THE GEOLOGICAL MAGAZINE.

No. LII.—OCTOBER, 1868.

ORIGINAL ARTICLES.

I.—ON THE GENUS *TRIMERELLA*, BILLINGS.¹

By Dr. GUSTAV LINDSTRÖM, of the University of Wisby, in the Island of Gotland.

[PLATE XX.]

MANY beds of limestone, belonging to the middle division of the Upper Silurian formation of the Island of Gotland, consist almost entirely of the fragments of a very large and peculiarly-shaped Brachiopodous shell. It may be regarded as one of the most characteristic fossils of these Upper Silurian rocks. Perfect valves, giving a satisfactory view of its structure have never been found. When Mr. Davidson, with his usual kindness, sent me copies of the figures and descriptions given by Mr. Billings,² of the new genus *Trimerella*, found in Canada, I had no hesitation in referring both the Canadian and the Gothlandic shells to the same genus. The materials obtained by Mr. Billings seem to have been more incomplete than mine; I have, therefore, been able to make some additions to the description given by him.

The greatest peculiarity consists in two siphons or tubes, that penetrate the shell along the median axis of the valves, or on both sides of it. These siphons, by degrees, taper off, and cease in the vicinity of the apex of the valves; their openings are of an ovate oblique form on the interior surface of the valves, and almost in the centre. An elevated shield, hiding the continuation of the siphons in its interior, is formed by the concentric shell-layers that envelop the siphons (Plate XX., Fig. 6), and, on the surface, by the mantle and other soft parts. This median elevation is smooth, having no impressions of muscular parts, and is deeply concave along the median axis. The lateral walls of both siphons are contiguous to the median axis of the valve, and continue as a straight ridge for a considerable distance down towards the inferior margin of the valve. The soft parts that secreted the concentric layers of the siphons, by degrees moved downward during the growth of the animal, filling the place they once occupied with shelly matter. Thus we find the apices of the siphons are generally filled with

¹ Translated and communicated by the Author from the "Ofversigt af Kongl. Vetenskaps-Akademiens Förhandlingar," 1867. No. 5. pp. 253-257.

² Billings, Geol. Survey of Canada, Pal. Foss., Vol. I., p. 167.

concentric layers. Some faint longitudinal striæ are seen on the interior walls of the siphons. The concentric layers around the siphons form two strata that are quite distinct from the rest of the shell-matter, and are imbedded in it. They cannot, therefore, be confounded with septa, which, when they do occur in the shells, are in immediate contact with the valves, and compactly united with them. The siphons of the dorsal valve are shorter than those in the ventral valve, and often more divergent. I think we gain the true interpretation of the nature of these siphons, if we attentively examine the interior surface of the valves in the genera *Lingula* and *Obolus*. The corresponding part of the valve of *Lingula* is occupied by two impressions of the adductors, situated on each side of a broad, faint, shield-like elevation.

In some of the Silurian *Lingulæ* these muscular impressions¹ are somewhat excavated in the valve.

The straight ridge, that continues below the impressions of the adductors, and to which in the recent *Lingulæ* the "*occlusores anteriores*," Owen ("anterior retractors," Woodward), are fixed, is, as it seems to me, homologous to the median ridge, continuing so far below the openings of the siphons. This ridge consists (in *Trimerella*) of two layers, that extend towards the margins of the valves, and are an immediate continuation of the siphonal layers. In *Obolus* the adductors occupy the same place as in *Lingula*, but are separated by a larger elevation, or median shield. In some of the Upper Silurian *Oboli* (which, perhaps, form a separate genus), this median shield is very much elevated and prolonged in a long narrow ridge, as in *Lingula*. In these *Oboli* the impressions of the adductors are deeply hollowed in the valves, so that the casts resemble two very short and pointed teeth.² But this peculiar form of the muscular scars is fully developed in *Trimerella*. I consider these characteristic siphons to be the muscular scars, because their openings occupy the same places as the adductors in the above-named genera, and also because the walls are marked with those longitudinal striæ so characteristic of the muscular impressions; they have, moreover, a mode of development quite different from that of the septa. There can, then, be discerned an almost continuous series in this development of the muscular scars; faintly indicated in the *Lingulæ*, strongly expressed in *Obolus* (more especially in those from the Upper Silurian rocks), and fully developed in *Trimerella*. No other vestiges

¹ Davidson, *Silurian Brachiopoda*, pl. ii., fig. 35; pl. iii., figs. 5, 6.

² Davidson (l. c. pl. iv., fig. 39). Compare also fig. 4 of my plate with the figure of a dorsal valve of *Trimerella grandis* in the work of Mr. Billings.

My above stated opinion as to the nature of the siphons of *Trimerella* is corroborated by the fact that in some species of *Crania*, especially the Cretaceous, these scars of the adductors continue in the form of narrow pointed siphons, ceasing at the apex of the valves. Thus, for instance, in *Crania spinulosa*, Hisinger, Leth. Suecica, pl. xxiv., fig. 7a; also, *C. Brattenburgensis*, in the German edition of Davidson's "Introduction to the *Brachiopoda*," pl. v., fig. 15, and *C. antiqua*, Defr., pl. v., fig. 16c. I can also cite the valuable authority of the late Dr. S. P. Woodward, in his "Manual of the Mollusca," p. 236 (*Crania*), "The large muscular impressions are . . . sometimes deeply excavated."

of muscular impressions are visible, excepting those on both sides of the elongated median ridge, and probably the narrow impressions going from the exterior margin of the adductors towards the margins of the valves. It is also possible that muscles were attached in the apical corners of the ventral valve.

If, however, *Trimerella*, by reason of the structure of its median muscular impressions, is related to the *Lingulidæ*, it is widely separated from them in another respect, as its dorsal valve is provided with a large tongue-shaped process (possibly the *processus cardinalis*?), by means of which it is articulated to the ventral valve. This process fits into a semilunar groove below the area of the ventral valve, and this area is formed by the lamellæ, that one by one have been secreted above the semilunar groove (Pl. XX. Fig. 7).

Another anomaly of which I have not seen any homology amongst the *Brachiopoda*, is that the lateral margins of both valves are grooved by a furrow, shallow at the ends and deepest in the centre. These furrows encircle the opposite margins, and make the valves close more tightly.

The valves attain a thickness of 15 millimètres, and consist in their perfect state of calcareous spar, and show no traces of any organic structure.

EXPLANATION OF PLATE XX.

- FIG. 1. Interior of ventral valve restored.
 „ 2, 3. Casts of both valves.
 „ 4. Cast of dorsal valve of *Obolus* ? *Davidsoni*, Salter (Gotland).
 „ 5. Section of ventral valve at the openings of the siphons.
 „ 6. Section of the same showing the concentric calcareous secretions around the siphons.
 „ 7. Cardinal process of dorsal valve fixed in the ventral valve.
 „ 8. Side view of dorsal valve.
 „ 9. Section of ventral valve at the apex.
 „ 10. Interior of the dorsal valve of *Obolus*, sp. from a cast in gutta-percha.

II. — ON SOME CAVITIES IN THE GRAVEL OF THE VALLEY OF THE LITTLE OUSE, IN NORFOLK.¹

By JOHN EVANS, F.R.S., F.S.A., Sec. Geol. Soc.

A FEW months ago both geologists and archæologists, and especially the latter, were surprised to hear of the discovery in the valley of the Little Ouse, between Thetford and Brandon, of certain cavities in beds of gravel, in which flint implements of the forms peculiar to the Palæolithic or river gravel were found, and which it seemed possible might have been the habitations of the early race of men who formed these implements.

An account of this discovery was communicated to the Norwich Geological Society, and also to the Norfolk and Norwich Archæological Society, by Mr. Sheriff Fitch, F.S.A., F.G.S., to whom the credit of first observing these cavities is due, and who I was in hopes would have made a communication on the subject instead of leaving it for me to do.

¹ Read before Section C. of the British Association, Norwich, August 23rd, 1868.