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XXXIII.—*On some new Cambro-Silurian Fossils.* By FREDERICK M'COY, Professor of Geology and Mineralogy in Queen's College, Belfast.

Cytheropsis Aldensis (M'Coy).

Sp. Char. Arcuato-oblong, dorsal margin much arched, greatest convexity about the middle, sloping more towards the anterior, which is slightly smaller than the posterior end; posterior end broadly arched, anterior end obtusely pointed; a concave flattened sinus rather more than half the length of the shell in the ventral margin, rather nearer to the anterior than the posterior end; an obscure roughened spot slightly nearer to the anterior than the posterior end, and slightly nearer to the dorsal than the ventral margin; valves moderately and evenly gibbous; surface very minutely punctured under a strong lens. Length $1\frac{1}{2}$ millimetre, depth about $\frac{2}{3}$ rds the length.

This little species is accompanied by a more elongate, oblong, less arched form of greater rarity, which may either be a distinct species or the male.

Extremely abundant in the dark earthy limestone of Aldens, Ayrshire.

(Col. University of Cambridge.)

Harpes parvulus (M'Coy).

Sp. Char. Cephalic shield semielliptical; flattened limb very wide (slightly exceeding the length of the glabella in front) with a thick margin; glabella narrow cylindrical, the slightly narrowed front about the width of its base, within the front margin of the cheeks; cheeks convex, one-third wider than the glabella at base; oculiform tubercles on a line with the anterior margin of the glabella, and slightly nearer to it than to the lateral margins; surface minutely granulated. Length of cephalic shield 3 lines, proportional length of front margin about $\frac{4.8}{100}$, length of glabella $\frac{4.6}{100}$.

This little *Harpes* is interesting as the first occurrence of the genus in Silurian rocks in Britain, although Col. Portlock has described two species which are common in Ireland. The species is remarkable for its small size and extremely wide marginal plate.

Limestone of Wrae quarry, Upper Tweed.

(Col. University of Cambridge.)

Pseudocrania (M'Coy), n. g.

Gen. Char. Shell slightly inequivalve, free, both valves regularly depressed, subconical, unattached; dorsal valve with or without

a small cardinal area; internally, margin broad, flat, smooth or minutely striated concentrically, anterior pair of muscular impressions much larger and more strongly marked than the posterior pair; pallial impressions numerous, linear, not interrupted along the middle.

This palæozoic genus differs from the true *Crania* in the following points: 1st, *Crania* is attached by the substance of the dorsal valve, and exhibits thereon an irregular scar; both valves are free and regular in *Pseudocrania*; 2nd, in *Crania* the posterior or marginal pair of adductor muscles are always larger and deeper than the medial or anterior pair; the reverse is remarkably the case in the present genus, which also has a smooth or minutely striated margin, destitute of the strong granulation and punctures of most *Cranie*. The *Crania antiquissima* as given by Verneuil may be taken as the type of the genus, as also the following species.

Pseudocrania divaricata (M'Coy).

Sp. Char. Longitudinally oblong, length and width almost equal, slightly narrowed posteriorly; hinge-line straight, a little shorter than the width of the shell; dorsal valve (analogue of the lower or attached valve) with a very low triangular cardinal area; external surface ornamented with sharp, prominent, narrow rugged lines divaricating from the beaks, those of the sides arched backwards towards the cardinal angles, about equally distant throughout from the intercalation of shorter striæ as the longer approach the margin, intervening spaces flat, about four ridges in the space of one line; internal casts show a broad, flat, defined rim with minute irregular concentric striæ, and the following parts in relief (depressions in the shell): 1st, a small oval mesial space originating near the hinge, and reaching to one-fourth of the length; 2nd, on each side of this, close to the hinge-margin, are two diverging oval muscular impressions; 3rd, at a little behind the middle of the shell are two ovate subtrigonal anterior muscular impressions considerably larger and deeper than the posterior pair; 4th, close in front of those a narrow semicircular impression (scar of visceral aponeurosis?) with its extremities arching backwards round the muscular impressions; 5th, between this and the front and lateral margin, a series of from fifteen to twenty-two uninterrupted equidistant longitudinally narrow pitted (? pallial) marks, each dividing at its anterior half, separated by rather wider smoother spaces. Length 10 lines, greatest width (a little in front of the middle) $10\frac{1}{2}$ lines, height of cardinal area three-fourths of a line.

In size and general character this agrees with the *Pseudocrania antiquissima* (Eichw. sp.) as given by M. de Verneuil (Geol. Russ. t. 1. fig. 12), but is easily distinguished externally by the beak being close to the posterior margin, and the remarkable divaricating sculpture of the valves, and internally by several minor points of detail obvious on comparison with the figure.

Common in the schists on the Bala limestone at Bryn Melyn quarry; schists of Pont y Glyn, Diffwys; and in the fine grits of Tan y Craig, Builth.

(Col. University of Cambridge.)

Siphonotreta micula (M'Coy).

Sp. Char. Longitudinally ovate. length and width about equal; sides and front broadly rounded, with a uniform curve, posterior extremity slightly acuminate; gently convex, perforated valve most so; greatest depth about one-fourth the length from the beak, which is near the posterior margin, and perforated by a round tubular opening; surface marked with a few concentric waves of growth, and sharp, flat, regular concentric linear striæ, about seventeen in the space of one millimetre; several short, slender, conical spines are rather irregularly scattered over the surface, the substance of the shell exhibiting under a high power an extremely minute reticular punctation. Average length (of rather large specimen) 2 lines, width usually rather less.

This small species varies from nearly orbicular to ovato-pentagonal in outline; in some specimens, particularly those from Wellfield, the depressions left by the spines of the surface are very obvious and rather crowded, producing a puckered irregularity of the surface, which is not to be seen in most of the specimens from Pen Cerrig; the concentric lineation is also more distinct in the former, between which the reticular punctation is so excessively minute, that it can only be traced with very fine and powerful glasses in favourable lights on the best-preserved portions of the shell, differing therefore very much from the most nearly allied fossil, the so-called *Terebratula hamifera* of Barande. In nearly all the specimens the distinct and rather large circular opening at the apex of the beak is easily seen, and in many specimens an irregular fissure, apparently produced by crushing, extends a variable distance towards the front margin, either in the median line or more or less to one side or the other. The few rather large concentric waves or interruptions of growth are only seen in some specimens.

This species seems to agree in everything with the little *Terebratula hamifera* (Bar.) (Haidinger's Naturwissenschaftliche

Abhandlungen, vol. i. p. 418. t. 20. f. 9), but has the reticular punctation infinitely more minute than he describes that of his species to be (half a millimetre long, or four in a square millimetre). M. Barrande gives the geological place of his species in Bohemia as "gehört der Quartzeitage (D) an d. h. dem am höchsten gelegenen Theile des untern Silurischen Systems von Böhmen," and the schists in which ours occurs in such profusion in Britain seem to hold precisely the same place. Its gregarious habits are curiously shown by the circumstance of a fragment of shale four or five inches long and wide from Pen Cerrig having afforded upwards of 100 specimens now in the Cambridge collection, and another mass not much larger from Wellfield having yielded upwards of 70.

Very common in certain spots in the black shale of Pen Cerrig, Builth, Radnorshire; and not uncommon in the olive schists of Wellfield, Builth, Radnorshire; very rare in the olive schists of Pentre Llangynyw near Welchpool, Montgomeryshire.

(Col. University of Cambridge.)

Pentamerus microcamerus (M'Coy).

Ref. & Syn. *Spirifer*? *levis*, Sow. S. S. t. 21. f. 12 (not *Pentamerus levis*, Sow.).

Sp. Char. Transversely elliptical; receiving valve depressed, gently convex, greatest depth near the beak, which is elevated nearly at right angles, the height being one-eighth the width of the hinge; entering valve greatly convex; beaks small, rather prominent, reaching to the plane of the lateral margins, with which the low triangular area is nearly parallel, greatest depth slightly behind the middle; a broad, faintly marked, slightly convex, obsolete mesial ridge, and a few faint, broad, obsolete, irregular lateral radiations; hinge-line slightly less than the width of the shell, side margins elliptically rounded, front margins very wide, gently convex; cardinal area nearly sixteen times wider than high; surface apparently smooth, or with a very minute fibrous longitudinal striation: internal cast of receiving valve showing the broad triangular boss of the foramen, slightly keeled, the mesial septum formed by the junction of its bounding lateral lamellæ, only reaching one-third the length of the shell, or little more than equal to the width of the rostral chamber; cast of entering valve with a very narrow triangular area in the plane of the lateral margins; two very slightly diverging dental lamellæ, scarcely reaching twice the width of the area (or one-eighth the length of the shell), the exterior edges of which form two more diverging slits, resembling cardinal teeth; a slight indication of a mesial septum

commencing a little in front of the ends of the diverging lamellæ, from between the ends of which project two long spatulate muscular impressions, not reaching quite to the middle of the shell. Width 2 inches 6 lines, proportional length $\frac{5.5}{100}$, depth of receiving valve $\frac{1.2}{100}$, of entering valve about the same.

I have recently examined such a great number of specimens from May Hill, that there can no longer be any doubt that it belongs, not to the genus *Spirifer* as suggested by Sowerby, nor to the genus *Orthis* as suggested by other palæontologists, but is a distinctly defined species of *Pentamerus*, distinguished by the very small size of the rostral chamber in the receiving valve, and the extreme shortness of the diverging lamellæ in the entering valve, which are not even indicated in Mr. Sowerby's figure thereof. As the species must be placed in the genus *Pentamerus*, and there is already a *Pentamerus levis*, I am obliged to propose a new specific name. In very young specimens 3 lines long the mesial septum exceeds half the length of the shell.

In the fine sandstone of Mandinam, Caermarthenshire; very abundant in the sandstone of May Hill, Gloucestershire.
(Col. University of Cambridge.)

Hemithyris angustifrons (M'Coy).

Sp. Char. Elongate ovate; both valves very gibbous in the middle, gradually sloping to the margins, which are nearly level, or with a very slight elevation of the front towards the entering* valve; greatest width in most specimens rather behind the middle, from whence the width diminishes to the narrow obtusely rounded front; beak of the receiving valve large, pointed, with a very long triangular opening beneath it; substance of the shell coarsely fibrous, surface nearly smooth or with irregular transverse squamæ of growth; casts show in the entering valve two subparallel approximate longitudinal sulci marking the inner edge of the muscular impressions, and with a fainter sulcus between them left by the slight mesial septum; two pits near the beak, left by the apophyses, strong; receiving valve with two strong dental lamellæ, one on each side of the beak, and a slight indication of a mesial septum;

* As the terms "dorsal and ventral valves" have been almost invariably misapplied by conchological writers in describing Brachiopods, and as the confusion is very great when we use these terms in accordance with their anatomical position (but contrary to common use), I propose to use "receiving valve" for the perforated valve of *Terebratula*, &c. (called "dorsal valve" by conchologists and "ventral valve" by anatomists), and I use "entering valve" for the opposite one, of which the beak enters the cavity of the receiving valve.

few straight, once- or twice-branched impressions of the pallial vessels on each side. Length 9 lines, proportional length of entering valve $\frac{8.5}{100}$, width $\frac{7.5}{100}$, depth of both valves $\frac{5.0}{100}$.

The general ovate form of this species, with its narrow front, without mesial ridge or sinus, and its pointed beak, with large foramen, easily distinguish it from any of the other Lower Palæozoic forms. It varies considerably in depth, being sometimes rather less than the above dimensions, and having in one specimen the proportion of $\frac{7.0}{100}$, compared with the length; the width is sometimes a little more and sometimes a little less than the measurement given above. Some specimens seem to show projecting irregular transverse squamæ of growth.

Occurs in great number in the greenish sandstone of Mulock quarry, Dalquorhan, near Girvan, Ayrshire.

(Col. University of Cambridge.)

Hemithyris Davidsoni (M'Coy).

Ref. & Syn. *Terebratula spherica* (David.), Bull. de la Soc. Géol. de France, 2nd S. vol. v. t. 3. f. 36 (not of Sow. S. S. nor Sow. Geol. Trans.).

Sp. Char. Globose or subcuboidal; entering valve deeper than the receiving one, moderately convex on the rostral half, abruptly and obtusely bent over towards the margin, nearly at right angles; beak of the receiving valve small, with a minute triangular opening beneath the apex, moderately convex, depressed towards the margin to form a broad, slightly defined sinus, the corresponding ridge to which in the entering valve is scarcely elevated; lateral margins nearly straight, front margin elevated into a quadrate sinus twice as wide as high; valves radiated with from eighteen to twenty very obtusely angular simple ridges, reaching distinctly to the beak, and sharply notching the margin, the four middle ones perceptibly larger than the rest. Length and width equal, and about 5 lines, depth of deflected front $\frac{5.5}{100}$, depth of both valves $\frac{8.8}{100}$.

This species differs from the *Terebratula spherica* (Sow.), Sil. Syst., by having the elevation of the front towards the entering valve as in ordinary cases, instead of towards the receiving one as in that species, which in consequence of this Mr. Davidson suggests to be a variety of *H. deflexa*; and the Devonian *Atrypa spherica* (Sow.), to which the present fossil is referred by Mr. Davidson, differs completely by having all the rostral portion smooth, while the ridges extend clearly to the beak in this Silurian type. The general form slightly recalls that of the *H. Wilsoni*, but there are much fewer ribs, and they are not divided by a medial sulcus on the deflected front.

Very rare in the Upper Ludlow rock of Burton and Brockton near Wenlock.

(Col. University of Cambridge.)

Hemithyris nasuta (M'Coy).

Sp. Char. Longitudinally ovate, longer than wide, gibbous, entering valve much deeper than the receiving one; receiving valve with a small obtuse beak, incurved nearly to touch the beak of the entering valve, with a small triangular perforation beneath; rostral portion tumid for about 5 lines from the beak, beyond which a wide flattened mesial depression is developed, gradually deepening towards the front, which in old specimens is very much produced into a flat tongue-shaped lobe, nearly as long as wide, gently sloping to the level of the most convex part of the entering valve; sides obtusely defined from the mesial furrow, gently convex, lateral margins slightly sigmoid, and bent upwards at the front, at a rounded angle of about 100° : entering valve with a slightly prominent beak; rostral portion and sides gently convex, after about 5 lines from the beak the middle is prolonged nearly in a straight line to the produced front margin, forming a large obtusely rounded mesial ridge: surface radiated with simple, close, obtusely rounded ribs, about four of which, rather larger than the rest, are raised with the mesial furrow, the broad sides of which are smooth, each side with about twelve slightly smaller ribs (seven in two lines at six lines from the beak near the side of the mesial furrow), leaving a rather broad smooth space at the rostral lateral margin on each side (a fine longitudinal striation is seen in some places). Length 1 inch 2 lines, proportional length of entering valve $\frac{90}{100}$, greatest width, about the middle of the length, $\frac{88}{100}$, greatest depth of both valves (one-third from the beak) $\frac{57}{100}$.

In form this species much resembles the *Terebratula promontorium* of Kutorga from the Lower Silurian limestones of Pulkowa (see Verhandlungen der Russ. Kais. Min. Gesellschaft zu St. Petersburg for 1845, t. 6. f. 3), but is distinguished by its ribbed surface.

Not uncommon in the schistose limestone of Craig Head near Girvan, Ayrshire.

(Col. University of Cambridge.)

Hemithyris sphaeroidalis (M'Coy).

Sp. Char. Suborbicular, gibbous, nearly equivalve, margins very obtuse from the inflection of the edges; lateral margins nearly level, front margin abruptly raised into a quadrate sinus, about twice as wide as long; receiving valve with a very

small pointed slightly incurved beak, with a minute triangular perforation beneath it, evenly gibbous except close to the sinus in the front margin, where there is a very slightly marked depression; entering valve evenly gibbous, with a very slightly marked, broad square ridge, extending a short way from the margin of the sinus; both valves radiated with from twenty to twenty-four very obtuse, rounded ribs, becoming gradually obsolete near the beaks, leaving the rostral portion nearly smooth, four of the ribs rather larger than the rest, slightly elevated with the mesial sinus; a short mesial septum in the entering valve; substance of the shell densely fibrous. Length 5 lines, proportional width $\frac{9.5}{100}$, proportional depth of both valves $\frac{7.0}{100}$.

The depressed spheroidal form and very obtusely rounded ribs becoming obsolete towards the beak, distinguish this species from the *H. nucula*, and the elevation of the mesial sinus being towards the entering instead of the receiving valve, as well as more depressed form, distinguish it from the *Terebratula spherica* and *Terebratula deflexa* of the Wenlock rocks, to which it is otherwise very similar.

This seems to be the Upper Silurian species referred to by Mr. Davidson as identical with the Devonian *Atrypa spherica* of Sowerby, to which it is very strongly allied, but is more depressed, has only four mesial ribs, and the beak is not adpressed. The obtuseness of the plaits and smooth rostral portion separate it from the *Terebratula pusilla* (Sow.) of the Lower Silurian rocks. The very obtuse margin, and smaller number of mesial plaits, and obtuse inflated form separate it from the *Terebratula famula* of Barrande (see Haidinger, Naturwissenschaftliche Abhandlungen, Band i. t. 17. f. 6).

Not uncommon in the Wenlock limestone of Dudley; Ireleth, Lancashire; Wenlock limestone of Ledbury, Herefordshire; and the limestone of the Hollies Church, Stretton.

(Col. University of Cambridge.)

Hemithyris subundata (M'Coy).

Sp. Char. Transversely broad, oval; valves gently and almost equally convex; beaks very small, apical angle 140° near the apex, lateral margins straight, front raised into a rounded wave, from which, in the large valve, a wide shallow mesial depression extends halfway to the beak, with a corresponding elevation in the small valve, in some specimens faintly extended to the beak: surface smooth. Average width 1 inch, proportional length $\frac{8.6}{100}$, length of entering valve $\frac{8.5}{100}$, depth of both valves $\frac{4.5}{100}$ to $\frac{5.0}{100}$.

This species is flatter and less wide than the *Atrypa* (*Pentamerus*) *undata* (Sow.), but less long than the *Atrypa* (*Pentamerus*) *lens*, being intermediate in form between the two. The casts show, however, in the small valve a rather strong slit in the beak for the short medial septum, and a transverse pit on each side for the origin of the apophyses or hinge-teeth. The receiving valve has two short diverging dental lamellæ, bordering its beak as in *Hemithyris* generally, with one or two small ridges between them; the sides of both valves show about three straight once- or twice-branched ridges of the pallial and ovarian vessels.

Very common in the schists and limestone of Mathyrafal S. of Meifod, Montgomeryshire; and in the schists of Pen y Craig, Llangynyw, Montgomeryshire; slate of Alt ffair ffynnon, Llanfyllin, North Wales.

(Col. University of Cambridge.)

Orthis Hirnantensis (M'Coy).

Sp. Char. Truncato-orbicular, depressed; cardinal area very low, triangular, nearly twelve times wider than high; hinge-line slightly less than the width of the shell; cardinal angles slightly obtuse, lateral and front margins horizontal, almost uniformly curved; entering valve perfectly flat, with a slight longitudinal mesial depression near the beak; receiving valve slightly and gently convex, most so along the middle, at about one-third the length from the beak; both valves with numerous slightly unequal, prominent, angular, strongly fasciculated striæ, each of the primary ridges branching near the middle into from five to seven smaller, forming in some specimens slightly angulated, divaricatingly arched groups, eight or ten striæ at the cardinal angles smaller and straighter than the rest, running nearly parallel with the hinge-line; separating sulci narrow, marked with very coarse punctures or little pits, and crossed by coarse obtuse transverse striæ; twelve to fourteen striæ in two lines at four lines from the beak; internal cast of receiving valve radiated with coarsely punctured impressions of the external striæ; cardinal teeth very short, thick, diverging at 80°. Width 1 inch, proportional length $\frac{70}{100}$, depth $\frac{16}{100}$.

This is an extremely beautiful species, remarkable for its flatness and broad divaricating bands of coarse, branched striæ, which are not at all arched along the hinge-line, as in the somewhat similar *O. retrorsistria* (in which the depth is greater, the striæ much more uniform, and the surface smoother, and the internal casts quite different).

Very abundant in the oolitic limestone and decomposing

schists over the Bala limestone at Aber Hirnant E. of Bala, North Wales; and in the similar limestone of Cwm yr Aethen; oolitic limestone of Maes y fallen, Bala, Merionethshire: rare in the limestone of Cerrig y Druidion, Denbighshire.
(Col. University of Cambridge.)

Orthis retrorsistria (M'Coy).

Sp. Char. Rotundato-quadrate, depressed, no mesial ridge or furrow in either valve; hinge-line nearly or quite as wide as the shell; cardinal angles slightly obtuse; cardinal area flat, triangular, six or seven times wider than high in the receiving valve, and inclined backwards at about 120° , only one-third this height in the entering valve; rostral tooth of entering valve very large, triangular foramen of receiving valve with an internal, semiconical, hood-shaped extension of the dental lamellæ within it; receiving valve gently convex, greatest depth about the middle of the length; entering valve flat round the margins, gently concave in the middle; both valves with a few concentric wrinkles of growth, about a line apart, and radiated with slightly irregular obtuse striæ, which branch into two or three, at two or three intervals between the beak and margin, so that each of the strong primary ones form from seven to ten at the margin, separated by a rather deeper sulcus from the adjoining ones, so as to produce a flat, indistinctly marked, fasciculation; intervening sulci about the same size as the striæ (obscurely punctured in some specimens), which are straight in the middle, gradually assuming a divaricating curve on the sides, which is so great near the angles, that a large number of the lateral striæ curve backwards from the beaks to terminate along the distal half of each side of the hinge-line instead of the lateral margin, all the striæ crossed by indistinct transverse lines of growth; the size of the striæ does not vary much in the various parts of the shell, from fourteen to seventeen may be counted in two lines at four lines from the beak; cast of entering valve nearly smooth except at the margin, which, in the middle, is marked with close slightly dichotomous lines; the narrow triangular boss of the foramen is cleft by a deep, narrow, elliptical pit of the rostral tooth, flanked by the pits of two short cardinal teeth, diverging at 70° , between which and the hinge-line are the smaller but more diverging bosses left by the cardinal pits; a deep straight sulcus extends from the rostral tooth nearly to the anterior margin, marking a very long obtuse mesial ridge, on each side of the rostral part of which is a subquadrate pair of muscular impressions reaching less than half the length of the shell, the length and width of the pair being nearly equal; the lateral boundaries

are formed by the deep impressions of a sigmoidal ridge, extending from the cardinal teeth on each side, each impression being slightly divided into two unequal lobes, anteriorly by the slight projection of an oblique narrow portion diverging from the anterior lateral angles; in fine specimens a faint transverse arched furrow separates the small posterior adductor impressions, which are longitudinally wrinkled, from the smoother and larger anterior portion; interior of receiving valve with two short cardinal teeth, diverging at 105° , from which two extremely long, narrow, elliptical muscular impressions extend more than half or nearly two-thirds the length of the shell, each lobe marked with faint radiating sulci, the pair being separated by a flat, acutely angular space, a little wider than one of the impressions at the anterior end, and extending to the point of the beak; a narrow space of the margin finely plicated, the rest of the surface nearly smooth or very faintly radiated. Width 10 lines, proportional length of receiving valve $\frac{9.0}{100}$, of entering valve $\frac{8.2}{100}$, depth $\frac{1.5}{100}$.

The backward curving of many of the lateral striæ to terminate on the hinge-line is more remarkable in this species than any other I know of, and suggests the specific name; something of the same sort may be seen in a less degree in the *O. subquadrata* (Hall), and one of the shells figured in the Mem. Geol. Surv. (vol. ii. pt. 1. t. 27. f. 9) as the *O. testudinaria*, from both of which the great general depression, the total absence of mesial fold, the concavity of the entering valve, great length of the narrow diverging muscular impressions in the receiving valve, &c., easily distinguish the present species. The same characters and backward curving of the lateral striæ separate it from the *O. protensa*.

Occurs in extraordinary profusion in the flags of S. end of Pen y gaer near Cerrig y Druidion, Holyhead Road, Denbighshire, closely covering extensive surfaces of the beds; flags at Hafod Evan, Penmachno, Caernarvonshire; schists of Cefn y coed, Llangedwyn, Montgomeryshire; schists W. side of Garn Brys, S.W. of Cernioge; abundant in the schists of Bwlch, Llandrillo, Corwen, N. Wales; schists of Llanwddyn E. of the Berwyn Mountains; schists of Das Eithin Ridge, Hirnant, Montgomeryshire; schists of Pen Cerrig Serth, Builth, Radnorshire; schists of Miltit Cerrig, Llangynnog, Montgomeryshire; schists of Bwlch y groes S. of Bala, Merionethshire; Alt yr Anker, Meifod, Montgomeryshire; schists of Tan y Bwlch y groes S. of Bala, Merionethshire; schists of Allt tre Ffynnon; limestone of Pentre cwm dda, S. of Glyn Diffwys, N. Wales; limestone of Llanfyllin, Montgomeryshire; common in the quartzite of Carn Goran, Cornwall.

(Col. University of Cambridge.)

Orthis sagittifera (M'Coy).

Sp. Char. Rotundato-quadrate or oblong, length usually a little greater than the width, depressed; hinge-line as wide as the shell; receiving valve obtusely subcarinate along the middle, most so near the beak, which is projecting, pointed, very slightly incurved, apical angle 140° , profile only slightly curved, lateral margins horizontal or with a slight mesial wave towards the receiving valve; cardinal area of receiving valve concave, triangular, four times wider than high, inclining backwards at 120° ; triangular foramen narrow, open to the apex; entering valve gibbous, deeper than the greatest depth a little behind the middle, profile strongly arched; cardinal area very narrow, about one-third the height of the other, to which it is nearly at right angles, or in the plane of the margin; beak small, depressed, with a deep narrow mesial sulcus extending from it about halfway to the margin; surface of both valves radiated with very close, numerous, obtuse, subequal, irregular, branching striæ, separated by much narrower, deep, coarsely punctured sulci, about nine in two lines at six lines from the beak, straight in the middle, and along the hinge-line, slightly arched divaricatingly and most branched at the sides, no fasciculation; internal cast of receiving valve without mesial septum, two short dental lamellæ diverging from the beak at 80° , forming part of the lateral boundaries of a short, prominent, flattened, triangular pair of muscular impressions, slightly wider than long, scarcely one-third the length of the shell, usually tripartite by a pair of wide longitudinal sulci, rest of surface finely radiated by impressions of the external striæ; cast of entering valve with the triangular boss of the foramen, slit by a very slender rostral tooth, from which a narrow obtusely angular furrow (corresponding with the external one) extends about half the length of the shell; cardinal teeth forming long deep sulci, rather more than one-fourth the length of the shell, and diverging at 60° , resembling the mark of a broad arrow-head, of which the mesial sulcus was the shaft, surface impressed by the external radiating striæ. Width (of small specimen) 8 lines, proportional length of receiving valve $\frac{9.7}{100}$, of entering valve $\frac{8.5}{100}$, depth of receiving valve about $\frac{2.7}{100}$, depth of entering valve varying from $\frac{2.5}{100}$ to $\frac{3.0}{100}$. Length often upwards of 1 inch, the length and depth greater in proportion to the width in these old specimens.

This species is perhaps most nearly allied to the *O. turgida* (M'Coy), from which it is distinguished externally by its flatter receiving valve with nearly straight profile, and a cardinal area less than half the height, and a much more obtuse apical angle;

the striæ are thicker and coarser; internally the difference is still greater, the present species having much shorter and wider muscular impressions in the receiving valve, and the characteristic broad arrow-shaped impressions of the rostral portion of the entering valve, produced by the comparatively long diverging dental lamellæ, wholly separated from the mesial furrow. The gibbous entering valve with its deep narrow mesial sulcus near the beak, coarser striæ, and totally different internal characters separate it from the *O. retrorsistria* (M'Coy), with which it also frequently occurs.

Extremely abundant in the decomposing sandy schists of Aber Hirnant E. of Bala, N. Wales.

(Col. University of Cambridge.)

Orthis turgida (M'Coy).

Sp. Char. Longitudinally ovate, globose, margins very obtuse, greatest width slightly in front of the hinge-line, which is slightly less than the width of the shell; receiving valve very gibbous, profile much arched by the large beak, declining nearly to the level of the lateral margins, greatest depth about the middle of the length; in old specimens there is a faint wide shallow depression towards the front margin, which gradually changes into an obscure prominence towards the beak, or in the young; sides tumid; beak long, apical angle 100° , entering valve extremely gibbous, sometimes hemispherical, in some specimens more depressed, but remaining remarkably tumid towards the margins; a deep narrow sulcus extends from the beak almost halfway to the margin, becoming rapidly effaced by widening and flattening towards the front, which is depressed, with a narrow sinus in young specimens (from the mesial sulcus), and very slightly raised with a wide shallow wave (not affecting the surface) in old individuals (from the slight mesial depression of the old receiving valve); both valves covered with numerous fine, sharply defined, obtuse striæ, separated by flattened spaces, equalling them in width, bifurcating two or three times between the beak and margin, where, in old individuals, they are a little finer than in the middle of the shell, eight or ten in two lines at six lines from the beak, about ten to twelve at the front margin at ten lines from the beak; cardinal area in receiving valve very large, flat, nearly half as high as wide, inclining backwards at 130° ; foramen narrow, triangular, entirely open; area of entering valve flat, triangular, about seven times wider than high: internal *cast* of receiving valve with strong dental lamellæ, diverging at 50° , forming the posterior lateral boundaries of a narrow ovate, strongly defined pair of muscular impressions,

reaching half the length of the shell, not divided by any mesial septum, but having one or two strong sulci on each side; margin finely sulcated by the external striæ, faint extensions of which reach a variable distance towards the beak: cast of entering valve very tumid, nearly smooth, deeply slit towards the beak by the very deep narrow sulcus, left by a thick mesial septum, reaching half the length of the shell, and to which the lamellæ of the very short, thick, cardinal teeth seem to converge, forming the mesial septum by their union, the wide triangular boss of the foramen slit by a slender rostral tooth. Length of small specimen 9 lines, proportional length of entering valve $\frac{7.5}{100}$, width $\frac{8.5}{100}$, depth of receiving valve $\frac{3.5}{100}$ to $\frac{4.5}{100}$, depth of entering valve $\frac{2.5}{100}$ to $\frac{3.5}{100}$. (Length occasionally 1 inch.)

From the great variation in the proportional depth of the entering valve in different specimens, I am uncertain which of the valves is the deepest, although I have little doubt the entering one is so. I have seen small specimens confounded with *O. elegantula*, from which the characteristic turgid appearance from the tumidity of the sides, larger mesial striæ, &c. distinguish it; in the adult state the tumid form and deep short furrow in the rostral half of the entering valve distinguish it easily from all I know.

Extremely common in the schists of Craig y beri, Llanarmon fach, Denbighshire; schists of Coed Sion, Llangadoc, S. Wales; very common in the schists of Aber Hirnant E. of Bala, N. Wales; limestone and coarse schists of Golden Grove, Llandeilo; schists half a mile N. of Conway Falls; common in the limestone of Llandeilo, Caermarthenshire; limestone of Mathyrafal fridd, Meifod, Montgomeryshire.

(Col. University of Cambridge.)

Orthisina Scotica (M'Coy).

Sp. Char. Subquadrate, valves evenly convex, much depressed; hinge-line as wide as the shell, apical angle 120° , sides subparallel, front with an obsolete emargination in the middle; entering valve gently convex, with an obscure narrow mesial depression from the beak to the margin; receiving valve with projecting beak, not incurved, profile consequently nearly straight, very obscurely subcarinate along the middle, sides gradually sloping to the margins; cardinal area very narrow, parallel-sided in the entering valve, wide, flat, triangular, and inclining backwards at only 120° in the receiving valve; pseudodeltidium and deltidial pit concave, foramen oval, near the apex; surface radiated with twenty-eight thick, simple,

subequal ridges, separated by deep sulci rather less than the ridges in width (three in two lines at six lines from the beak in the middle). Width 1 inch, proportional length of receiving valve $\frac{8.5}{100}$, length of entering valve $\frac{7.2}{100}$, greatest depth of both valves (about the middle) $\frac{4.5}{100}$.

There are two or three strong imbrications of growth at the margin, but I cannot distinguish any superficial striæ in the specimens at my command. In form it is intermediate between the *O. inflexa* and the *O. plana* (Pand. sp.), but is more depressed, the beak of the receiving valve not at all incurved, the pseudodeltidium concave outwardly, and is easily distinguished by its comparatively few, thick, simple ribs.

Very common in the concretionary limestone of Craig Head near Girvan, Ayrshire; calcareous shales of Colmonel on the Stincher.

(Col. University of Cambridge.)

Leptæna tenuicincta (M'Coy).

Sp. Char. Rotundato-quadrate; hinge-line as long as the shell is wide; cardinal angles forming nearly rectangular small flattened ears, sides subparallel, obtusely rounded, front wide; receiving valve subhemispherical, very gibbous, greatest depth a little behind the middle of the shell; beak large, prominent, obtuse, incurved to the level of the lateral margins; cardinal area nearly in the plane of the lateral margins, very broad, flat, triangular, height rather more than one-fourth the width; triangular foramen narrow, closed by a convex pseudodeltidium; entering valve very concave, with a mesial septum extending nearly to the margins; surface of both valves marked with very regular, minute, equal rounded concentric wrinkles, having a slight retral wave in the middle of the front, about twelve in the space of one line at the middle of the shell. Width about 5 lines, proportional length of receiving valve $\frac{9.0}{100}$, of entering valve $\frac{7.5}{100}$, depth $\frac{6.5}{100}$.

This beautiful species seems almost identical in size, shape and marking with the *Producta tenuicincta* (M'Coy) and *Leptæna enigma* (Vern.), but has a very wide distinctly marked cardinal area. Lest those species should prove to have arææ when more numerous and perfect specimens can be examined, I give my old specific name to this undoubted *Leptæna*.

Olive schists of Cefn Grugos W. of Llanfyllin, Montgomeryshire.

(Col. University of Cambridge.)

Ann. & Mag. N. Hist. Ser. 2. Vol. viii.

Strophomena spiriferoides (M'Coy).

Sp. Char. Subrhomboidal, sides rather depressed, only slightly convex; hinge-line as wide as the shell; cardinal angles square or slightly acute, sides subparallel, slightly rounded, front very abruptly raised into a quadrate sinus, one-third wider than high, from which a very prominent rotundato-quadrate mesial ridge extends sharply defined to the beak, and an almost equally deep and strongly defined flattened mesial hollow extends to the beak of the receiving valve, both valves radiated with subequal thread-like ridges, occasionally dichotomising (about fourteen in three lines at six lines from the beak): casts of the receiving valve show the closed, cicatized foramen, with a long slender cylindrical extension of matrix, half a line thick, arching from the apex of the beak into the back, at one-fourth the length from the beak, and two thick, short, slightly diverging cardinal teeth and lamellæ; casts of entering valve show two very short, thick, diverging pits of cardinal teeth, and a large double ovate pit left by the great bifid rostral tooth, and a trace of a slender mesial septum. Average width 1 inch, proportional length of receiving valve $\frac{8.5}{100}$, of entering valve $\frac{6.9}{100}$, depth $\frac{6.0}{100}$.

This is so extremely like the *Spirifera radiata* of the Wenlock limestone, that I have no doubt it has very often been confounded with it, and probably all the examples quoted by authors of *S. radiata* from the Caradoc and inferior strata will be found referable rather to the present shell, which abounds in these inferior rocks, where I have never seen the true *S. radiata* (nor does the present species occur to my knowledge in the Upper Silurian strata). Externally the present shell may be distinguished from the *S. radiata* by its longer hinge-line, flatter sides, and coarser striation, while the internal casts show the generic difference by demonstrating the pit for the great rostral tooth in the beak of the entering valve, and the slender tubular filling of the apical foramen as in the *Leptæna* (*Strophomena*) *sulcata* (Vern.), Bull. de la Soc. Géol. de France, 2nd S. vol. v. p. 31. f. 4, to which it is most nearly allied, but from which it differs by its greater gibbosity, and very prominent mesial ridge and hollow extending from the beak, giving it exactly the appearance of *Spirifera*. The *Orthis Vespertilio* when very finely sulcated might be mistaken for this species, but has the mesial depression in the entering and mesial elevation in the receiving valve, in which also the triangular foramen is open throughout.

Extremely common in the impure limestone of Moel y Garth, Welchpool, Montgomeryshire; very abundant in the limestone

and schists of Bala, Merionethshire; very common in the Caradoc sandstone of Horderly; very abundant in the schists of Alt y Anker, Meifod, Montgomeryshire; schists of Tan y bwlch y groes S. of Bala, Merionethshire; schists of Bryn Melyn near Bala, Merionethshire; schists of Gelli Grin, Bala, Merionethshire; schists S.W. of Pwllheli, Caernarvonshire; schists of Pen y gaer, Cerrig y Druidion, N. Wales; schists of Beavers Grove, Bettws-y-coed, N. Wales; schists of Rhiwargor, &c.

(Col. University of Cambridge.)

Strophomena simulans (M'Coy).

Sp. Char. Truncato-elliptical; hinge-line slightly exceeding the width of the shell, forming short, rounded, semicylindrical ears, from a more or less pronounced indentation of the lateral margins; front wide, elliptically rounded; entering valve gently and slightly convex for about nine lines from the beak, and then more rapidly arched towards the receiving valve to a position sometimes nearly at right angles with the rostral portion; receiving valve nearly as concave as the entering valve is convex externally, except near the beak which is convex; cardinal area rather low, triangular, and nearly at right angles to the plane of the lateral margins; foramen broad, triangular, closed by the pseudodeltidium, except at the apex, where there is a tubular perforation (leaving a little columnar stem-like portion of matrix projecting from the apex of the cast); cardinal teeth very small, bifid, diverging at 115° , the dental lamellæ, originating from them, converge under the muscular impressions, so that their inner gently incurved edges, touching the shell, diverge at about 65° ; muscular impressions undulato-orbicular, about a fifth wider than long, reaching rather less than half the length of the shell; surface sometimes with a few oblique concentric plicæ on the ears; surface regularly radiated with very fine slightly irregular striæ, about twenty-five to thirty in two lines at six lines from the beak, and at that distance usually every 5th, 7th or 9th of the striæ larger than the others, but near the beak they often seem simply alternate in size, the intervening delicate sulci closely punctured. Width 1 inch 10 lines, proportional length of rostral portion about $\frac{3^0}{100}$, more deflected front about $\frac{3^0}{100}$, depth at middle of length $\frac{2^0}{100}$.

This species in size, form, striation and tubular perforation of the apex of the beak almost exactly resembles the *Lepiana alternata*, Conrad, but differs in having the receiving or foraminated valve concave instead of being the convex one; the striation is also finer and flatter or more uniform, which, with the greater

deflection or arching of the valves, also separate it from the *S. grandis*.

The specimens from Blain y cwm and Golden Grove are netted by a beautiful little species of *Vioa* branching frequently, nearly at right angles, forming straight, forking or angularly bending channels, one-fourth of a millimetre in diameter, the branches being at a little more or less than a line apart, and either in the plane of the valves or at right angles to it (leaving round perforations): it might be called *Vioa rectangularis*.

Not uncommon in the schists of Cefn Coch, Glyn Ceiriog, Denbighshire; in the olive schists of Golden Grove, Llandeillo, Caermarthenshire; schists of Blain y Cwm W. of Nantyre, Glyn Ceiriog, Denbighshire; and one doubtful specimen in the sandy schists of the Malverns, Worcestershire.

(Col. University of Cambridge.)

Leptæna (Leptagonia) unguia (M'Coy).

Sp. Char. Semioval; hinge-line as wide as the shell, forming short, rounded, slightly projecting ears; cardinal area low, triangular, with a large tubular foramen at the apex of the beak; receiving valve horse-hoof-shaped from the slope of the deflected front, being at a much more obtuse angle in the middle of the front than at the sides; visceral disk depressed, very slightly convex towards the beak, rendered rugged by seven or eight concentric wrinkles (only three or four at the margin commonly seen), angle between the disk and the deflected front obtusely rounded, the depth of the latter being rather less than the length of the disk; entering valve flat, concentrically wrinkled like the receiving one, but with a narrow margin, equally deflected all round, and only one-fifth or one-sixth the length of the disk; surface of both valves radiated with extremely fine close obtuse punctate striæ, about twenty-eight or thirty-two in two lines at four lines from the beak, every 3rd, 5th or 7th of which are usually considerably stronger than the others in all the middle portion; interior of both valves closely punctured and striate; the close, straight, pallial impressions resemble the external striæ on the deflected front, but are only eighteen in the space of two lines; interior of receiving valve with two rather long, very slightly incurved dental lamellæ diverging at 105°, including the rotundato-trigonal pair of muscular impressions which are one-third wider than long, and extend about half the length of the disk, being only separated by a slight indication of mesial septum at their anterior edge; apex of the triangular boss of the foramen with a small abrupt mucro from the entrance of the matrix into the small tubular

opening at the apex of the beak; interior of entering valve with two very short diverging cardinal teeth, and a minute rostral tooth. Width 11 lines, proportional length $\frac{7.5}{100}$, length of disk in receiving valve $\frac{4.7}{100}$, length of disk in entering valve $\frac{6.5}{100}$, depth $\frac{2.5}{100}$.

This so exactly resembles some of the small varieties of *L. deltoidea* and the *L. camerata* (Conrad) as figured by Hall, that I should not have thought of separating them, were it not for the very much finer striæ, which very easily separate the species from our British specimens of *L. deltoidea*. The foramen of the apex of the beak is also larger, the dental lamellæ more divergent, and the muscular impressions much wider. I find the peculiar hoof-like form and other characters of this little shell (unlike *L. deltoidea*) to be extremely constant.

Gregarious, in extraordinary abundance, completely filling some beds of the limestone of Llansaintffraid, Glyn Ceiriog S. of Llangollen, Denbighshire; limestone of Selottyn Road S. of Llangollen, N. Wales.

(Col. University of Cambridge.)

Lingula Davisii (M'Coy).

Sp. Char. Ovato-pentagonal, or broadly subtrigonal, depressed, slightly and broadly convex near the beak, and about half-way to the margins, which become gradually compressed; greatest width at about the middle of the length; front slightly narrowed but very wide, subtruncate, and very slightly convex, obtusely rounded at the lateral angles to the subparallel slightly convex sides; posterior lateral margins rather long, forming an obtuse angle at the sides (usually nearly equalling half the length of the shell, nearly straight, and meeting at the beak at an angle of about 100° in the short and 95° in the long valve); surface with numerous, faint, concentric, rather wide subangular undulations of growth, accompanied by irregular concentric imbricating laminar striæ, ten in one line on the exterior of the shell; no trace of longitudinal external striæ, but on the internal cast a few faint obsolete flattened fibrous radiations observable with the lens. Length 7 lines, proportional width $\frac{7.7}{100}$, depth about $\frac{1.5}{100}$.

This curiously wide satchel-shaped *Lingula* is the species discovered by Mr. Davis in such profusion in the *Lingula* slates near Tremadoc in company with the large elongate *L. ovata* (M'Coy), and I have great pleasure in dedicating the species to him; at the same time I must remark, that except for a slightly greater width and perhaps less coarsely undulated surface, it seems scarcely to differ from the *L. lata* of Pander; as however

this writer gives no description of his species, as his figure gives at least the differences noticed, and as Mr. Sowerby has unfortunately described a totally different Silurian species under the same name, I think (although this latter should not retain the name of *L. lata*) that it is better to give a distinct name to our very abundant and distinctly marked species. The British species most allied to this is the *L. attenuata* (Sow.), which however is easily distinguished by its much longer trigonal, retrally narrowed form, or rising from the gradual passage of the sides into the posterior lateral margins (without angulation), the very prominent narrow gibbosity from the beaks, &c. The substance of the shell is very thin, and the traces I have seen apparently of the mesial ridge extend little more than one-third the length of the shell.

Extremely abundant in the greenish slates of Penmorfa, Tremadoc, N. Wales; rare in the schists E. of Nant y Groes S. of Bala, N. Wales.

(Col. University of Cambridge.)

Lingula tenuigranulata (M'Coy).

Sp. Char. Shell black, semielliptical; sides parallel, abruptly rounded to the wide, nearly straight front, gradually rounding into the undefined arched posterior lateral margins, which unite elliptically in front of the beak, the curve being rather wider than a semicircle, in the small valve, but more elongate from the projection of the considerably longer beak in the opposite one; valves with a moderate, flattened, triangular gibbosity, widening from the beak to the front margin, from which the sides slope rather abruptly to the margins, the greatest depth being at about the middle of the length; surface with irregular, flattened, concentric laminar wrinkles, strongest on the sides, nearly obsolete in the middle; entire surface covered with extremely minute, close, regular, equal, sharply granular, longitudinal, slightly undulated striæ (about twenty-six in one line in the middle of the shell), the intervening spaces between the striæ about equalling the striæ in width. Length (of shorter valve) 1 inch 9 lines, proportional width $\frac{7.0}{100}$, depth $\frac{2.5}{100}$.

This species far exceeds the *Lingula quadrata* (Eichwald) in size, though that has hitherto been the largest species known; it is easily distinguished therefrom as well as from the *L. granulata* (Phill.), to both of which it bears some resemblance, by the extremely minute granular lineation of the surface (which is quite invisible to the naked eye, or with a lens of low power only giving a dullness to the surface) and the semielliptical regular arch formed by the union of the two posterior lateral margins of the

shorter valve. In the *L. quadrata* also the front is much rounded and narrower, and the rather strong mesial lineation of the de-corticated specimens does not occur in our species, in which, when the surface is removed, there are only seen traces of obsolete, broad, longitudinal fibrous bands, not at all confined to the middle of the shell, nor linear in character. As usual in fossil *Lingula*, it is the beak only of the smaller valve which is seen most commonly; but two of our specimens show the pointed beak of the larger valve, extending a quarter of an inch beyond the rostral margin of the other, the two being undisturbed from their original position.

Common in the sandy and calcareous schists of Alt yr Anker, Meifod, Montgomeryshire; sandy schists of Das Eithin ridge, Hirnant, Montgomeryshire.

(Col. University of Cambridge.)

Spondylobolus (M'Coy), n. g.

Gen. Char. Suborbicular, slightly narrowed towards the indistinct, short hinge-line, nearly equivalve, flattened; small valve with a slightly excentric apex, beneath which, on the interior, the substance of the valve is thickened into a wide undefined boss; opposite valve slightly longer, from the apex being perfectly marginal and slightly produced, channelled by a narrow triangular groove, the anterior end of which is flanked within by two very prominent thick conical shelly bosses, representing hinge-teeth: substance of the valves thick, testaceous, not glossy, minutely fibrous, but not distinctly punctured under a lens of moderate power, except by the ends of the fibres.

One species of this genus is indistinctly known already from the figures and descriptions of Mr. Davidson under the name *Crania Sedgwickii*, the prominent cardinal protuberance being taken for the posterior pair of muscular impressions; neither the tissue of the shell nor the internal impressions, however, are identical with those of *Crania*. The grooving of the beak of one valve, and the depressed orbicular form, show the strongest affinity to the Russian genus *Obolus*, which differs however by its glossy corneous substance, peculiar internal impressions (as figured by Kutorga), and want of the conical cardinal bosses. These latter, as well as the terminal beak of one valve and sub-central beak of the other, remind us of *Trematis* of Sharpe; but neither of the specimens I have examined of the small valve show the fissure of that genus, nor does Mr. Davidson allude to anything of the sort in his large species; and further, the coarse punctation of *Trematis* does not exist here. I think its zoological position very doubtful; the greatest affinity is probably with

Siphonotreta (which it resembles very much if the tube in the beak be viewed as modified into a groove by a cleft or division of the internal rostral pad, the walls of which would thus correspond to the cardinal bosses of the present genus, forming a passage thus to *Obolus*). I think a peculiar family should be formed to include those three genera, the family being placed between *Crania* and *Discina*.

Spondylobolus craniolaris (M'Coy).

Sp. Char. Suborbicular, depressed, slightly undulated, the width scarcely exceeding the length, front and sides broadly rounded, slightly acuminate behind; apex near the posterior margin; substance of the shell thick, calcareous, smooth, with very minute faint concentric striæ, very minutely fibrous, but the punctation (if it exists) indistinct; beak of small valve small, obtusely pointed at about one-fourth the length from the posterior margin; beneath the beak the shell is greatly thickened, forming an obtuse wide pad, internally reaching nearly to the margins; beak of larger valve terminal, slightly produced, apparently channelled below by a triangular groove, on each side of the base of which is a strong conical boss, projecting into the cavity of the opposite valve like cardinal teeth; surface dull, nearly smooth, or showing under very strong glasses an indistinct, very minute punctation (perhaps due to the fibrous tissue of the shell) and delicate concentric striæ. Length 4 lines, width $4\frac{1}{2}$ lines.

The specimens I have examined are chiefly internal impressions, showing two very deep small oval pits near the hinge-line, resembling the so-called *Crania Sedgwickii* of Davidson (Bull. de la Soc. Géol. de France for October 1848), from which it differs in the greater approximation of these impressions (which are clearly not analogous to the muscular impressions of *Crania*), smaller size, &c.

Five or six specimens have occurred in the shale of Bultth Bridge, Radnorshire.

(Col. University of Cambridge.)

Holopella tenuicincta (M'Coy).

Sp. Char. Very elongate, spiral angle 20° , whorls probably eight or nine, but only five or six usually preserved, gently convex, sutures simple, deep, sutural angle 80° ; surface girt with close, fine, sharp, subequal, spiral striæ (about thirty-five in the space of one line on the basal whorls), crossed by a few obsolete, sigmoidally arched lines of growth. Length about 8 lines, width

at base 3 lines, length of last whorl 2 lines, length of penultimate whorl $1\frac{1}{2}$ line.

I imagine this may be the Scotch fossil referred by Mr. Salter (Quart. Geol. Journ. for August 1851) to the Upper Ludlow, *Turritella (Holopella) obsoleta* of Sowerby, as it has very much the same size and shape; and the distinctive spiral lineation requires a good cross light and some care to detect; but with these and a lens of low power it may be always seen, even in the sandstone casts, and the species thus easily distinguished from that of the newer rocks. The sutures are always more oblique than in the *H. obsoleta*. The slight inequality of size of the striæ seems in parts subalternate, in parts irregular.

Common in the sandstone of Mulock quarry, Dalquorhan.
(Col. University of Cambridge.)

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

July 9, 1851.—John Gould, Esq., F.R.S., in the Chair.

The following paper was read:—

ON THE GENERIC SUBDIVISION OF THE BOVIDÆ, OR HOLLOW-HORNED RUMINANTS. BY H. N. TURNER, JUN.

In the series of observations upon the Ungulate Mammalia, of which I attempted last winter to lay before the Society the more general results, my attention was also in some measure directed towards the detailed arrangement of those portions of the order which have generally proved subjects of difficulty. Of these, the classification of the *Bovidæ*, or hollow-horned Ruminants, has certainly been the greatest, since they form a well-marked natural group, including a great variety of forms, with but few remarkable differences of structure. I soon found, however, that even setting aside some of the more strikingly-modified genera, the distinctions afforded by the skull were much more decided than any that I could find among the *Cervidæ*, which, from their being less rich in number and variety, were always easier to subdivide correctly. Not having been able at that time to observe the skulls of certain of the more remarkable forms, I set the matter aside for better opportunities; and now that the large and interesting collection of hunters' spoils which Mr. Roualeyn Gordon Cumming has brought together, and is at present exhibiting in London, has given me the opportunity of supplying some of these desiderata, I venture, although there are yet a few points I could wish to ascertain, to lay this portion of my researches before the Society.

There cannot be a doubt that the horns present the best and most readily discernible characters, or that, when the genera are once correctly determined, they may be pretty easily defined by the variations of these parts alone; but it has long since been seen how the con-