

transversis decussatis; regione umbilicali impressa; apertura sub-circulari; labio vix incrassato; labro simplici.

Hab. Tabu-Sima; 25 fathoms.

A small thin species with plicate whorls crossed by regular elevated transverse liræ.

5. Genus SCALIOLA, A. Adams.

Shell thin, turreted, perforate; whorls rounded, agglutinate. Aperture circular; peritreme simple, acute.

Scaliola bella, A. Adams, Ann. Nat. Hist. 1860, vol. vi.

Hab. Tabu-Sima; 25 fathoms.

An examination of fresh specimens of this little genus proves that it has the faculty, like *Helicina agglutinans* and the species of *Onustidæ*, of covering the surface of the valves with foreign bodies.

Shanghai, China,
May 3, 1861.

XLVIII.—*Additional Notes on some new Palæozoic Star-fishes.*
By J. W. SALTER, Esq., F.G.S., Geol. Survey of Great Britain.

[Plate XVIII. figs. 9, 10, 11.]

To the Editors of the Annals of Natural History.

GENTLEMEN,

In the Notes I sent you on the Silurian Starfishes (Annals, ser. 2. vol. xx. p. 321, pl. 9) one of the most doubtful points was the true position of the long-armed genus *Protaster* (fig. 4). It had all the appearance of an *Ophiura*, and yet there was so much apparent similarity to the accompanying genera of *Asteriadæ* as to suggest the expectation that they might be found nearly allied.

A fresh set of specimens of these beautiful fossils has cleared up the point, at least so far as it shows that *Protaster* possessed the usual madreporic plate of the *Asteriadæ*. Its position, and a slightly magnified view of the plate are given in the sketch, fig. 9.

There were also some important differences, when *Protaster* was compared with the *Ophiuridæ*, in the structure of the arms themselves; for the number of plates in a circuit of the arm was six in *Protaster*, four in all ordinary *Ophiurids*. This number, indeed, is constant; or if, as in *Ophiolepis*, the upper plate be sometimes divided, this is accidental, no species being known in

which it is normally so. The six plates in a circuit were therefore supposed to result from the division of the upper and lower plates each into two pieces. But there was a manifest resemblance in the lower plates of the arm to the corresponding ambulacral plates or ossicles of *Palæocomma* (*ib.* fig. 3), and even *Palasterina* (fig. 2). Again, the passages for the ambulacral feet were supposed to be *outside* these two plates, between them and the marginal plates, which would be the right position for *Ophiura*, or a modified form of *Ophiuridæ*, as this was supposed to be.

Our fresh specimens clear up this point likewise, and show that in the structure of the ambulacra, as well as in the form, *Protaster* was only imitative of the *Ophiuridæ*.

The real shape of the ambulacral bones (fig. 11) is given from a perfect specimen; and a comparison between figs. 10 and 11 will show how the passages may *appear* to be outside the ossicles, and yet be really *between* them, as usual in *Asteriadæ*. The great size of the apertures encroaches so much on the length and breadth of the ossicle as to excavate it in the manner shown in fig. 11, which is a magnified view of two pairs of these bones. There is manifestly no room for the feet to protrude at *b*; and hence, till the narrow overhanging piece (*c*) was shown by these specimens, the aperture appeared to be outside the plate, as in *Ophiura*.

It is curious enough, but should hardly be surprising, to find a form belonging to one family so closely simulating those of another, even to minute details. No one, I am persuaded, looking merely to the general shape of these long-armed species, with their round disks apparently covered with scales*, and the twisting arms fringed with stiff spines, but would have referred them to the Ophiurid group. If he looked closer, he would find the plates composing the arms flattened squamæ, rather than thick ossicles, bearing combs of spines exactly like those borne by *Ophiuridæ*. The oral apparatus, if not quite like that of an Ophiurid, is at least very unlike that of a Star-fish; and there are even the pencils of spines which are conspicuous on the oral ossicles of the former group. Every character of the Asteriad group has been distorted, so to speak, in order to simulate that of another group; and when we detect Nature's innocent fraud, we can but wonder the more at her ingenuity.

I may just mention, in passing, the presence of the madreporiform tubercle on those curious forms figured lately by Prof.

* They are not really so, though Prof. E. Forbes described and figured them as such in Decade I. of the Geological Survey. The skeleton even of the disk is closely reticular, and the disk is membranous between the bones.

Wyville Thomson (New Edinb. Phil. Journal, new series, 1861, pls. 3, 4), which he calls *Echinocystites*, and considers to be a passage-form from the *Cystideæ* towards the *Echinida* proper. I do not see why they may not be rather a passage-form from the Star-fishes to the *Echinida*; for *Agelacrinites* and *Edrioaster* were shown by Mr. E. Billings to be inflated star-fishes; and *Paleodiscus*, which Prof. Thomson admits to be allied to his new genus, has both a flattened form and transverse ambulacral ossicles with grooves between them. The position of the anus, near to the apical pole, as in many *Asteriadae*, the higher development of the masticatory apparatus, and the thick clothing of the surface with spines might all receive explanation readily if this curious form were considered as a globular Star-fish, passing, by many of its characters (the perforated ambulacral plates especially), towards the *Echinida*.

I am, your obedient Servant,
J. W. SALTER.

EXPLANATION OF PLATE XVIII.

Fig. 9. *Protaster Miltoni*, with magnified madreporic plate; from Leintwardine, Shropshire, in Lower Ludlow rock.

Fig. 10. Arm, under side: *a*, proximal end. The large passages for the feet are covered with a light tint.

Fig. 11. Ambulacral ossicles, magnified.

XLIX.—*On a Microzoal Bed in the Carboniferous Limestone of Clifton, near Bristol.* By W. W. STODDART.

[Plate XVIII. figs. 1–8.]

THE bed of limestone now to be described is, without exception, the most extraordinary and interesting that it has ever been the author's lot to examine. Numerous as are the small shells and fossils in many of the Tertiary beds of the Isle of Wight, Hampshire, and other places, yet they are all very far surpassed by the immense number of organisms in the Clifton bed; and so minute are these, that it is a rare occurrence to find one the eighth of an inch in diameter. The casts are so exquisitely perfect, that the cell-aperture of the zoophyte or the hinge-markings of the Entomostracan are frequently to be met with in a very good state of preservation.

The extensive section of the Carboniferous Limestone displayed at Clifton has for a long period been well known and frequently described by various geologists. The facility with which all its different beds may be reached has always afforded good opportunities for their study.

The section may be completely followed from the Upper De-



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