exclusively of Tertiary beds in all England. It was originally represented by the Geological Survey as being held up in a forked fault with a sort of repetition of the London Clay at its northern base. There certainly seems no justification for the introduction of the London Clay into this position, viz. the northern base of the hill. There may, however, be some better reason for the introduction of a fault, for it is just hereabouts that the junction of the Creechbarrow Beds with the Pipeclay series takes place. This is a piece of stratigraphy which I have not yet succeeded in solving to my own satisfaction, though such a question has only an indirect bearing on the origin of Creechbarrow as a hill. I am far from saying that everything in connection with its origin has been explained, but without doubt one great predisposing cause is the protection which the softer strata have received from the concretionary limestone. Such protection is not only accountable, in a great measure, for the existence of the hill itself, but also for its present shape, which has to a considerable extent been determined by the original form of the calcareous body that accumulated in some old Tertiary lakelet, ages before the uplift of the Purbeck Hills.

II.—WOODWARDIAN MUSEUM NOTES: SALTER'S UNDESCRIBED SPECIES. VIII.¹

By F. R. COWPER REED, M.A., F.G.S.
(PLATE XVI.)

LAMELLIBRANCHIATA (Continued).

GONIOPHORA GRANDIS, Salter. (Pl. XVI, Figs. 1, 2.)

1873. *Goniophora grandis*, Salter: Cat. Camb. Sil. Foss. Woodw. Mus., p. 151
(a 827).

1891. *Goniophora grandis*, Woods: Cat. Type Foss. Woodw. Mus., p. 77.

There is only the one poorly preserved and imperfect specimen in the Woodwardian Museum on which Salter founded this species. It comes from the Wenlock Limestone of Dudley and belongs to the Fletcher Collection. Salter says of it (a 827): "Strongly costated and marked with lines of growth which decussate the ribs. Twice the size of the common Ludlow species." The material is so poor that the specific description must necessarily be incomplete.

DIAGNOSIS.—Shell narrow, transversely elongate, dorso-ventrally compressed. Valves very deep, angulated by diagonal, very strong carina from beak to posterior angle. Anterior side with large deep subcordate lunule. Below the diagonal carina the surface of the valves is marked by about twelve strong radiating rounded ribs, curved slightly forwards, parallel to the margins of the lunule and crossed by numerous concentric growth-ridges. Above the carina the sole ornamentation is the continuation of this series of concentric ridges, the radiating ribs being entirely absent.

MEASUREMENT.—Length (diagonal, along carina) approximately 45–50 mm.

¹ For previous articles see GEOL. MAG., 1901, pp. 5, 106, 246, 355, and 576; 1902, pp. 122 and 145.

REMARKS.—It is not very profitable to compare this poorly defined species with others. The only form of *Goniophora* known to me with similar radiating ribs on the anterior lower half of the shell only and concentric ridges above and below the carina, is *G. truncata*, Hall,¹ from the Hamilton Group of New York.

MODIOLOPSIS COMPLANATA (Sow.).

1851. *Modiolopsis complanata* (Sow.), McCoy: Brit. Pal. Foss., p. 266.
 1873. *Modiolopsis planata*, Salter: Cat. Camb. Sil. Foss., p. 182 (*b* 71-3).
 1891. *Modiolopsis planata*, Woods: Cat. Type Foss. Woodw. Mus., p. 81.

The specimens which McCoy named and described (op. cit. supra) as *M. complanata* (Sow.) were renamed *M. planata* by Salter, though in the margin of his Catalogue (loc. cit.) he puts *M. complanata* with a query after it. I do not see sufficient reason to doubt the accuracy of McCoy's identification, and therefore Salter's specific name *planata* must be dropped.

MODIOLOPSIS MIMUS, Salter. (Pl. XVI, Fig. 3.)

1873. *Mytilus mimus*, Salter: Cat. Camb. Sil. Foss. Woodw. Mus., p. 182 (*b* 141).
 1891. *Mytilus minimus*, Woods: Cat. Type Foss. Woodw. Mus., p. 82.

The name of this species is printed *mimus* in Salter's Catalogue, both on p. 182 and in the index, p. 200. On the back of the tablet bearing the specimen the name *minimus* was found written in pencil, and Mr. Woods adopted this in his Catalogue. There is only one specimen of the left valve (*b* 141), and it comes from the Upper Ludlow of Lesmahagow.

DIAGNOSIS.—Shell inequilateral, obliquely elongate, obtusely pointed. Body narrow, slightly curved, convex, especially near beak. Beak anterior, terminal, small, pointed, convex. Posterior portion of shell rather depressed and flattened, but not sharply marked off from body of shell. Ventral margin short, subacuminate. Posterior margin almost vertical, gently rounded. Hinge-line straight, nearly the width of shell, at angle of 60° to oblique axis.

Surface marked with concentric growth-lines.

MEASUREMENTS.

	mm.
Length along oblique axis	16
Width along hinge-line	9
Length from hinge-line to ventral margin	12

REMARKS.—This species bears some resemblance to the Bala form *Modiolopsis pyrus*, Salter,² but the hinge-line is relatively rather longer, the beak more acuminate and terminal, and the posterior portion of the shell larger. Some American species of *Leptodesma* from the Chemung Group³ seem to bear a considerable resemblance to *M. mimus*.

ORTHONOTA (?) HUGHESI, Salter. (Pl. XVI, Figs. 4, 5.)

1873. *Ctenodonta Hughesi*, n.sp., Salter: Cat. Camb. Sil. Foss. Woodw. Mus., p. 82 (*a* 979).
 1891. *Ctenodonta Hughesi*, Woods: Cat. Type Foss. Woodw. Mus., p. 74.

¹ Hall: Paleont. N.Y., vol. v (1883), p. 13, pl. xlv, figs. 1-5.

² Mem. Geol. Surv., vol. iii, 2nd ed. (1881), p. 552, woodcut xii, fig. 1.

³ Hall: Pal. N.Y., vol. v, pt. 1, pl. xci, figs. 23-5.

Salter says of this form that it is "squarer and more ovate than the kindred Caradoc forms." There are four specimens in the Woodwardian Museum, and Salter based his species on two of them (*a* 979) consisting of a complete internal cast of both valves and an external cast of the upper portion of the shell. All were found in the Lower Llandovery Beds (Upper Bala of Salter) of Sefin Llettyrhyddod, Llandovery.

DIAGNOSIS.—Shell equivalve, inequilateral, transversely subovate, narrowing and subtruncate posteriorly, subcompressed. Beaks obtuse, moderate, near anterior end, with small impressed lunule in front below them. Hinge straight, about two-thirds width of shell. Anterior portion of shell convex; posterior portion slightly flattened, compressed. Anterior end broadly rounded; posterior end narrower, more pointed, angulated between ridges. Ventral margin regular, subparallel to dorsal. Two faint low diverging ridges run obliquely backwards over posterior slope of valves to posterior end of ventral margin, but are almost indistinguishable near the beak. Hinge area behind beaks narrow, lanceolate. Ligament external, in groove. Hinge-line edentulous? Pallial line simple, no sinus. Posterior adductor scar well marked, about half-way between beak and posterior extremity. Anterior scar faint. Surface of valves marked by faint concentric growth-lines.

MEASUREMENTS.

						mm.
Length	...	...	...	...	...	15
Width	...	...	...	...	...	24
Thickness	...	...	...	...	...	8

REMARKS.—The characters of the hinge and absence of the typical teeth would alone be sufficient to remove this species from the genus *Ctenodonta*; and it appears to belong to the genus *Orthonota*.

Orthonota solenoides (Sow.)¹ bears a distant resemblance, but is relatively more transverse, and the posterior ridges are wanting.

ACTINOZOA.

HELIOLITES CÆSPITOSA, Salter. (Pl. XVI, Figs. 6, 7.)

1873. *Helicilites cæspitosa*, Salter: Cat. Camb. Sil. Foss. Woodw. Mus., p. 104 (*a* 343).

1888. *Helicilites cæspitosa*, Etheridge: Cat. Brit. Foss., pt. i (Palæoz.), p. 20.

1891. *Helicilites cæspitosa*, Woods: Cat. Type Foss. Woodw. Mus., p. 20.

The three original specimens (*a* 343) come from the Wenlock Limestone of Dudley and belong to the Fletcher Collection. The species is not uncommon there, and we have numerous specimens from the same locality. Salter (op. cit. supra) describes it as "something like *H. Grayi*, but cells approximate; shallow pits, not raised." One of the original specimens is a fine and almost perfect corallum.

DIAGNOSIS.—Corallum ramose, but not diffuse, consisting of several subparallel, irregularly rounded or lobate, stout branches, increasing in thickness from the base, and bearing calices over their whole surface. Larger corallites small, very numerous, approximate,

¹ Murchison *Siluria*, 5th ed., 1872, pl. xxiii, fig. 9.

GM Woodward del. et lith.

West, Newman imp.

Silurian Mollusca & Coral.

usually less than half their diameter apart, in some cases almost contiguous; margin slightly exsert, but calyx sunk below general surface; walls crenulated and infolded to form twelve short septa, extending inwards from one-quarter to one-third the diameter of the calyx. Smaller corallites (coenenchyma) not numerous, usually only 2-4 irregular rows between the larger corallites; polygonal in shape, with well-developed walls and regular horizontal and mostly equidistant tabulæ, so as to divide the tubes into a series of square cells.

MEASUREMENTS.

	mm.
Diameter of calyx of larger corallite	1-1.5
Length of corallum	80.0
Diameter of corallum at base	20.0
Diameter of corallum at crown	55.0

REMARKS.—This species differs from *H. Grayi*¹ in the rounded or lobate form of the branches, and in the number, approximation, and depression of the calices of the larger corallites. From *H. inordinata* it differs by possessing stouter, more lobate branches, more numerous, closer and larger corallites with depressed calices, and less abundant coenenchyma. A Norwegian species named *Plasmopora ramosa*, Kiær, has been recently described² which bears a considerable resemblance to *H. cæspitosa*, and is stated to be closely allied to *H. Grayi*. It differs in the more exsert margins of the corallites, the absence of septal prominences, and in the wider spaces between the corallites. The internal structure, moreover, which is the most important feature, appears to be distinct.

EXPLANATION OF PLATE XVI.

FIGS. 1, 2.—*Goniophora grandis*, Salter. Wenlock Limestone: Dudley. Fletcher Coll. Nat. size.

FIG. 3.—*Modiolopsis minus*, Salter. Upper Ludlow: Lesmahagow. Enlarged $\frac{2}{3}$ nat. size.

FIGS. 4, 5.—*Orthonota Hughesi*, Salter. Lower Llandovery Beds (Upper Bala, Salter): Sefin Llettyrhyddod, Llandovery. Fig. 4, side view; Fig. 5, hinge aspect of shell. Enlarged $1\frac{1}{2}$ nat. size.

FIG. 6.—*Heliolites cæspitosa*, Salter. Wenlock Limestone: Dudley. Fletcher Coll.

FIG. 7.—Portion of corallum, enlarged $\frac{2}{3}$ nat. size.

III.—ON THE MAKING OF A QUARTZ SCHIST.

By JOHN PARKINSON, F.G.S.

IN a paper published³ some eight years ago, Prof. T. G. Bonney discriminated between the dominant characteristics of quartz schists from the Alps and quartzites modified by pressure. The distinctions as therein pointed out may be thus summed up.

In a quartz schist we find an absence of indications of original fragments, the shape of the quartzes proving that they were formed *in situ*; together with no evidence "that the mica in its present form is derivative"; from which it almost necessarily follows that

¹ Edwards & Haime: Brit. Foss. Corals (Palæont. Soc.), p. 252, pl. lviii, fig. 1.

² Kiær: Die Korallenfaun, Ét. 5, Norweg. Silur., p. 32, t. v, figs. 5-6: Palæontographica, Bd. xlvii, 1899-1900.

³ GEOL. MAG., Dec. III, Vol. X (1893), p. 204; also GEOL. MAG., Dec. IV, Vol. III (1896), p. 400 ("On a Pebbly Quartz-Schist from the Val d'Anniviers").