with some of our British types, as a few of them have therein either received new names or been misunderstood. We possess, however, several forms which have not been as yet recorded in French catalogues, such as *Lingula sub-ovalis*, *Thecidium Wetherellii*, *Argiope megatrema*, *Trigonosemus incertum*, *Ter. capillata*, *T. Robertsoni*, *T. depressa*, *T. Carteri*, and *Rh. lineolata*.

The following is the distribution of the French Cretaceous Brachiopoda according to M. d'Orbigny :

I. Etage Néocomien	{ Inferieur ou Néocomien . . . . .	22
	{ Supérieur ou Ungonien . . . . .	7
II. Etage Aptien . . . . .		5
III. Etage Albien . . . . .		11
IV. Etage Cénoménien . . . . .		16
V. Etage Turonien . . . . .		7
VI. Etage Senonien . . . . .		23
		—
But as three are repeated, the total amount of Cretaceous species or varieties	} 88	
known to M. d'Orbigny would be about . . . . .		

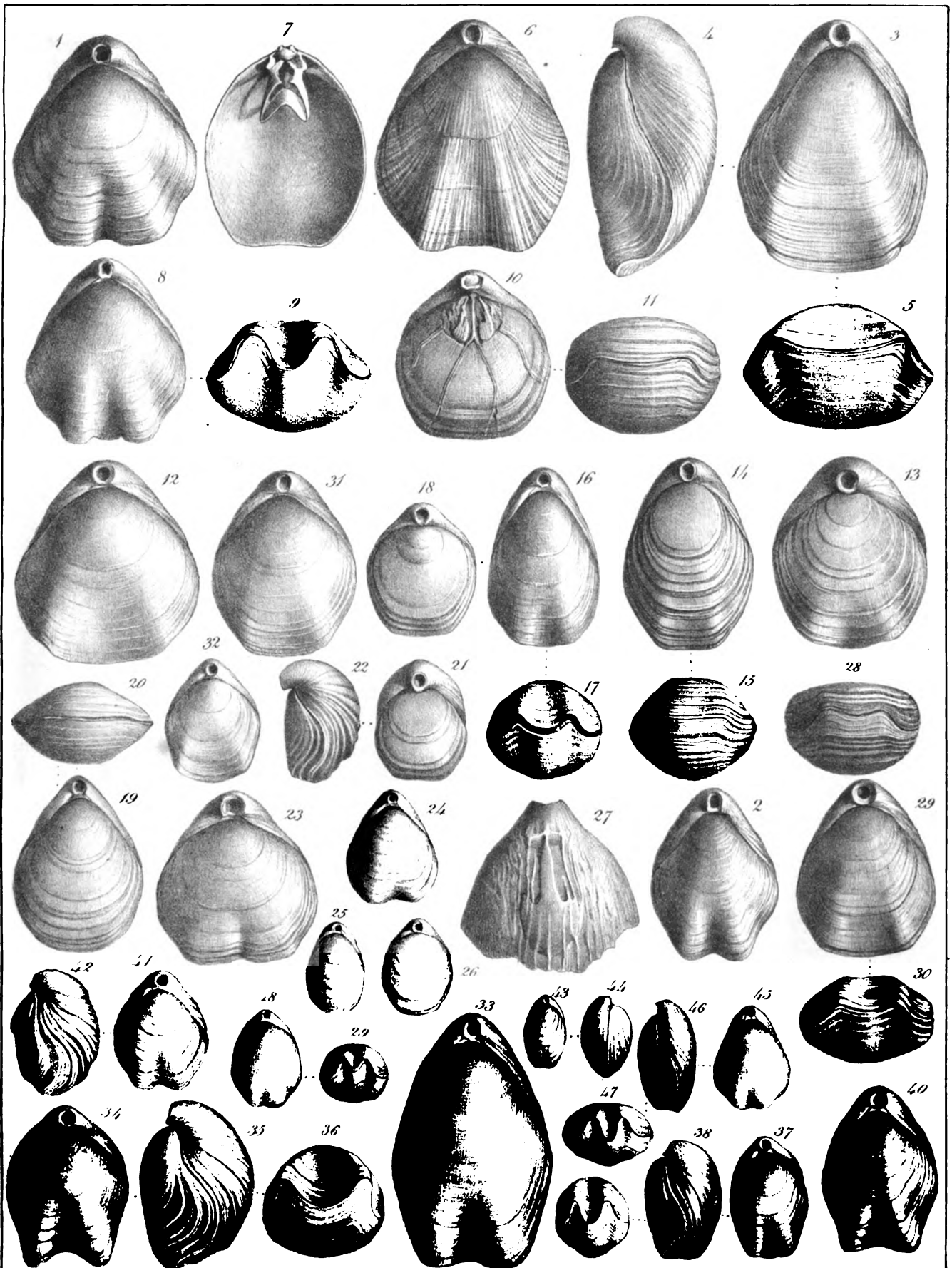




PLATE VI.

CRETACEOUS SPECIES.

Fig.			
1 to 2.	<i>Terebratula biplicata</i> ,	<i>var. Dutempleana</i> ,	<i>D'Orb.</i> , from the Red Chalk of Hunstanton.
3 to 5.	"	"	Upper Green Sand, Cambridge.
6.	"	"	" " " " , a specimen exhibiting remains of colour.
7.	"	"	Upper Green Sand, Cambridge ; interior of dorsal valve.
8, 9.	"	"	from Cambridge ; intermediate shape between <i>T. biplicata</i> (type) and the <i>var. Dutempleana</i> .
10 to 13.	"	"	<i>var. obtusa</i> , <i>Sow.</i>
14 to 28.	"	"	Different shapes from the Upper Green Sand of Cambridge.
29, 30.	"	"	from the Gault, Folkstone.
31, 32.	"	"	Two examples, from the Lower Chalk of Cambridge and Lewes.
33 to 42.	"	"	( <i>Brocchi</i> ). A series of specimens and varieties from the Upper Green Sand, near Warminster, and which appear to approach most to the Italian figure.
43, 44.	"	"	( <i>T. faba</i> , <i>Sow.</i> )
45 to 49.	"	"	? Stated to be from Lower Green Sand, near Devizes by Mr. Cunnington.





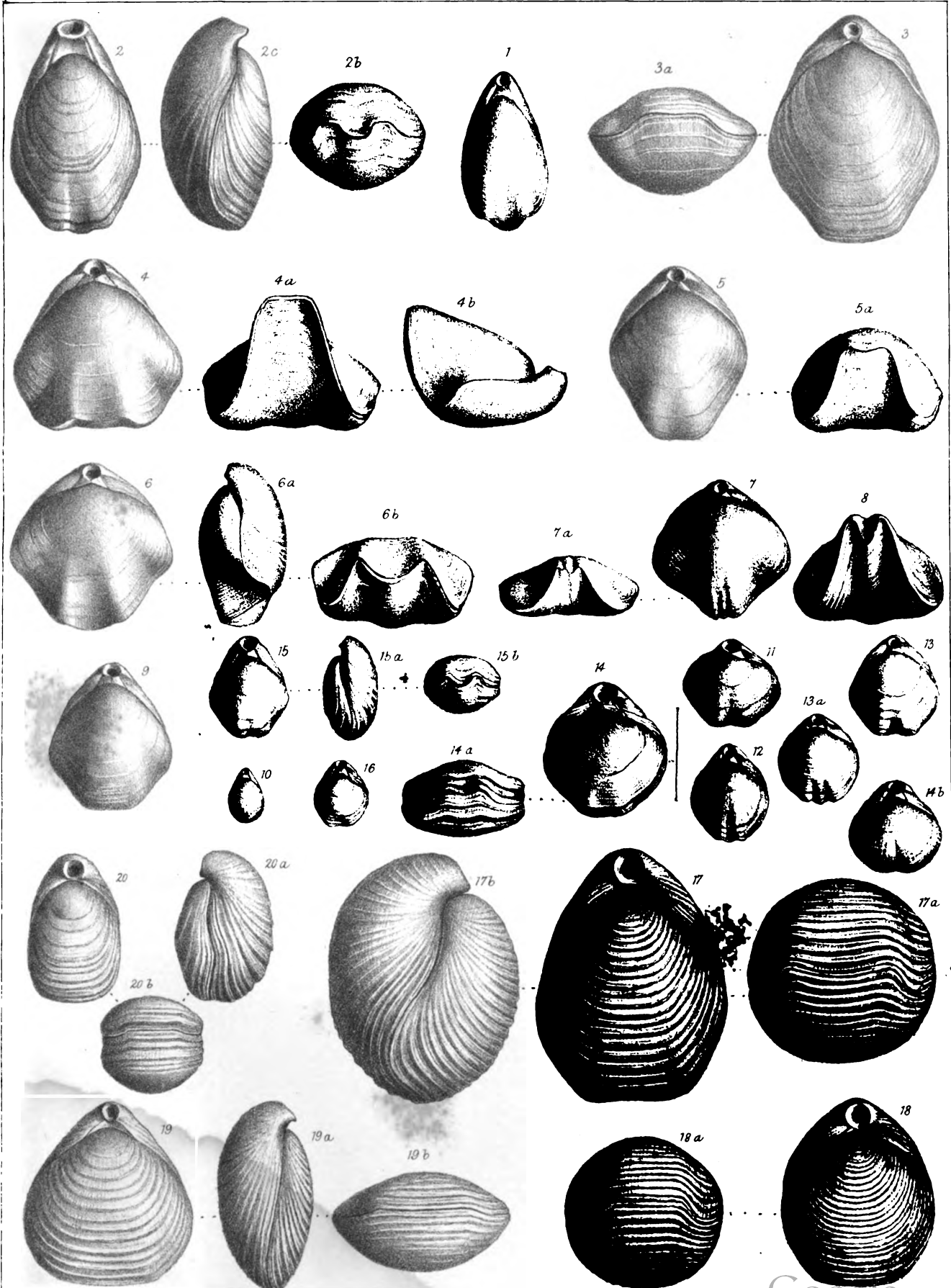




## PLATE VII.

### CRETACEOUS SPECIES.

- Fig.  
1. *Terebratula praelonga*, *Sow.* The original figure, Lower Green Sand, Sandgate.  
2. " " A fine example, from Maidstone.  
3. " *Carteri*, *Dav.* From Lower Chalk, Dover.  
4. " *sella*, *Sow.* A very adult individual, from the Lower Green Sand, Isle of Wight. British Museum.  
5 to 6 " " Ibid.  
7. " " Gault, near Maidstone  
8 to 10. " " Isle of Wight.  
11 to 16. " *Tornacensis*, *var. Roëmeri*? *D'Archiac.* A small race, Farringdon Sponge Sand and Gravel. See also Pl. IX, figs. 1 to 8.  
17 to 20. " *sulcifera*, *Morris.* Different shapes; Lower Chalk, Cambridge.



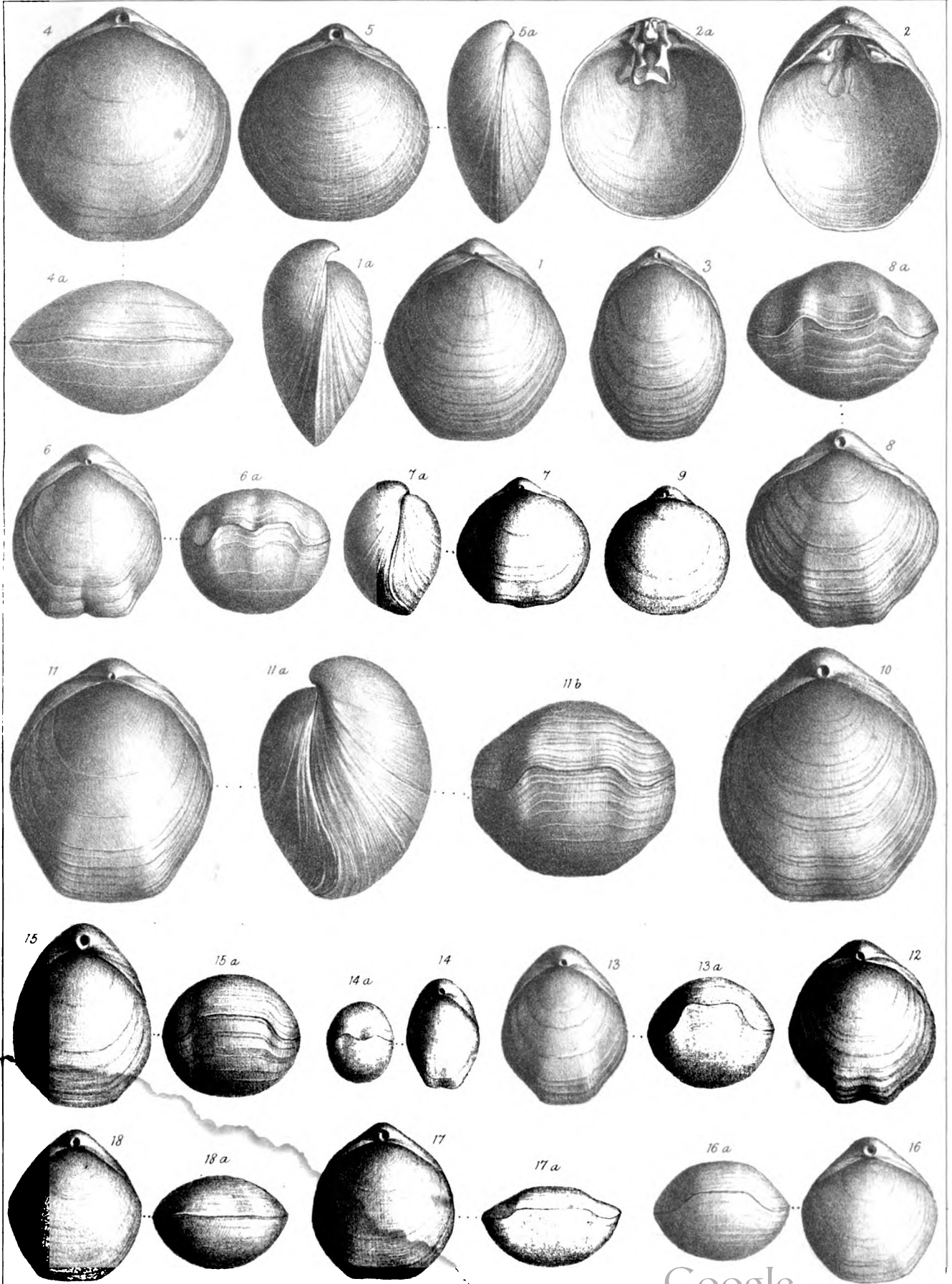




## PLATE VIII.

### CRETACEOUS SPECIES.

Fig.		
1.	<i>Terebratula carnea</i> , Sow.	A typical shape, Chalk, Trimmingham.
2.	„ „	Interior of ventral or dental valve.
2 <sup>a</sup> .	„ „	Interior of dorsal or socket valve.
3.	„ „	(var. <i>elongata</i> , Sow.). Norwich.
4 to 5.	„ „	Circular variety, from „
6.	„ <i>semi-globosa</i> , Sow.,	from the Lower Chalk, near Lewes.
7.	„ „	A circular specimen, from Gravesend.
8.	„ „	A remarkable variety, from Lewisham, Kent.
9.	„ „	Original figure of Sowerby's <i>T. subrotunda</i> .
10 to 11.	„ „	(var. <i>T. bulla</i> , J. de C. Sow.).
12.	„ „	A var., from Grays.
13.	„ „	(var. <i>T. albensis</i> , Leymerie), from Charing, Kent.
14.	„ „	A malformation.
15 to 16.	„ „	(var. <i>T. albensis</i> ).
17.	„ „	(var. <i>subundata</i> , Sow.), from the Red Chalk, Hunstanton.
18.	„ „	from the Chalk with Quartz Grains, Evershot, Dorsetshire.









## PLATE IX.

### CRETACEOUS SPECIES.

Fig.

- 1 to 8. *Terebratula Tornacensis*, var. *Rœmeri*, *D'Archiac*. A dwarf race, from the Farringdon Sponge Sand and Gravel. See also Pl. VII, figs. 11—16.
- 9 to 24. „ *depressa*, *Lamarck*. A series of shapes, age, and varieties, from the Farringdon Sponge Gravel. 15. Interior of the dorsal or socket valve.
25. „ *Robertoni*, *D'Archiac*. Ibid.
26. „ *tamarindus*, *Sow*. Lower Green Sand, near Sandgate.
- 27, 28. „ „ Farringdon Sponge Sand and Gravel (rare):
- 29 to 31, „ „ Different shapes, from the Isle of Wight.
- 32 to 34. *Waldheimia Celtica*, *Morris*. Different ages, from the Lower Green Sand, Isle of Wight.
35. „ „ Interior of the dorsal or socket valve.
36. *Terebratula Tornacensis*? Farringdon.
37. „ *biplicata*, *Brocchi*. Farringdon.
38. „ ? Farringdon; only two or three dorsal valves have been found.
39. „ ? perhaps, a var. of *T. sella*, from the Lower Green Sand, Maidstone.
40. „ *biplicata*? from the highest bed of Lower Green Sand, Folkstone.

*Note.*—Figs. 36, 38, 39, and 40, are doubtful forms; the want of sufficient material has prevented more positive identification.

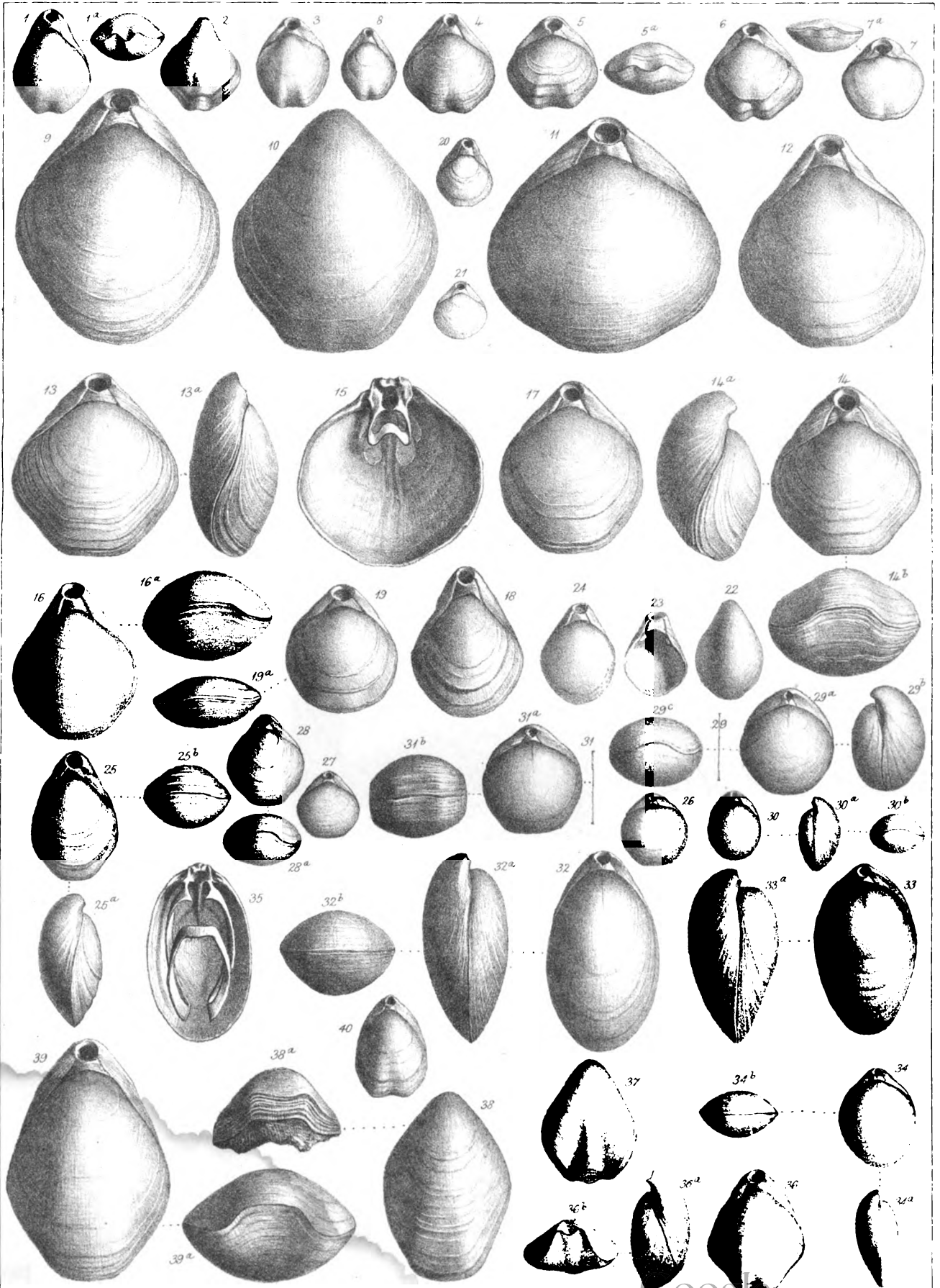




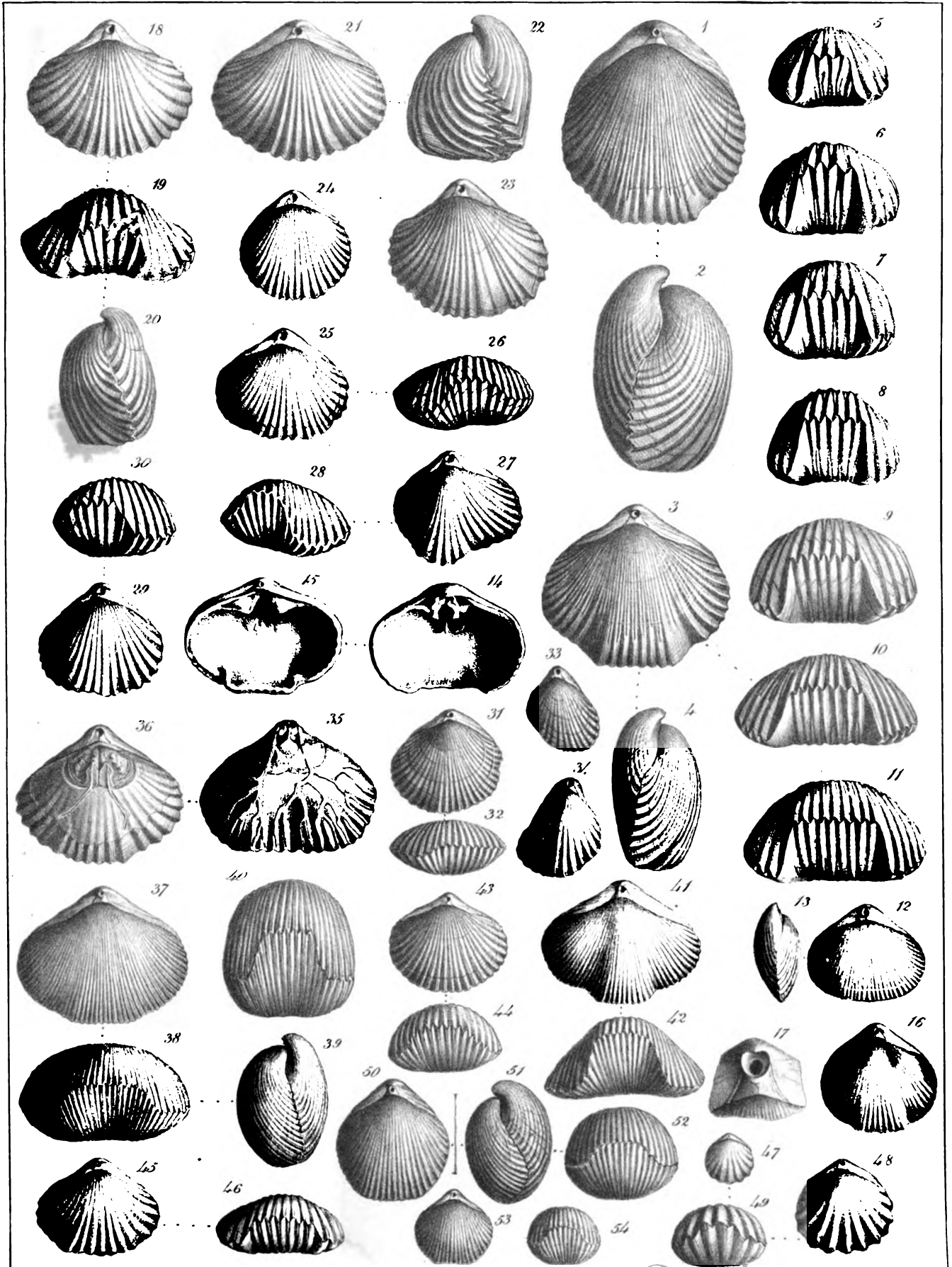


PLATE X.

CRETACEOUS SPECIES.

Fig.

- 1 to 17. *Rhynchonella plicatilis*, var. *octoplicata*, *Sow.* A series of specimens and varieties from the Chalk of Norwich.
- 18 to 20. „ *sulcata*, *Parkinson.* Upper Green Sand of Cambridge.
- 21, 22. „ „ Speeton Clay, Yorkshire.
- 23 to 36. „ „ Varieties and malformations, from Cambridge.
- 37 to 40. „ *plicatilis*, *Sow.* Chalk, Brighton.
- 41, 42. „ „ Var. (Kent).
- 43 to 46. „ „ (var. *Woodwardi*, *Dav.*).
- 47 to 49. „ ? Chalk, Charing.
- 50 to 54. „ *Cuvieri*, *D'Orb.* Lower Chalk.









## PLATE XI.

### CRETACEOUS SPECIES.

- Fig.  
1. *Rhynchonella compressa*, *Lamarck*. Upper Green Sand, near Warminster.  
(See also Pl. XII, fig. 25.)
2.           "           "           (*Ter. dilatata*, Sow.).
3.           "           "           A malformation viewed from the front.
4.           "           "           "           (*Ter. dimidiata*, Sow.), from Chard.
5.           "           "           "           from Warminster.
- 6 to 14.     "           *latissima (lata) Sow.* Different examples from the Upper Green  
Sand of Warminster. (See Plate XII,  
fig. 24.)
- 15 to 22.   "           "           Several varieties from Farringdon (*R. antidichotoma?*  
*Sharpe*).
- 23 to 27.   "           *nuciformis, Sow.* Several examples from the Farringdon Sponge  
Gravel.
- 23<sup>a b c</sup>.     "           "           Enlarged.
- 28 to 32.   "           *depressa, Sow.* Farringdon (fig. 32, *R. triangularis*, Sharpe).  
(See also Pl. XII, fig. 26.)

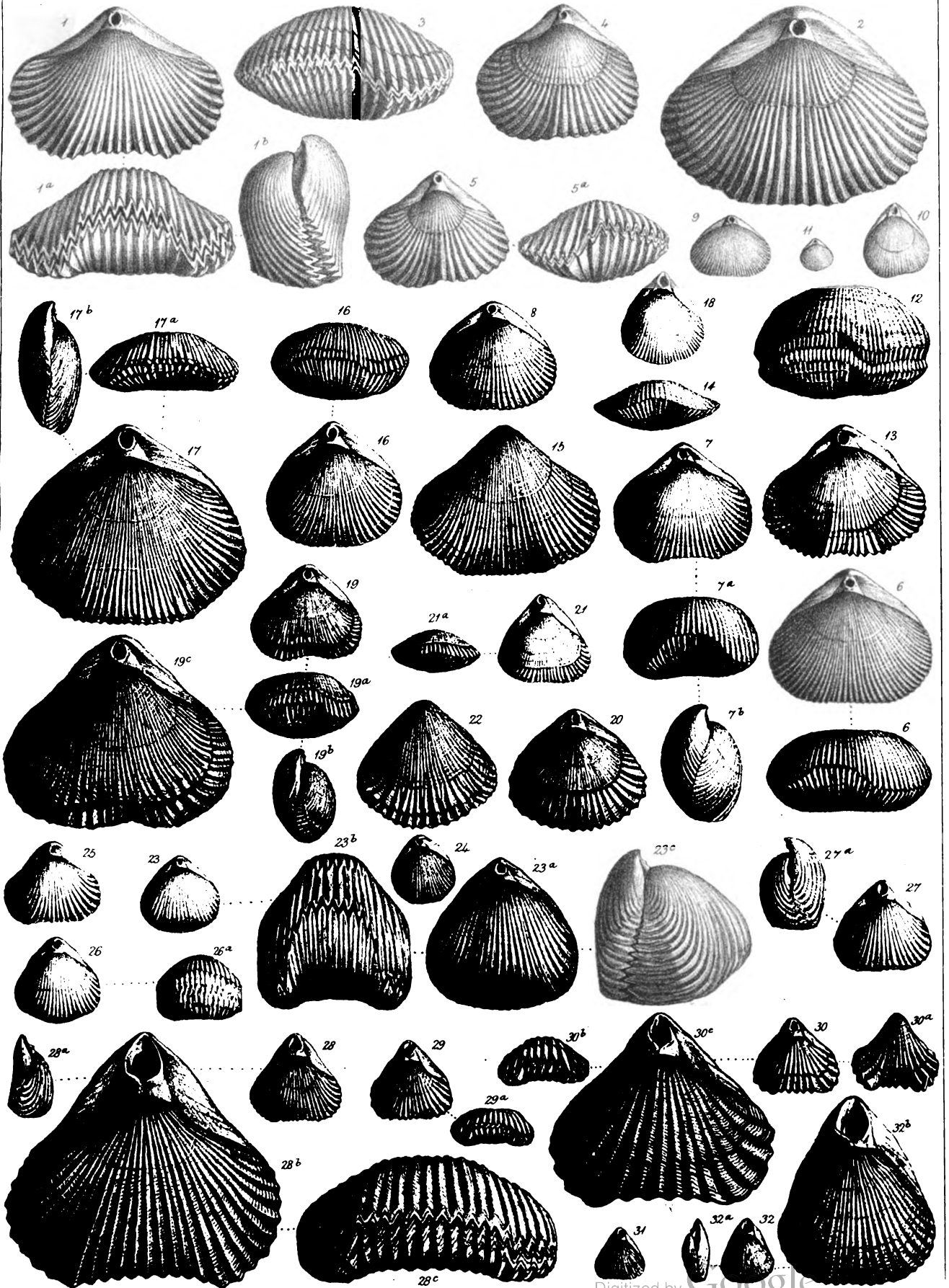




PLATE XII.

CRETACEOUS SPECIES.

Fig.			
1 to 5.	<i>Rhynchonella limbata</i> , <i>Schlotheim</i> , 1813 ( <i>Ter. sub-plicata</i> , <i>Mantell</i> . Different varieties, from the Chalk Norwich. Figs. 4—5. Var. <i>lentiformis</i> , <i>Woodward</i> .		
6 <sup>a b</sup> .	„	<i>lineolata</i> , <i>Phillips</i> .	Drawn from the original example, from the Speeton Clay, Yorkshire.
6 <sup>c d</sup> .	„	„	Enlarged.
7 to 10.	„	„	Small variety or race. Upper Green Sand, Cambridge.
11.	„	<i>Gibbsiana</i> , <i>Sow</i> .	Lower Green Sand, Isle of Wight
12 <sup>a</sup> .	„	„	Slightly enlarged, from Pluckley, Kent.
12 <sup>c</sup> .	„	„	Another example; nat. size.
13, 14.	„	<i>parvirostris</i> , <i>Sow</i> .	Figs. 13, adult; 14, young; from the Lower Green Sand, Isle of Wight.
15.	„	<i>Martini</i> , <i>Mantell</i> (= <i>Ter. pisum</i> , <i>Sow</i> .).	A typical shape, from the Gray Chalk, Folkstone.
15 <sup>a b</sup> .	„	„	Enlarged.
16 <sup>a b</sup> .	„	„	Chalk detritus, Charing.
16 <sup>c</sup> .	„	„	Enlarged.
16 <sup>d</sup> .	„	„	Upper Green Sand, Warminster.
17, 18.	„	<i>Grasiana</i> , <i>D'Orb</i> .	Upper Green Sand, Warminster; fig. 18 enlarged.
19 <sup>a b c</sup> .	„	„	Warminster.
19 <sup>d</sup> .	„	„	Enlarged.
20, 21.	„	<i>Mantelliana</i> , <i>Sow</i> .	Lower Chalk, Folkstone.
22.	„	„	Upper Green Sand, near Warminster.
23.	„	„	? Lower Chalk, near Lewes.
24.	„	<i>latissima</i> , <i>Sow</i> .	A very remarkable specimen, from the Chloritic Marls of Chardstock.
25.	„	<i>compressa</i> , <i>Lamarck</i> .	<i>Ibid</i> .

Fig.			
26.	„	<i>depressa</i> , <i>Sow.</i> var.	Farringdon.
27.	„	<i>nuciformis</i> , <i>Sow.</i> ?	Upper Green Sand, Isle of Wight.
28.	„	<i>depressa</i> , <i>Sow.</i> , var. B.	Chalk, with chloritic grains of Chardstock
28 <sup>b c</sup> .	„	„	Enlarged.
28 <sup>a</sup> .	„	„	Young.
29.	„	„	var. ? Upper Green Sand, Shaftesbury.
30.	„	„	var. A. Chardstock.
30 <sup>a b</sup> .	„	„	Enlarged.
31.	Argiope	<i>Megatrema</i> , <i>Sow.</i> , sp.	Original figure, 'Trans. Geol. Soc.'
31 <sup>a</sup> .	„	„	Enlarged.
32.	„	„	Upper Green Sand, Warminster.
32.	„	„	Enlarged.
33.	„	<i>Buchii</i> , <i>De Hagenow</i> ?	Lower Chalk, Kent.
33 <sup>a</sup> .	„	„	Enlarged.
34.	„	<i>Megatrema</i> =( <i>decemcostata</i> , <i>Ræmer</i> ).	Upper Green Sand, Cambridge.
34 <sup>a b c</sup> .	„	„	Enlarged.
35.	„	„	Ræmer's original figure.
35 <sup>a</sup> .	„	„	Enlarged.
36.	„	„	A specimen of the same, from Essen.
36 <sup>a</sup> .	„	„	Enlarged.
37.	„	<i>Bronni</i> , <i>De Hagenow</i> .	His original figure.
38.	„	<i>Bucchi</i> , „	Ibid.

*Nota.*—Figs. 35 to 38, have been introduced to facilitate comparisons with our British examples, upon which some uncertainty appeared to exist.

39.	<i>Thecidium</i>	<i>Wetherelli</i> , <i>Morris</i> .	Sponge Gravel, Farringdon; interior of the ventral or dental valve.
39 <sup>a</sup> .	„	„	Enlarged.
40 to 41.	<i>Crania</i>	<i>cenomanensis</i> , <i>D'Orb</i> .	Farringdon. Fig. 40, lower valve; 41 <sup>a</sup> , enlarged; 41, upper valve; 41 <sup>a</sup> , enlarged.