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## XXI.—On the fossil botany and zoology of the rocks associated with the coal of Australia

Frederick M'Coy M.G.S. N.H.S.D.

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XXI.—*On the Fossil Botany and Zoology of the Rocks associated with the Coal of Australia.* By FREDERICK M'COY, M.G.S. & N.H.S.D. &c.

[Continued from p. 157.]

[With nine Plates.]

ZOOPHYTA.

*Stenopora crinita* (Lonsd.).

Very abundant, forming globose masses five inches in diameter, with a mammillated surface like that of the *Ceriopora verrucosa* (Gold.). In the sandstone of Wollongong, N. S. Wales; also in the sandstone of Darlington; more rare in calcareous beds at Black Head, N. S. Wales.

*Stenopora ovata* (Lonsd.).

Common in Darlington sandstone, N. S. Wales.

*Stenopora Tasmaniensis* (Lonsd.).

Not uncommon in the sandstone of Darlington, N. S. Wales.

*Fenestella ampla* (Lonsd.).

Common in the sandstones of Muree, Bell's Creek, and Loder's Creek, N. S. Wales.

*Fenestella fossula* (Lonsd.).

Common in the sandstone of Muree, N. S. Wales.

*Fenestella internata* (Lonsd.).

Common in the sandstone of Bell's Creek and Darlington, N. S. Wales.

*Fenestella undulata* (Phil.).

Rare in the shale of Dunvegan, N. S. Wales.

*Fenestella.*

Two species closely resembling the *F. antiqua* (Lonsd.) (the Devonian variety) and the *F. plebeia* (M'Coy) of the British carb. slate, but not determinable with certainty from their state of preservation: common in the shale of Korinda, N. S. Wales.

*Glaucanome.*

A species most allied to the *G. pluma* (Phil.) of the British carboniferous rocks, and perhaps identical with it, but not in sufficiently good preservation to determine. Common in the shale of Dunvegan, N. S. Wales.

*Cladochonus* (M'Coy), new genus.

(Etym. κλάδος, a branch, and χώνη, a funnel.)

*Gen. Char.* Polypidom of very thick, straight, slender, calcareous tubes, suddenly dilating at short regular distances into large, oblique, cup-shaped terminal chambers, longitudinally striated within; from the point where the dilatation commences, a second slender tube similar to the first is given off at an angle varying with the species, and terminating at the same distance as the former in a similar cup, bent in nearly an opposite direction to the first, and giving rise at its base to a third slender tube as before. The whole polypidom erect, attached by the base only, which embraces some foreign body.

These singular and beautiful corals have some relation to *Aulopora*, but differ in their curious erect habit, regular, angular, mode of branching, slender, equal, stem-like tubes and abruptly dilated terminal cups bent in nearly opposite directions. The *Aulopores* are attached for the most part by one side; the tubes gradually expand to the mouths, which all open nearly in one direction; they have no regular distance for branching and frequently anastomose. The present corals have also much thicker walls to the tubes, the central hollow being proportionally very small. I formerly described some species of this group under the genus *Jania*, being uncertain where to place them; such are the *J. crassa* and *J. bacularia* of the 'Synopsis of the Irish Carb. Limestone Fossils,' which should now be removed to this genus.

*Cladochonus tenuicollis* (M'Coy). Pl. XI. fig. 8.

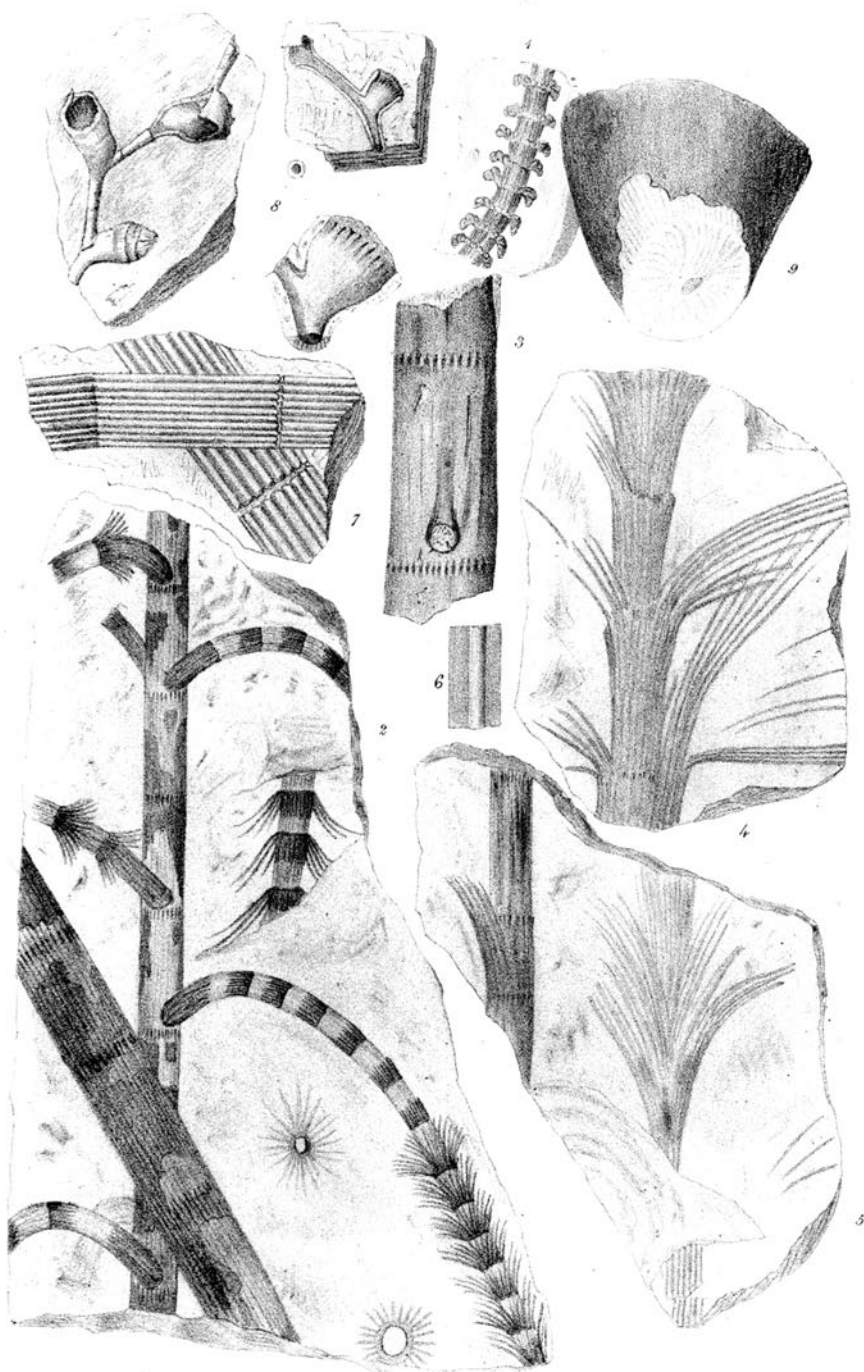
Distinguished by the slenderness of the stems. Common in the Dunvegan shale.

*Strombodes? Australis* (M'Coy). Pl. XI. fig. 9.

I have given the above name provisionally to a species of *Strombodes* from the calcareous shale of Wagamee, N. S. Wales, having the precise form of the *Turbinolia fungites* of British writers. It is certainly without transverse chambers, having the vertical lamellæ twisted about the centre; the lamellæ are about thirty-six in number, all reaching the centre, though grouped in irregular bundles as they approach it. The section is slightly oval, the lamellæ in the direction of the long axis being straight, those of the sides much arched. The external surface is striated longitudinally, the striæ being double the number of the lamellæ.

*Turbinolopsis bina* (Lonsd.).

Agreeing minutely with Devonshire specimens. Rare in the shale of Dunvegan, N. S. Wales.



*Amplexus arundinaceus* (Lonsd.).

Common in the gray limestone of Curradulla or Limestone Creek, N. S. Wales.

## CRINOIDEA.

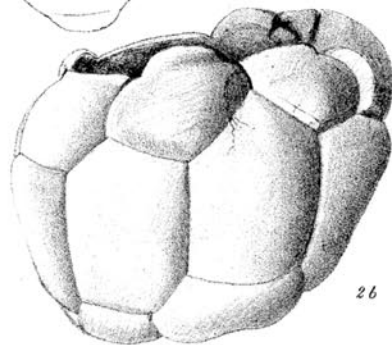
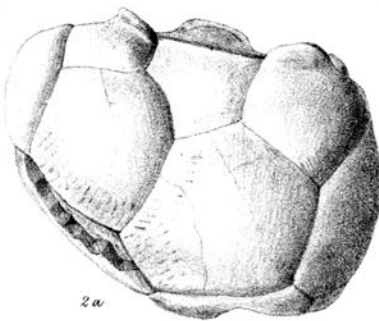
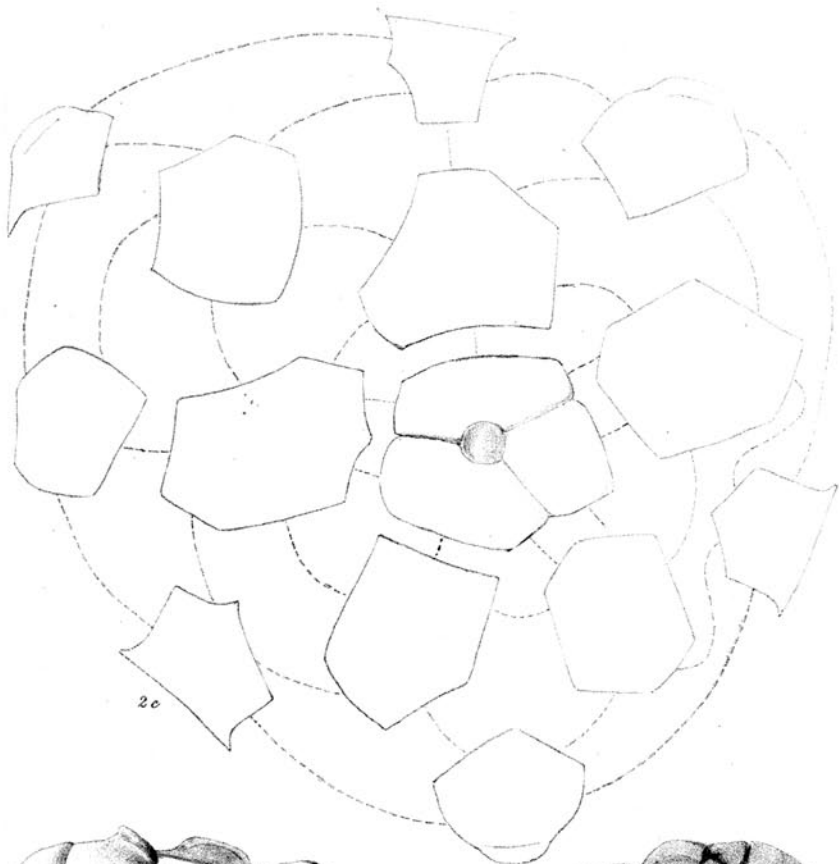
*Tribrachyocrinus* (M'Coy), new genus.

*Gen. Char.* Cup globose; pelvis (or dorso-central plate) large, saucer-shaped, pentagonal, tripartite; first costals (or first row of perisomic plates) five, one pentagonal, three hexagonal and one (?) heptagonal; one of the hexagonal costals is truncate above and supports one pentagonal interscapular plate; between these and the heptagonal costal is situated one large, roundish, pentagonal, intercostal plate; in the re-entering angle between this latter and the summit of the heptagonal costal is an obscurely hexagonal plate, analogous to a second costal. Scapulæ (or ray-bearing plates) three, rhomboidal or obscurely pentagonal, upper margin rounded, lower margin pointed; two of those in the re-entering angles between the first costals and one in the angle between the intercostal plate and the second costal. Interscapular plates three, shield-shaped, pentagonal; upper margin broad, straight, truncate, with the two upper lateral angles horizontally extended into short angular processes.

The singular Crinoid for which I propose this genus is very differently constructed from any other of the generic groups with which I am acquainted. The cup is not symmetrical in form, like that of other Crinoids, but is as it were humped on one side by the interpolation of the large irregular intercostal (marked *h* in the diagram) and the second costal (*i*). The only specimen found is slightly crushed laterally, so as to render this inequality of the sides very remarkable. The arm-bearing plates or scapulæ, which are so generally five in the other genera, are only three in the present animal, forming a strong peculiarity which it shares only with the genus *Triacrinus* of Count Münster (Beiträge zur Petrefactenkunde), a little Crinoid of the Eifel differing in every other respect from the Australian form. The general disposition of the plates is most analogous to that of *Poteriocrinus*, from which it differs in the number of the scapulæ and every point of detail. I am as yet only acquainted with one species of the genus, which it is not possible therefore to characterize specifically: I have dedicated it to the Rev. W. B. Clark, to whose zeal we owe the specimens described in this paper.

*Tribrachyocrinus Clarkii* (M'Coy). Pl. XII. fig. 2.

The surface is smooth, with the exception of a few irregular radiating plicæ at the margin of some of the plates, which seem



Frederick M. Coy del. Wing. Lith.

Hullmandel & Walton's new Process.

in some cases to overlap each other—an appearance however which may be deceptive. Length of the cup 1 inch 7 lines, width about  $1\frac{1}{2}$  inch.

From the soft gray shale of Darlington, N. S. Wales.

*Actinocrinus.*

Fragments of pelvic plate of this genus occur in the Dunvegan shale, and large columns apparently of *Cyathocrinus* are common in the limestone of Wagamee, N. S. Wales, and also in the limestone of Wollamhoola, N. S. Wales.

CRUSTACEA.

(*Entomostraca.*)

*Bairdia curtus* (M'Coy), Synop. C. L. Foss. pl. 23. fig. 6.

This little creature is perfectly identical with those I have described and figured, from the lower limestone of Kildare, in the 'Synopsis of the Carb. Limestone Fossils of Ireland.'

Mr. Morris, in Count Strzelecki's work, has noticed a *Bairdia* which he says is intermediate between my *B. gracilis* and *B. curtus*, being more slender than the latter; but his figure is greatly more gibbose, so that I am uncertain whether his *B. affinis* be really distinct or not. At any rate there can be no doubt with regard to the present examples, which are from the shale of Dunvegan, N. S. Wales.

*Cythere impressa* (M'Coy), Synop. C. L. Foss. pl. 23. fig. 16.

This is another species which I have described from the shales at the base of the carboniferous series in Ireland, and from the complexity of its form is, if possible, a still more positive identification than the last; the agreement in outline, central hollow and its little marginal tubercle, &c. being absolutely perfect, and admitting of no doubt. It is certainly very curious to see those two genera and species of minute Crustaceans occurring together in the shales at the Antipodes just as we see them in our own lower carboniferous beds.

Occurs with the *B. curtus* in the shale of Dunvegan, N. S. Wales.

(*Trilobita.*)

*Brachymetopus* (M'Coy), new genus.

(Etym. *βραχὺς*, short, and *μέτωπον*, the forehead or glabella.)

*Gen. Char.* Cephalothorax truncato-orbicular; limb narrow, produced backwards into flattened spines; glabella smooth, cylindrical or ovate, about twice as long as wide, not reaching within about its own diameter of the front margin; one pair of small, basal, cephalothoracic furrows, or none. Eyes reni-

form, in the midst of the cheeks (? smooth); eye-lines unknown. Surface strongly granulated; one tubercle on each side of the anterior end of the glabella, the marginal row and a circle round each eye being larger than the rest. Body-segments unknown. Pygidium nearly resembling the cephalothorax in size and form, rather more pointed, strongly trilobed, and with a thickened prominent margin; axial lobe about as wide as the lateral lobes, of about seventeen narrow segments; lateral segments about seven, divided from their origin, each terminating in a large tubercle at the margin.

The minute Trilobites for which I propose the present genus are very distinct in habit from those of other genera, and as two or three species are now known, it seems desirable to place them together under one name. They are the smallest perfect Trilobites known, from two to three lines being the greatest width they have been seen to attain. The *Phillipsia Maccoyi* of Capt. Portlock's Geol. Report on Londonderry, &c. certainly belongs to this genus, and is at first sight difficult to distinguish specifically from the Australian species. The Irish species alluded to was collected by the writer from the lower carboniferous limestone of Kildare, and sent to Capt. Portlock for his monograph of Irish Trilobites, under the impression that it formed the type of a new genus and species, but probably from there being but one specimen it was placed provisionally by that author in his genus *Phillipsia*, from which it differs in its small, short glabella, smooth eyes, want of cephalothoracic furrows, &c. Having now examined numerous specimens of the Australian species, there can be no longer any doubt of the distinctness of the group from *Phillipsia* from the characters of the cephalothorax, and the pygidium is still more distinct. From those materials I have therefore drawn up the above characters, which it is believed will distinguish them easily from the other generic types. From the general similarity in the structure of the pygidium, I am inclined to refer the fossil which I have named *Phillipsia* (?) *discors* (Synopsis of the Carb. Limestone Foss. of Ireland, pl. 4. fig. 7. p. 161) to the same genus. This is also a very small Trilobite, the length of the pygidium being only three lines; and although referring it provisionally to *Phillipsia*, I suggested in the above work that it should when better known form the type of a distinct genus, which however it was not possible to frame until now. I have dedicated the present species to Count Strzelecki, whose fine work on the physical features of New South Wales and Van Diemen's Land has so materially advanced our knowledge of that country, and who has recorded the existence of minute Trilobites (undetermined) in the limestone of Yass Plains, which probably belong to this group if not to this species.



*Brachymetopus Strzeleckii* (M'Coy). Pl. XII. fig. 1.

*Sp. Char.* Glabella widest at the base, with one very minute obscurely marked cephalothoracic furrow at the base on each side; all the segments of the pygidium with an irregularly tuberculated ridge along the middle; lateral segments forming large tubercles where they join the thickened limb, opposite each of which is a short slender spine projecting from the margin.

The greater size of the glabella and its being widest at the base will distinguish the head from that of the *P. Maccoyi* (Portk.), and the granulation extending entirely across the segments and the spinose margin will distinguish the pygidium from that of the *P. discors* (M'Coy).

Width one and a half line.

Common in the shale of Dunvegan, N. S. Wales.

*Phillipsia.*

A species closely resembling the *P. gemmulifera* (Phil. sp.), but not distinctly preserved, occurs in the shale of Dunvegan, N. S. Wales.

## MOLLUSCA.

(*Brachiopoda.*)

*Atrypa cymbæformis* (Mor.).

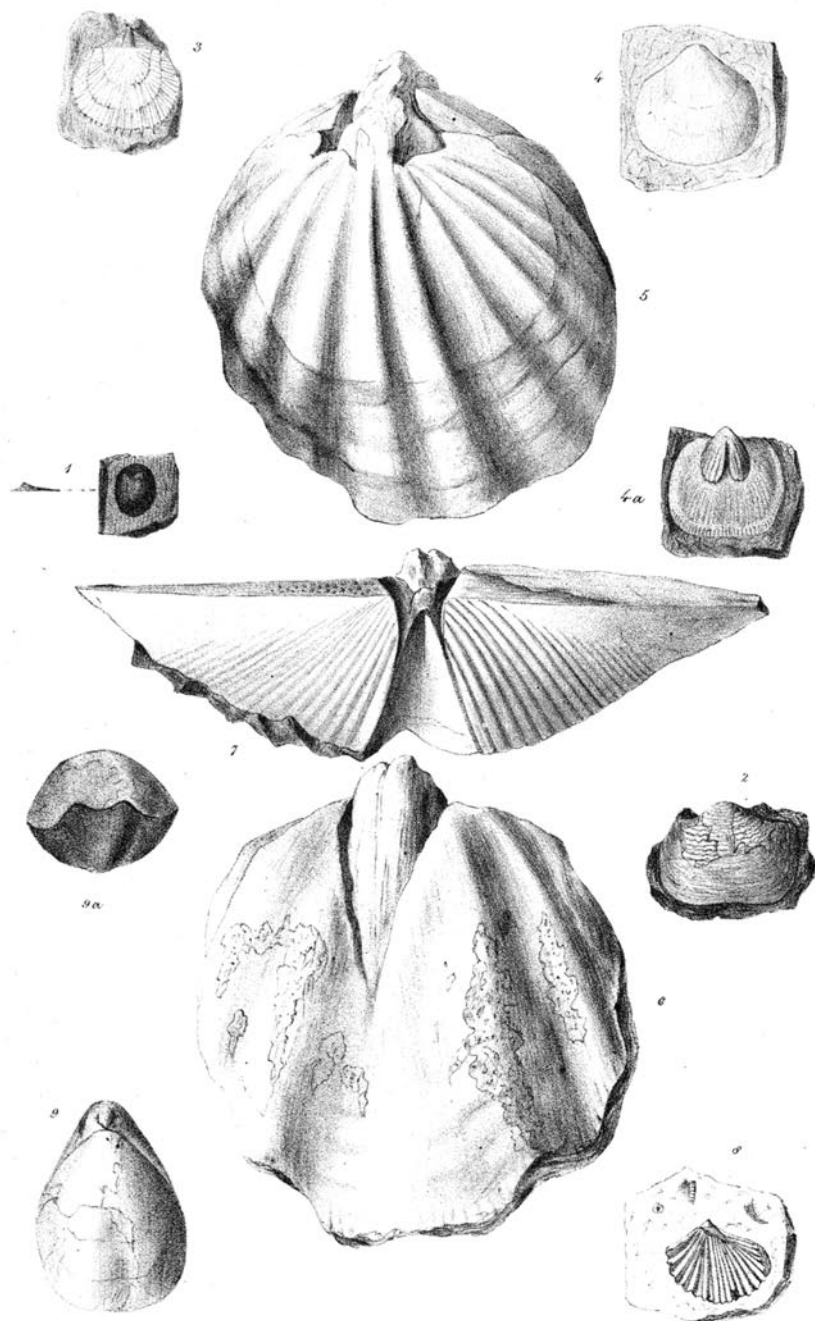
Very common in the sandstone of Muree, N. S. Wales, and in the impure limestone of Black Head, N. S. Wales.

*Atrypa biundata* (M'Coy). Pl. XIII. figs. 9 & 9 a.

*Sp. Char.* Longitudinally ovate, gibbose, smooth; front narrow; margin raised in two rounded waves, from which two obsolete rounded ridges extend a short way towards the beak on the ventral valve, and one obscure rounded mesial ridge extends nearly to the beak on the dorsal valve.

This species closely resembles the *A. hastata* (Sow.) of the British mountain limestone, and may have been confounded with it; it is however perfectly well distinguished by the character of the front margin, which in *A. hastata* is straight and even, but is elevated and bent into a double fold in the Australian species, somewhat as in the less exaggerated varieties of the *Terebratula biplicata* (Sow.) of the oolites (from which it is known by its imperforate beak, &c.); also both valves of the *A. hastata* are plano-concave towards the front margin, while the dorsal valve of the present species presents an obtuse mesial convexity. Length 1 inch 1 line, width 10 lines, thickness 7 lines.

Common in the dark limestone of Black Head, N. S. Wales, in



Frederick Mc Coy del. W. Wing lith.

Hullmandel & Walton's new Process.

the coarse conglomerate of Korinda, N. S. Wales, and in the gray schists of Lewin's Brook, N. S. Wales.

*Atrypa Jukesii* (M'Coy). Pl. XIII. fig. 8.

*Sp. Char.* Transversely oval, length two-thirds the width; sides with eight or nine large, acutely angular, simple plaits, extending from the beak to the margin, which they deeply indent; mesial elevation moderate, square, of five slightly angular simple plaits, much smaller than those of the sides.

This species is closely allied to the *A. pleurodon* (Phil.) of the carb. limestone of Britain, and the *A. fallax* (Sow.) of the upper Devonian and lower carboniferous shales of England and Ireland, but is distinguished by the dissimilarity in size and angulation between the mesial and lateral plaits; the mesial plaits are if anything a little larger than those of the sides in the British forms alluded to. Length  $4\frac{1}{2}$  lines, width 7 lines.

Common in the Dunvegan shale.

I have dedicated this species to my friend Mr. Jukes, who has geologically examined a considerable portion of the country and collected many fossils, which I have not as yet seen.

*Spirifera (Reticularia) crebristria* (Mor.).

This species has got a distinct cardinal area, and could not therefore belong either to *Terebratulula* or *Athyris* as suggested by Mr. Morris; it is in fact a typical example of that little group of *Spirifers* for which I have suggested the name *Reticularia* in the 'Synop. Carb. Foss.' &c., distinguished by their small size, area and hinge-line as in *Martinia* (M'Coy), (that is, the former shorter than the width, and the latter moderately large,) in addition to a reticulated surface and *parallel dental lamellæ*. Is this really distinct from the *Spirifera (Ret.) microgemma* (Phil.) of the Devonian and lower Irish carboniferous shales? On comparison I scarcely think it is.

Rather rare in the schists of Dunvegan, and in the fine sandstone forming the summit of a hill one mile south of Trevallyn, N. S. Wales.

*Spirifera vespertilio* (Sow.).

Not uncommon in the impure limestone of Black Head, N. S. Wales, and abundant in the dark calcareous schists of Eagle Hawk's-neck, Van Diemen's Land.

*Spirifera calcarata* (Sow.).

I cannot in the slightest particular distinguish examples from the sandy shales of Dunvegan, N. S. Wales, from those so abundant in Devonshire and in the lower carboniferous shales and sandstones of Ireland.

*Spirifera avicula* (Sow.).

Abundant in the sandstones of Korinda, also occasionally in the limestone of Black Head, N. S. Wales.

*Spirifera Darwinii* (Mor.).

Common in the sandy schists of Loder's Creek and Barraba; more rare in the arenaceous limestone of Black Head, N. S. Wales.

*Spirifera subradiata* (Sow.).

Common in the sandstone of Muree, in the arenaceous limestone of Black Head, in the schists of Wollongong, and in the fine sandstones of Darlington, N. S. Wales.

*Spirifera subradiata* (? var. resembling *S. glabra*).

Common in the sandstone of Maitland, and in the arenaceous limestone of Irawang, N. S. Wales.

*Spirifera attenuata* (Sow.).

Specimens perfectly undistinguishable from the *larger variety* so abundant in the lower carboniferous shales of Ireland (as at Hook Point, co. Wexford), are common in the arenaceous shales of Dunvegan, N. S. Wales.

*Spirifera Tasmaniensis* (Mor.).

Common in the hardened schists of Lewin's Brook, N. S. Wales.

*Spirifera lata* (M'Coy). Pl. XIII. fig. 7.

*Sp. Char.* Transversely rhomboidal, moderately gibbose, width four times the length; sides flattened, regularly attenuating to the very acute cardinal angles; cardinal area broad, flat; mesial fold wide, defined, angular, smooth; about sixteen to eighteen slightly convex, simple, smooth ribs on each side of the mesial fold, becoming indistinct as they approach the cardinal angles, so as to leave nearly a third of the length of the sides smooth.

This differs from the widest varieties of the *S. disjuncta* (Sow.) by its defined and smooth mesial hollow, extent of the smooth space at the end of the sides, and the smaller number and greater width of the radiating ridges, which are also much less prominent; the smoothness of the mesial fold and width of the cardinal area separate it from the *S. convoluta* (Phil.); and from the *S. Rømerianus* (Kon.) it is known by its size, greater width, smooth cardinal extremities and flatter and wider lateral ridges. Length 1 inch 1 line, width 4 inches.

From the hard schists of Lewin's Brook, N. S. Wales.

*Spirifera duodecimcostata* (M'Coy). Pl. XVII. figs. 2 & 3.

*Sp. Char.* Transversely oval or subrhomboidal, gibbose; sides rounded; hinge-line shorter than the width of the shell; cardinal area wide, triangular, curved; mesial ridge prominent, deeply divided by a mesial sulcus; mesial hollow wide, deep, defined, and showing a mesial ridge corresponding to the mesial sulcus of the ridge of the ventral valve; five or six strong, subangular, simple ridges on each side of the mesial fold.

Length of dorsal valve 1 inch 3 lines, width 1 inch 9 lines. Not uncommon in the calcareous grit of Wollongong and in the sandstone of Muree, N. S. Wales.

*Spirifera oviformis* (M'Coy). Pl. XIII. figs. 5 & 6.

*Sp. Char.* Longitudinally ovate, longer than wide; hinge-line much shorter than the width of the shell; sides rounded, gibbose; mesial ridge large, rounded, divided by a deep furrow; mesial hollow very wide, flat, undefined; three or four large rounded prominent ribs on each side of the mesial fold, rendered obscurely nodulose by the obtuse concentric undulations of growth.

This is one of the very few *Spirifers* in which the length exceeds the width, by which character it may be known from all the varieties of the *S. subradiata*. The figures on the plate are from two different specimens. Length 2 inches 6 lines, width 2 inches 3 lines.

Not uncommon in the sandstone of Barraba, N. S. Wales.

This species and the last belong to the subgenus *Brachythyris* (M'Coy).

*Orthis striatula* (Schlot.).

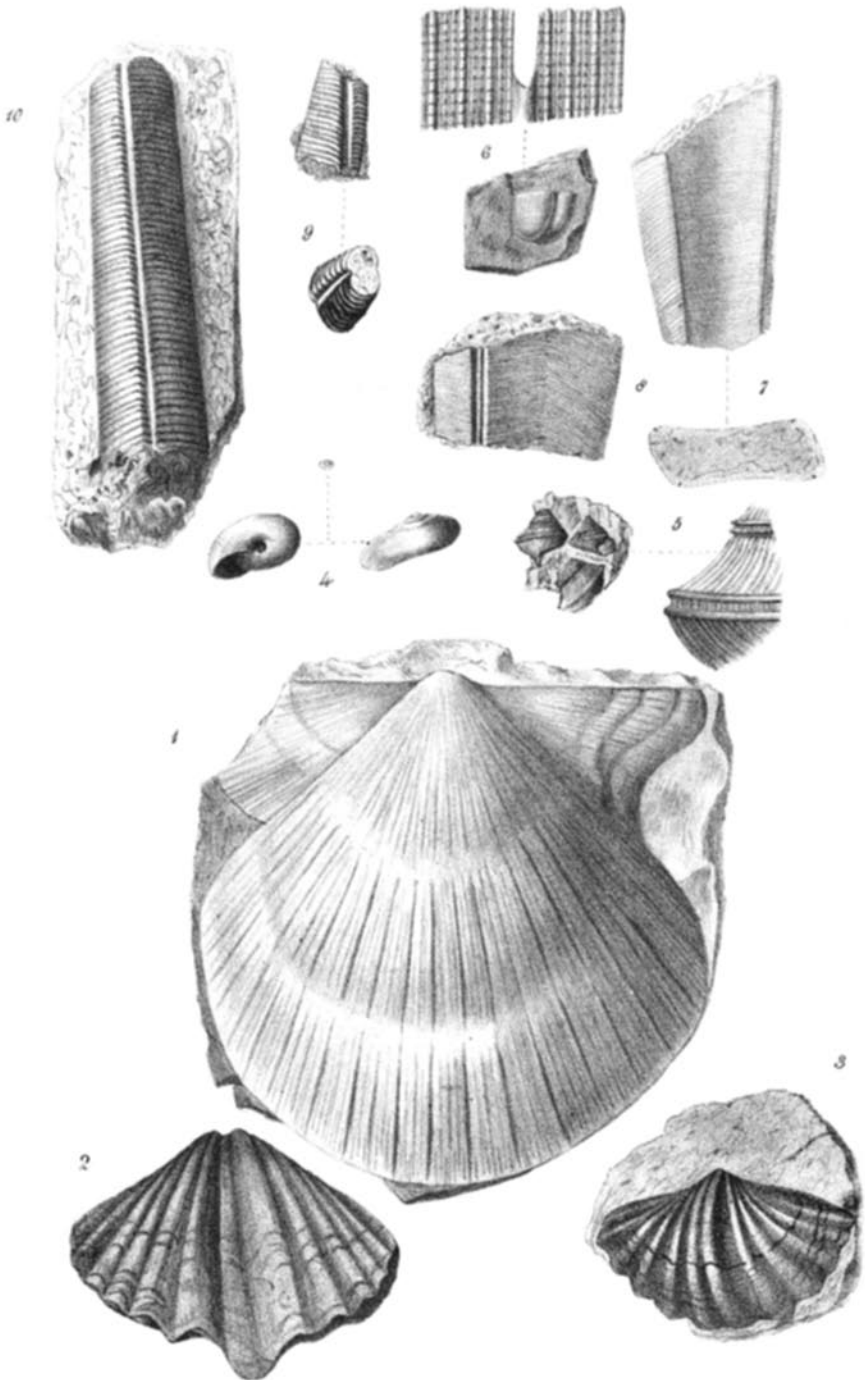
On the most careful comparison I find nothing to distinguish the Australian specimens from those so common in the Eifel and lower Irish carboniferous shales.

Abundant in the hard rock of Lewin's Brook, N. S. Wales.

*Orthis Australis* (M'Coy). Pl. XIII. figs. 4 & 4 a.

*Sp. Char.* Longitudinally obovate, very depressed, uniformly convex, length nearly equalling the width; width greatest towards the front margin, narrowing towards the hinge-line, which slightly exceeds half the width of the shell; sides and front margin nearly straight, slightly convex; surface with very numerous, fine, nearly equal dichotomous striæ radiating from the beak.

This is closely allied to the upper Devonian and lower carboniferous fossil to which Prof. Phillips restricts the name *O. inter-*



*lineata*, and to the carboniferous *O. Michelini* (Lév.), (*O. filiaris*, Phil.). From the former it is distinguished by its narrow, longitudinally obovate figure, and from the latter by its wider hinge-line and much finer striae; and from both it differs in the form of its muscular impressions. Length 7 lines, width  $7\frac{1}{2}$  lines.

Abundant in the shales of Lewin's Brook, N. S. Wales.

*Orthis spinigera* (M'Coy). Pl. XIII. fig. 3.

*Sp. Char.* Longitudinally obovate, gently convex; length of ventral valve two-thirds the width, width greatest near the front margin, narrowing rapidly towards the hinge-line, the length of which is little more than half the width towards the front; cardinal area triangular, flat, half as high as wide; sides of the shell much rounded; front margin without sinus, slightly convex; surface with two or three strong distant imbrications of growth, crossed by numerous small, strong, angular, radiating ridges (about twenty-two at two lines from the beak); they are nearly equal in thickness, but shorter ones are interpolated, chiefly at the concentric imbrications of growth, between each pair of the primary ones as they approach the margin, beyond which, when well preserved, they are produced into slender conical spines; they are about their own diameter apart, the intervening flat spaces being coarsely striated across.

Somewhat allied to the Russian *O. plana* (Pand. sp.), but very distinct by the character of the striation and by the short hinge-line and comparative width of the front. Length of ventral valve 5 lines, width 7 lines; height of cardinal area 2 lines, width of hinge-line 4 lines.

Rare in the shale of Dunvegan, N. S. Wales.

*Productus antiquatus* (Sow.).

Reticulated rostral portions well preserved and perfectly undistinguishable from the British carboniferous specimens.

Common in the hard schist of Lewin's Brook, N. S. Wales.

*Productus brachythærus* (Sow.).

Very common in the calcareous grit of Loder's Creek, and also at Korinda, N. S. Wales.

*Productus setosus* (Phil.).

I find the Australian species undistinguishable when minutely compared with our common British mountain limestone species above-named. In the dark indurated schist of Lewin's Brook, N. S. Wales.

*Productus scabriculus* (Sow.).

In the calcareous flags and dark limestone of Hall's quarry,

Hobart Town : associated with this there is abundance of a flatter species, concentrically wrinkled and with more irregularly placed, blunt, round spines, which may, or may not, be distinct from the *P. fragaria* and *P. caperata* of the upper Devonian and lower Irish carboniferous shales, but from the state of preservation I cannot satisfy myself of the species.

*Productus undulatus* (M'Coy). Pl. XIII. fig. 2.

*Sp. Char.* Subquadrangular, one-third wider than long, gibbose, front slightly concave at the margin ; sides nearly rectangular, bluntly rounded ; beak large, tumid ; surface with fine, close, short, undulating transverse wrinkles ; a few obscure traces of oblong spines towards the margin.

This species is slightly allied to the *Leptæna lepis* of the Eifel, and the *L. membranacea* and *L. mesoloba* (Phil. Pal. Foss.), but is distinguished from the two first by its gibbose quadrangular form, concave front and large tumid beak ; and from the latter by its want of mesial ridge and spines, and by the fine transverse plication of the surface. Length 7 lines, width 10 lines.

Rare in the sandstone of Loder's Creek, N. S. Wales.

*Leptæna* — ?

A species closely resembling the *L. Hardrensis* (Phil.), but more square in outline, not so wide, and more coarsely striated, is common in the shale of Dunvegan, N. S. Wales ; it also resembles the *Chonites Laguesianus* of the Belgian carb. shale and the *Chonites Falklandica* of the Falkland Islands, but as I have not examined either of those latter species, I prefer leaving the determination of the Australian form uncertain.

*Orbicula affinis* (M'Coy). Pl. XIII. fig. 1.

*Sp. Char.* Longitudinally ovate, very much depressed ; margin slightly undulated ; apex acute, excentric towards the right side, one-third of the length from the anterior edge ; surface with fine, sharp, irregular concentric plicæ.

This is only to be distinguished from the *Orbicula Davreuxiana* (Kon.) of the Tournay carb. shale by the fine sharp concentric plication of the surface. Length 3 lines, width  $2\frac{1}{2}$  lines, height three-fourths of a line.

From the shale of Dunvegan, N. S. Wales.

[To be continued.]