

On New Brachiopoda,
from the Inferior Oolite of Dundry, &c.

BY MR. CHARLES MOORE, F.G.S.

WHEN a geologist removes from a district where he has been occupied in working out its ancient fauna, and where its various localities are associated with the discovery of many interesting organic remains, to one comparatively new to him, his feelings of regret may be softened by the hope, that in the wide field of geological observation in which he may happen to be placed, something may still be left for him to accomplish. Feelings akin to these were experienced by myself, in removing from the rich geological locality of Ilminster, to take up my residence in Bath, in former years successively the residence of Walcot, and William Smith—to the latter of whom we are indebted for the basis on which our knowledge of stratification now rests—of Lonsdale and others, through whose united labours its neighbourhood has obtained considerable distinction. Close application to the arrangement of my collection, which is intended to form a free museum for the city, has as yet prevented my becoming familiar with its geological details. I have therefore to hope from future examination it will fully merit the reputation which has been accorded to it.

The local newspapers having lately contained a statement that valuable beds of stone, equalling, according to the account, the oolite of Caen, in Normandy, had been found at Dundry, near Bristol, and knowing that it had long deservedly held a high position as a rich geological locality, I felt anxious to pay it a visit. I the more desired this, as I had seen, when examining the interesting collection at the Bristol Institution, specimens whose specific forms were familiar to me, labelled as from the inferior oolite of Dundry, but which I had previously believed to be characteristic of the middle lias. These beds have, until lately, been confounded with the inferior oolite, but are situated between the latter formation and the lower lias, and I therefore hoped on the escarpment of the hill leading up to Dundry, I should find some sections, shewing the beds intervening between the lower lias and the Dundry oolite, which would be the position of my old familiar beds at Ilminster, from whence these specimens might have come ; but after a careful examination no trace of them could be found. It is more than probable the specimens to which I refer were from the middle lias of some other locality, associated by mistake with those of the inferior oolite.

In proceeding from Bristol to Dundry, the new red sandstone is first passed, a good section of which may be observed at Bedminster, in a deep cutting of the Great Western Railway. On the side of the road ascending to Bedminster Down, a junction is seen of the marls of the new red sandstone with the clays of the lower lias, and in a quarry higher up the road appear the lowest beds of the lias, known as the white lias. In this section occurs a stratum called Cotham marble or landscape stone. From this point until the base of Dundry hill is reached, sections

are seen in several other quarries, and occasionally in cuttings by the road side, all still belonging to the lower lias. In ascending the escarpment of the hill, the beds next in succession should have been the middle lias—then the upper lias, and next in order the Dundry beds of inferior oolite.

The summit of the hill, on which Dundry stands, 700 feet above the level of the sea being reached, a magnificent prospect opens to the view, rich and varied as any lover of nature could desire. Beneath lies the city of Bristol, and the eye can penetrate far beyond into Gloucestershire, until intercepted by hills contemporary in age with those of Dundry, whilst on the other hand the land of the Silures, from whence we derive so much of our mineral wealth, opens to the view beyond the expanse of the Severn.

The church of Dundry, dedicated to Michael the Archangel, is well known. Standing on the brow of the hill with its lofty and beautiful tower, it presents an object which may be seen to a great distance, and assists the mariner in his navigation of the channel. Collinson, writing in 1791, remarks that "the western summit of the hill is a most bleak, dreary and solitary situation, whereon nature has been very sparing with her gifts, and the hand of art never exerted itself, but in hewing out immense quarries in days of yore, and erecting one poor forsaken building for the purpose of a beacon house."

It is on the western side of the hill the principal quarries are found. They have lately passed into new hands, and the present proprietor is working the beds extensively. They are of considerable thickness, and yield a very compact, fine grained, durable freestone. It appears to me remarkable that the value of such beds of oolite within five miles of a city like Bristol, with ample means for its con-

veyance to a distance, should until lately have been lost sight of, and that, for a long period the best beds in these quarries should not have been worked. Formerly their value must have been appreciated, as is evidenced by the shafts and excavations everywhere apparent. No better illustration of the durability of the stone they yield can be presented than in the churches of Dundry and Redcliffe, Bristol, which were built with stone from this locality. The beds of oolite at Dundry are about fifty feet in thickness, and in descending order would show, 1st—raggy beds which are removed to obtain the best stone for building. 2nd,—beds of freestone for which the quarries are now worked 12 feet in thickness. These are not rich in organic remains. 3rd,—Rubbly beds of stone with intervening patches of sand and sandy clay overlying No. 4, the lowest or ammonite bed, for which this locality has so long been celebrated. It is from this bed all the organic remains have hitherto been obtained. Knowing that it had yielded nearly two hundred specific forms, I looked forward to my visit to Dundry with pleasurable anticipation. It happened however, that the ammonite bed had been of late but little worked, and as it underlies those of most value it is not so likely to be reached for the future. During the day I obtained but two or three species of *Terebratula* and *Rhynchonella*, a *Lima*, and a few corals, from a locality undoubtedly rich, so that I did not realize the expectations with which I set out upon my excursion.

On returning from Dundry to Bristol, on the north side of the hill, above the village of Bishport, are several small quarries by the roadside, the upper beds of which are composed of the rubbly stone mentioned above in section 3.

The one nearest Bishport shows signs of much disturbance and has a considerable dip to the north. In this

section may be traced thin bands of sandy clay, immediately overlying several compact beds of stone, (probably the ammonite bed,) for which the quarry was opened. Before leaving I collected some of these sands and clays to examine at my leisure. The result of my first examination convinced me that they contained organic remains hitherto unknown, and the series of Brachiopoda I have succeeded in making from them are of no little interest. Great labour and perseverance are needed in the discovery of these little specimens, the completion of the series now noticed, with some others intended for a future paper, having required six visits to Dundry and an examination of upwards of two cwt. of sand under the lens, occupying me almost daily for several months.

DESCRIPTION OF NEW BRACHIOPODA.

Family—TEREBRATULIDÆ.

Genus—ZELLANIA, Moore.—1854.

Type—ZEL. DAVIDSONII, Moore, Plate 1, fig. 1—3.

Shell minute; unattached; foramen large and rounded, encroaching on both valves, or triangular; valves depressed, convex, dorsal valve usually most so; external surface rugose, shewing slight tendency to striation, at others having concentric lines of growth, which are more defined on the ventral than on the dorsal valve; valves articulate. Interior of dorsal valve granulated or smooth, shewing flattened granulated or smooth margin, surrounded by an elevated ridge, which commencing under the dental sockets passes to the front of the shell, where it is partially obliterated, and is there united by a central septum.

Obs. Since reading my paper at the Taunton Meeting, I have been enabled to determine more clearly the internal

characters of this genus, which were then unknown. Its exterior had led me to suppose it allied to *Morrisia*, a genus first appearing in the chalk, which in form it much resembles. I have since obtained several examples, shewing its interior; which at once shew that it does not belong to that genus; I therefore propose for it the generic name of *Zellania*. The *Zellania* has a large and rounded foramen, which, like that possessed by *Morrisia*, encroaches on both valves; while on the other hand the interior of the dorsal valve shews that it has affinities with *Thecideum*, in having internal ridges and a central septum; and will consequently unite the *Terebratulidæ* with the *Thecideidæ*. The probability of the existence of a loop such as that possessed by the *Argyope*, has been suggested by Mr. Davidson, but although I have in several instances made dissections for its discovery, its existence cannot be satisfactorily established.

This genus is at present represented by three species. It first appears in the upper lias, where one species is found; becomes more abundant in the inferior oolite; and I have also found a single specimen in the great oolite of Hampton down.

Examples:—Zel. Davidsoni; Laboucherei; Liasiana.

ZELLANIA DAVIDSONII.—*Moore.*—Plate 1, fig. 1—3.

Shell small—rugose; presenting a slight tendency to striation; widest towards the front, and contracting slightly towards the foramen; foramen large and rounded, encroaching on both valves—slightly produced beak; hinge line straight; area small; valves convex, the dorsal one but slightly so. Interior presents a uniformly rugose, granulated structure; dorsal valve has a wide flattened margin,

surrounded by a well defined internal ridge, which is partly obliterated towards the front of the shell; it is there united by an elevated septum, occupying about half the length of the shell.

Obs. This species is the most abundant; it is from the inferior oolite of Dundry. I have much pleasure in naming it after my kind friend, Mr. Davidson, to whose aid I have been indebted in my research into the Brachiopoda, and whose beautiful work on them does him so much honour.

ZELLANIA LABOUCHEREI.—*Moore.*—Plate 1, fig. 4—5.

Shell very minute; of an elongated oval shape; front rounded; both valves equally convex; foramen large; area small; beak slightly produced; exterior of dorsal valve smooth, ventral shewing distinct concentric lines of growth.

Obs. This species is readily distinguished from the *Zel. Davidsonii*, by its more oval shape, the absence of radiating striæ, and by the constant presence of lines of growth, which, by the aid of a lens, are perceived on the ventral valve only of this species. It is from the inferior oolite of Dundry, and is very rare.

It is named after the respected president of our Taunton meeting, the Right Hon. H. Labouchere, M.P.

ZELLANIA LIASIANA.—*Moore.*—Plate 1, fig. 6—8.

Exterior of shell slightly striated, smooth, square; foramen large, triangular; valves thin and flattened; ventral slightly concave, dorsal slightly convex; interior of dorsal valve shewing strongly defined elevated ridges, which, commencing under the cural spurs, are united by a central septum.

Obs. This species, being from the *upper lias* of Ilminster, is the oldest representative of the genus yet known. It may readily be distinguished from the other species by its flattened contour, the thinness of its shell, and by the less symmetrical arrangement of the internal ridges, these being generally seen through the shell, give it a somewhat plicated character. Like the ridges in *Zel. Davidsonii*, they are partly obliterated towards the front of the shell.

Family—RHYNCHONELLIDÆ.

Genus—RHYNCHONELLA.—*Fischer.*

RHYNCHONELLA LOPENSIS.—*Moore.*—Plate 1, fig. 9—10.

Shell small—flattened; thickest at the umbo; triangular; nearly straight in front, from whence it tapers to the beak; deltideum triangular; dorsal valve slightly concave; ventral valve proportionately convex.

Obs. This little species is from a bed of blue oolitic marl, occurring in the neighbourhood of Lopen, near Ilminster, where it is very rare. In Mr. Davidson's appendix to his monograph on Brachiopoda, page 30, it is named *R. triangularis*, but that name having been previously adopted by Walenberg, it has been altered.

Family—SPIRIFERIDÆ.

Genus—SPIRIFER.—*Sowerby.*

Shells of this family had their introduction at a very early geological period. They were numerous in the intervening periods, up to the lias, in the lower beds of which one species, *S. Walcottii*, is abundant. In the middle lias there are two species, *S. Munsterii*, and *S. rostratus*. The latter species passed into the upper lias, where I have found one specimen of it. In these beds, a new but very

rare species occurs, *S. Ilminsteriensis*. This hitherto has been supposed the highest point reached by the spirifer, but the discovery of a species at Dundry carries its range into the oolitic period.

SPIRIFER OOLITICA.—*Moore*.—Plate 3, fig. 13—14.

Shell very minute, usually much broader than long, having nine distinct plications, graduating regularly from central one which is in relative proportion to the others; without defined sinus or fold; punctuations not distinguishable. Interior of valves smooth; dorsal valve having large and deep dental sockets; ventral valve having no perceptible central septum.

Obs. This little species is abundant in the inferior oolite of Dundry, and it also occurs at Seavington, near Ilminster.

Family—THECIDEIDÆ.

Genus—THECIDEUM.—*DeFrance*.

The oldest forms of this genus in England are from the middle lias, from which formation I obtained three species in 1849, viz., *Thecideum Bouchardii*, Dav.; *T. Moorei*, Dav.; and *T. triangularis*, D'Orb.; which, with *T. rustica*, Moore, from the upper lias, and *T. Dickinsonii*, Moore, from the inferior oolite, comprised all the then known oolitic species. With the exception of the latter, these species have since been found by M. Eugene Deslongchamps in the upper lias of France; and that zealous geologist has found associated with them seven other species, so that the list has thus been considerably increased. Two liassic forms, *T. Bouchardii*, and *T. triangularis*, pass into the inferior oolite of Dundry,

where they are the most abundant species, and with them are five new species, described in this paper. Not less than nineteen liasic and colitic species are now known.

These shells are in general attached to other bodies; and, as their forms are modified from this circumstance, greater care is necessary in the determination of species; and more especially as the same species presents great contrast in form, depending upon age and the state of perfection in which the shell is found. This may be seen on comparing *T. serratum*, fig. 3, plate 3 (in which the supra-membraneal disk is preserved), with figs. 4—5, which are more imperfect forms of the same species. The same may be noticed on comparing *T. Forbesi*, fig. 9, plate 3, with fig. 10.

THECIDIUM BOUCHARDII.—*Dav.*—Plate 1, fig. 11—13.

Shell inequivalve, flattened, sub-circular; attached by the principal portion of the ventral valve; deltideum large, elevated, triangular; area large and extended, shewing lines of growth; hinge line depressed in centre, leaving a small flat area under the deltideum; dorsal valve much smaller than the ventral. The interior of the ventral valve shews a slight middle septum, on each side of which are two large scars, due to the attachment of the cardinal muscle, on the outer edge of which are two small depressions, which received the adductor muscles; interior rugosely striated; the cavity of the valve in adult shells surrounded by a broad margin, having a wavy appearance, due to lines of growth. Interior of dorsal valve has a broad granulated margin, within which is a very high central septum, nearly reaching the surface of the opposite valve, from whence proceeds a granulated ridge, united by

a bridge over the visceral cavity; within this ridge is a smooth slightly concave space, between which and the granulated interior is a small granulated ridge.

Obs. This species has been figured by Mr. Davidson and M. Eugene Deslongchamps, but from more imperfect specimens. No examples have before been obtained so perfect as those now figured; which is due to my being successful in opening several bivalve specimens. In the detached and worn valves, the septum is less deep, and the granulations to some extent obliterated.

From the inferior oolite of Dundry, where it is common. It is also found in the upper and middle lias.

THECIDEUM GRANULOSUM.—*Moore.*—Plate 2, fig. 1—6.

Shell thick, longitudinally oval; area triangular, concave; deltideum flattened; hinge line straight; outer side of dorsal valve convex, having lines of growth and short striæ towards the frontal margin, ventral valve having a sinus in the centre. Interior of ventral valve has a central ridge through its greater length, on each side of which are muscular impressions. The interior of dorsal valve has a flattened thickly granulated margin, within which is a raised ridge, formed of larger single granulations, united in the centre by a septum occupying about one-half the length of the shell, sometimes smooth, at others covered with granulations, and joined over the visceral cavity by a bridge, the equivalent of the cural processes of *Terebratula*; within this ridge occurs a small raised ridge, answering to the loop in other Brachiopoda to which were attached the brachial membrane and oral arms, within which, and occupying the larger portion of the cavity of the shell, occurs a calcified supra-membraneal disk, divided by the

septum into two lobes of brain-shaped convolutions, the free portion of which extends over the visceral cavity.

Obs. This species presents considerable variety, in most cases depending upon the completeness of the supra-membraneal disk. In the varieties presented by figures 4 and 5, the raised and solid portions, only of the disk are preserved. This species has more punctuations than other oolitic forms, which are particularly numerous and large in the visceral cavity.

From the inferior oolite of Dundry, and is not uncommon.

THECIDEUM DUPLICATUM.—*Moore*.—Plate 2, fig. 7—12.

Shell rather broader than long; valves convex; surface slightly granulated; attached by the upper part of the ventral valve; hinge line straight; deltideum small, depressed, triangular, under which is a small flattened space; interior of the dorsal valve shews a regularly granulated margin, within which is a raised granulated ridge, united in the centre by a septum, with an enlarged granulated base, from the top of which is thrown off on either side a high ridge, in the perfect shell covered in its whole course with irregularly shaped calcareous processes, which appear in some instances long enough to reach the interior surface of the ventral valve; the ridge describing a circle returns towards the base of the central septum; over the visceral cavity is the bridge from whence two small processes depart. Interior of the ventral valve has a slightly raised septum, on either side of which are the impressions of the larger muscles; above the septum is an elevation bounded by ridges, which received the insertion of the adductor muscles.

Obs. The interior of the dorsal valve of this species is very variable; in some instances the internal ridges are formed by widely-separated granulations, of which fig. 12 is an extreme variety; in others they are continuous, as in fig. 11. Fig. 9 is drawn from a specimen I was successful in opening, but does not give a faithful representation of the spinose character of the ridges, which were accidentally broken before the drawing was made.

From the inferior oolite of Dundry.

THECIDIUM SEPTATUM.—*Moore*.—Plate 2, fig. 13—16.

Shell small, thick, transversely oval; area flattened; deltideum small, depressed; hinge line straight, exterior of the dorsal valve convex. Interior of the dorsal valve shews a raised septum or ridge, from which, in the middle, spring lateral branches, assuming the form of a letter Y; these traverse the length of the shell, and occasionally divide it into three nearly equal parts; outer margin small, and slightly granulated, within which is a granulated ridge. The interior of the ventral valve has a slightly raised central ridge.

This species is rare. It is from the inferior oolite, Dundry.

THECIDIUM SERRATUM.—*Moore*.—Plate 3, fig. 1—6.

Shell inequivalve, triangular, very small; attached to other bodies by the whole of the ventral valve, and by an expanded base; area flattened; deltideum very long, rounded, shewing lines of growth. Exterior of dorsal valve flattened, or slightly convex, rather more than half the length of the whole shell. External front of the ventral valve very raised, shewing punctuations, sometimes



striate. Interior of the ventral valve shows two produced teeth, between which, under the deltideum, is a small central ridge, on either side of which are muscular depressions; beyond which are the impressions of the larger muscles. About the middle of the cavity of the valve, commence striated ribs, which become more produced as they approach the inner front of the shell, terminating at the margin of the valve in small bosses or knobs. The interior of the dorsal valve has a deep frontal margin, comprising nearly half the area of the valve, chiefly occupied by a series of deep grooves, which received, when closed, the bosses of the ventral valve; where the grooves cease, a flattened striated band occurs. Within the margin is an elevated ridge, with granulations, united at the top by a straight ridge, forming a bridge over an elongated visceral cavity, and at the bottom by a broad septum. The inner portion of the valve is occupied by a calcified supra-membraneal disk, divided into two lobes by the central septum.

Obs. This beautiful species of *Thecideum* is the only one which presents so peculiar a frontal margin. It is very rarely found perfect; only two specimens shewing the supra-membraneal disk having been obtained. The usual forms of the less perfect dorsal valves may be seen in varieties fig. 4—5. On the interior of the dorsal valves are large punctuations. The outer front of the ventral valve, when perfect, is also punctuated; but when worn, the internal striated ribs appear.

From the inferior oolite of Dundry.

THECIDÉUM FORBESEI.—*Moore*.—Plate 3, fig. 8—10.

Shell transversely oval, depressed, smooth; deltideum short, raised, triangular; area flat; hinge line straight;



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margin of valves equal; attached by the whole of the larger valve. The interior of the ventral valve shews under the deltidium three little ridges, between which are situated muscular depressions; towards the front of the shell are short expanded ribs. The interior of the dorsal valve has a rounded visceral cavity, surmounted by the bridge, and partly hidden by the supra-membraneal disk, which in this species is formed by two circular platforms, on the outer edge of which, and scattered over its surface, are arranged a number of elevated granulations. These are divided in the centre by a long septum, from the base of which proceeds the outer granulated ridge, and beyond this is a small granulated margin.

Obs. The interior of the ventral valve of this species is not unlike *T. serratum*, but it wants the elevated front of that shell; and it may also be distinguished by its more oval shape and less produced beak. When the supra-membraneal disk is wanting, the dorsal valve shews two small oblong elevations on each side of the septum, as seen in the variety fig. 10.

This little species is named in remembrance of that eminent and lamented palæontologist, Professor E. FORBES. It is from the inferior oolite of Dundry.

THECIDEUM TRIANGULARIS.—*D' Orb.*

Plate 3, fig. 11—12.

Shell triangular, longer than broad; deltidium small, area flat; hinge line straight; small valve slightly convex. Interior of ventral valve divided by a straight ridge occupying the length of the shell. Interior of the dorsal valve has a granulated marginal ridge, from the centre of which

rises a thick triangular septum, on either side of which is a small sub-circular ridge, formed by a range of granulations.

Obs. This species has been figured by Mr. Davidson and M. E. Deslongchamps, the latter of whom mentions that the sub-circular ridges in the French specimens are sometimes formed of a double line of granulations. In examples that have come under my observation, the ridge is usually made up of single granulations, and those at times widely separated; but I have no hesitation in placing them under this species. It is common in the inferior oolite of Dundry; the large valve is found in abundance attached to oyster and other shells, in the fuller's earth near Combe Down, Bath; it occurs in the great oolite of Hampton Down, and I have obtained it in the middle lias of Ilminster.

PLATES TO ILLUSTRATE
MR. CHARLES MOORE'S PAPER
ON NEW BRACHIOPODA.

In each plate, the small lines placed by the figures, are intended to denote their natural size.



PLATE I.

Fig.

1. *Zellania Davidsonii*, *Moore*, perfect shell, enlarged;
f, foramen.
2. " " Ventral valve enlarged.
3. " " Interior of dorsal valve enlarged,
shewing its rugose surface; *c*,
cardinal process; *a*, area; *t*, teeth
sockets; *r*, ridge; *s*, septum.
4. *Zellania Labouchei*, *Moore*, perfect shell, enlarged.
5. " " Exterior of ventral valve,
shewing lines of growth.
6. *Zellania liasiana*, *Moore*, enlarged illustration.
7. " " Ventral valve enlarged.
8. " " Interior of dorsal valve, enlarged;
shewing teeth sockets, cural spurs,
ridges, and septum.
9. *Rhynchonella Lopensis*, *Moore*, enlarged figure.
10. " " Ventral valve enlarged.
11. *Thecideum Bouchardii*, *Dav.*, enlarged illustration of
the perfect shell, shewing
the comparative size of the
dorsal valve, and the wavy
margin of the larger valve;
a, area; *d*, deltideum.
12. " " Interior of the ventral valve,
enlarged; *m*, muscular de-
pressions.

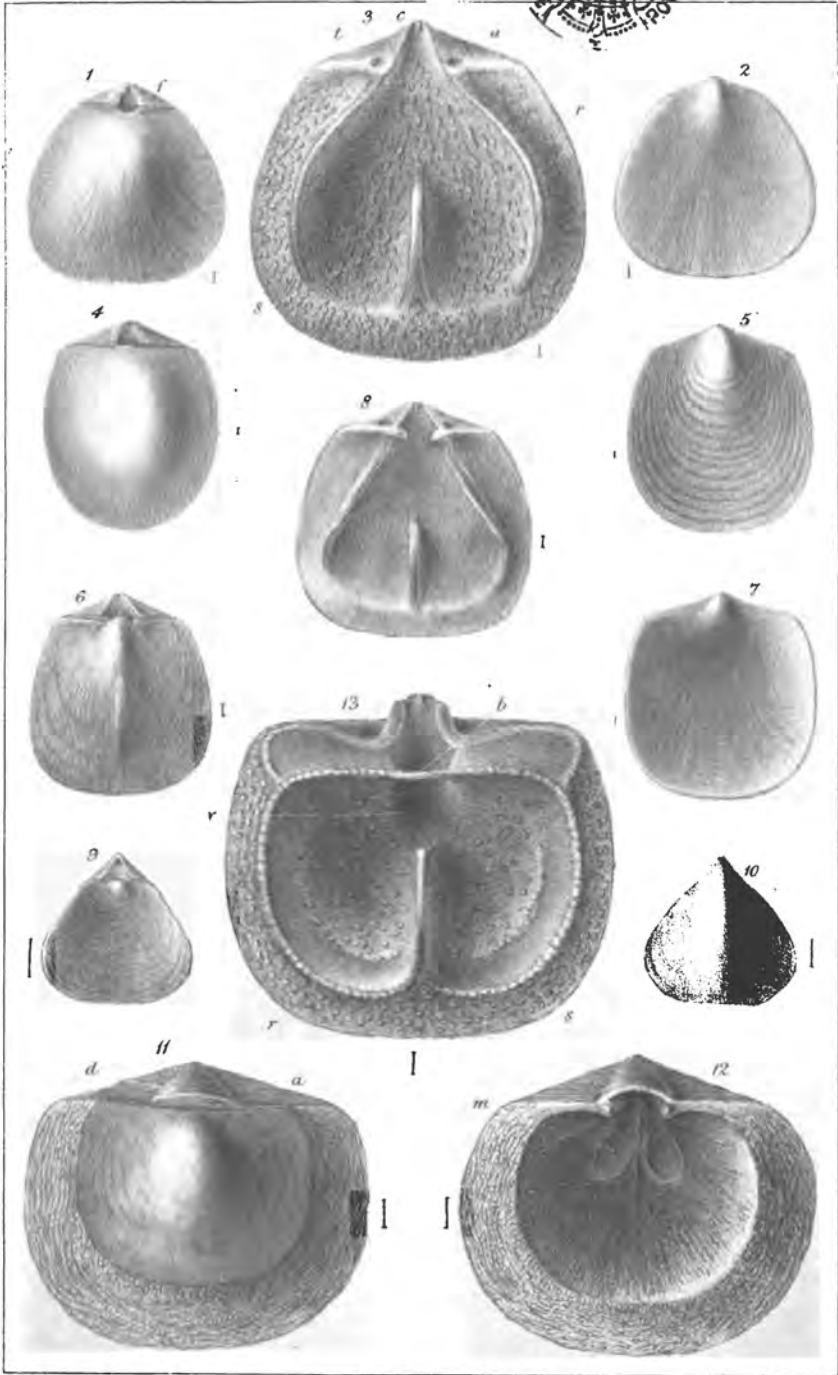


PLATE II.

- Fig.
1. *Thecideum granulosum*, *Moore*, perfect shell, enlarged.
 2. " " Enlarged exterior of ventral valve, shewing attached portion.
 3. " " Interior of dorsal valve, enlarged; *m*, the perfect calcified supra-membraneal disk; *s*, septum.
 4. " " Another enlarged dorsal valve; *b*, the bridge; *v*, visceral cavity; *l*, loop; *r*, granulated ridge; *m*, solid portion of supra-membraneal disk.
 5. " " Variety of dorsal valve, enlarged.
 6. " " Interior of ventral valve enlarged.
 7. *Thecideum duplicatum*, *Moore*, perfect shell, enlarged.
 8. " " Exterior of ventral valve, enlarged, shewing point of attachment.
 9. " " Enlarged illustration of interior of dorsal valve, shewing spinose ridges; *b*, bridge, with two small processes.
 10. " " Enlarged interior of ventral valve, shewing teeth and muscular depressions.
 - 11—12. " " Dorsal valves, enlarged varieties.
 13. *Thecideum septatum*, *Moore*, perfect shell; enlarged.
 14. " " Dorsal valve, enlarged; shewing bridge and internal ridges.
 15. " " Dorsal valve; variety; enlarged.
 16. " " Interior of dorsal valve, enlarged.

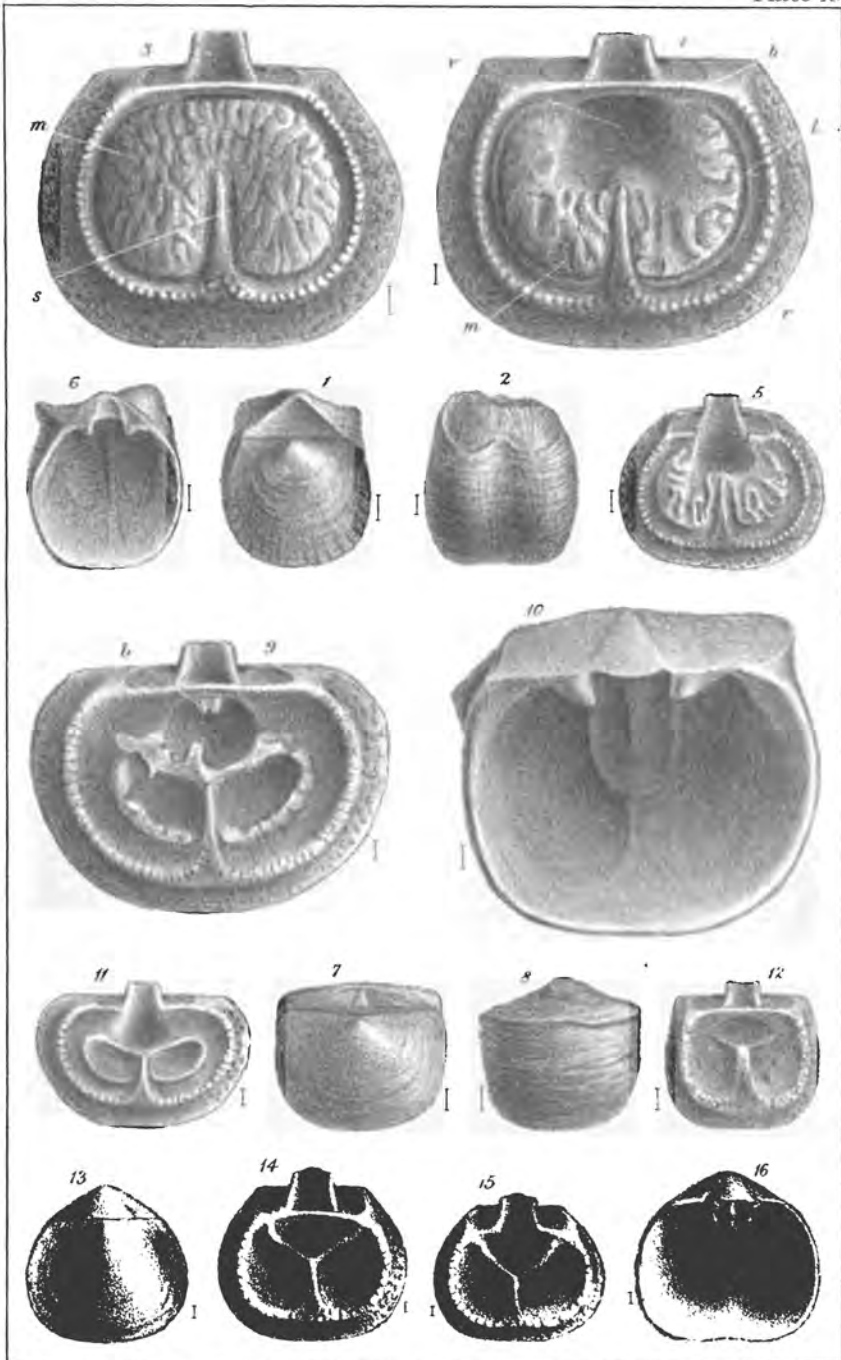


PLATE III.

Fig.

1. *Thecideum serratum*, *Moore*, perfect shell, enlarged; shewing expanded base of attachment.
2. " " Enlarged interior of ventral valve, shewing internal ribs and bosses on the edge of the valve; *m*, muscular impressions; *t*, teeth; *d*, deltidium.
3. " " Dorsal valve, enlarged; *m*, perfect supra-membraneal disk; and shewing besides the bridge, raised ridge and septum; also the grooved margin.
- 4—5. " " Enlarged varieties.
6. " " Profile enlarged; shewing the produced front and deltidium.
7. *Thecideum Forbesii*, *Moore*, perfect shell; enlarged.
8. " " Interior of ventral valve, enlarged.
9. " " Interior of dorsal valve, enlarged; *b*, bridge; *v*, visceral cavity; *m*, supra-membraneal disk with granulations.
10. " " Imperfect or worn variety, enlarged.
11. *Thecideum triangularis*, *D'Orb*, perfect shell, enlarged.
21. " " Interior of dorsal valve, var.
13. *Spirifer oolitica*, *Moore*, enlarged exterior.
14. " " Exterior of ventral valve, enlarged.

