

47. *On PALÆOCORYNE and other POLYZOAL APPENDAGES.* By Prof. J. YOUNG, M.D., F.G.S., and J. YOUNG, Esq., F.G.S., Hunterian Museum, Glasgow University. (Read June 24, 1874.)

[PLATES XL.-XLIIL.]

IN 1869 Mr. James Thomson, F.G.S., drew Dr. P. M. Duncan's attention to some interesting forms common in local collections in Glasgow, but not previously described. Dr. Duncan and Mr. H. M. Jenkins described and figured these fossils in the 'Philosophical Transactions' for 1869, bestowing on them the generic name *Palæocoryne*, and referring them to the Hydrozoa. Professor Allman in his great work on the Hydrozoa (Ray Society), criticised the published descriptions and figures, and, relying on the accuracy of these figures, suggested their foraminiferal relations. In 1873 Dr. Duncan again discussed *Palæocoryne*, and adhered to his former opinion as to its structure and affinities. In 1871, at a meeting of the Glasgow Geological Society, Mr. James Thomson exhibited a large suite of fossils, among them *Palæocoryne*; it was suggested that the Polyzoa possessed other appendages generally similar in character. We have had the opportunity of examining a very large series of specimens contained in the Hunterian Collection and the cabinet of Mr. John Young; and Mr. Thomson has been kind enough to place his specimens in our hands, thus enabling us to reexamine those on which the genus was founded. The results of our investigation are as follows:—

1. The structures named *Palæocoryne* are organically connected with the Polyzoa on which they occur; the tissue of the one is continuous with that of the other, the cells of the base of *Palæocoryne* being the cells of the polyzoon from which it springs.

2. The continuity of the tissue is demonstrated by transparent sections and polished surfaces, and is satisfactorily seen to be constant when large numbers of examples are examined. The accompanying figures, 12-16, 24, 31, 32, 40, 42, illustrate various modifications of the fossil, and show that the bases of the processes are often perforous for some little way up.

3. The "dactylose basal lobes" of Dr. Duncan are in reality the branches of the polyzoon, of which the processes are continuations. Figure 40 is redrawn from the specimen which appears in Messrs. Duncan and Jenkins's paper, 'Phil. Trans.' 1869, pl. 66. fig. 8. If our drawing is compared with figures 22-24, 42, it will be seen that the cellular structure is polyzoal, and that the broken ends of the dactylose lobes were not correctly drawn in the Philosophical Transactions.

4. From fractured and polished sections it is certain:—(a) that except in one species, *F. (nodulosa) multiporata*, the branches and dissepiments of the polyzoa are solid, and that the stem and capitulum of the processes are likewise solid; (b) that the cavernous base

is, as already said, the cellular branch of the *Fenestella*; (c) that the radiating tentacles of *Palæocoryne* are solid; (d) that the terminal aperture of the arm, and the central aperture of the disk, are only found in fractured specimens; (e) that the central and peripheral portions are of unequal density.

5. In these, as in other Polyzoa with calcareous skeleton, the difference of tissues gives an appearance of tubularity, which is enhanced in polished specimens by the removal of the laxer tissue, so as to suggest a central groove: and as growth occurs by superposition of layers of calcareous matter, the limits of the softer tissue as seen in profile are parallel.

6. When such a composite mass is fractured by bending, the fracture is not clean unless the force is great and sudden; but the proximal part shows a conical stump, the unequal waste of whose material gives the appearance of a pitted tubercle. Thus is to be explained the suggestion of a canal at the end of the broken processes in Polyzoa, and of the supposed articular surfaces in *Heterophyllia mirabilis*.

7. The upper surface of the "capitulum" may be cupped, or prolonged into a central cone of various length, from a mere prominence to an elongated shaft. In no case is there an aperture save by fracture. The hard tissue closing in the bottom of the cup is thinner than elsewhere; and the lax calcareous matter of the axis, diverging here towards the rays, has a cancellated aspect on section; but nothing like a definite cavity is seen. The lappets described by Dr. Duncan, when visible, are nothing more than the triangular areas defined by the converging ridges which prolong the ornament of the upper surface of the rays on to the centre of the cup. When there is a central cone the ornament is similarly prolonged on it.

8. The arms are very unequal in number and length; and even in the same cup one or two of these processes may be much longer than the rest.

9. The stems do not always bear "capitula." Figure 43 shows a whorl of radii given off without any thickening. Figure 43 and many specimens show the arms given off at irregular intervals; and bifurcation is not uncommon (figures 29, 39). In our large suite of specimens we can trace many stages of progress; thus figure 19, from the non-poriferous face of *Fenestella membranacea*, is as yet a tapering column; in figure 40 the capitulum is formed; in figure 43 the whorl is, as said, without capitulum, and what answers to the pyramid is prolonged past the whorl as a continuation of the stem.

10. These forms lead us to another group, which, obviously, Dr. Duncan has not had the opportunity of examining. He says *Palæocoryne* is found near the margins of the frond; we have found it there and near the base on the non-poriferous as well as the poriferous faces. But we have also found the processes figured in figures 12-25, 29, 31, 32, 36-39, 45. These are structurally identical with *Palæocoryne*; and their ornamentation likewise agrees in every particular. In fact, we regard *Palæocoryne* as a sterile process of

a Polyzoon, which gives off other processes (figure 46) answering to dissepiments; in which, as in the modification selected by Duncan, the axis may be contracted, and the dissepiments given off as a whorl. Nor need this arrangement be regarded as very anomalous; for figures 12, 46 show the spiral tendency of the ornamental lines, and this, in several polished specimens, gives a curious appearance of discontinuity to the layers of calcareous matter. The pyramid in the centre of the cup is simply the prolongation of the stem beyond the contracted internodes; but no specimens have as yet shown a repetition of the verticillate arms\*. Figures 31, 32 show the remarkable relation of the sterile branches to the frond; they are prolongations of the dissepiments.

11. The ornament of the surface is thus not "mimetic," but is truly that of the Polyzoa; and its variety is probably of specific value. Thus *F. nodulosa* (figures 36-38) gives off processes which bear recurved spines. *F. membranacea* gives off the fluted branches (figures 31, 32, 34), the ridges being transversely grooved so as to give the appearance of a head of maize. *Actinostoma fenestratum* bears the finely grooved processes in figure 16. We have not yet determined fully all the varieties; for as these processes are not in the same plane as the fronds, they are most frequently detached in fossilization.

12. The functions of these processes it is impossible to speak of positively. Those which are given off from the non-poriferous face and near the base of calycine fronds seem to be adventitious roots, supports to the fabric; while those given off from the margins and from the poriferous face near the margins would seem to be mere irregularities of growth, unless it should turn out that in them we have the commencement of new fronds.

13. King figures, in his 'Permian Fossils,' pl. iv. figs. 7, 8, a bundle of adventitious roots connected with the base of a cup-like frond belonging to *Synocladia virgulacea*, Phillips. We have figured a *Palæocoryne* from the Permian (figure 41). D'Orbigny (Mollusques et Rayonnées) gives a drawing of *Clausa Franquana*, in which the stem ends in a barren prolongation such as we have described. The condition, therefore, is not exclusively confined to palæozoic Polyzoa, although it is a matter of surprise that only casual allusions have been made to it in this country, nor, as far as we have been able to ascertain, has it been described by any Continental palæontologist.

14. Among several hundred examples we have not found *Palæocoryne* or any similar structure in connexion with other than fenestrated forms, such as *Fenestella*, *Actinostoma*, and *Polypora*. But the similarity of surface-ornament in some species of *Glaucanome*, and the detached state in which the fragments are usually found, forbid our regarding the evidence as more than negative.

15. The evidence we have adduced seems to prove:—(a) that *Palæocoryne* is only one type of the processes which were given off

\* One such specimen has since been sent to us by Dr. Rankin of Carlisle (Nov. 1874).

by certain palæozoic Polyzoa; (b) that the stellate processes called *Palæocoryne* are given off chiefly, if not exclusively, from the poriferous and (more rarely) from the non-poriferous faces; and (c) that the other processes described may arise from the poriferous faces, and from the edge and base of the fronds.

Our favourable opportunities as regards examples have enabled us to give a more complete view of these interesting forms than Dr. Duncan has had the opportunity of giving. We look to receive in turn the criticisms of those who are familiar with other and especially recent types of Polyzoa.

#### DISCUSSION.

Prof. DUNCAN remarked that it was to be regretted that those critics who differed from original investigators in matters of fact did not correspond with them before offering their views to the Society. Had this course been taken in this instance, he would have been spared the necessity of explaining Prof. and Mr. Young's errors of observation, and of showing that they had not as yet comprehended either the anatomy or the classificatory position of *Palæocoryne*. He objected to Palæozoic Polyzoa being saddled with such "appendages" as *Palæocoryne*, because no modern form had any thing like them; for they could not be compared to the avicularia or to vibracula. Moreover the base of *Palæocoryne* sat upon, covered, and destroyed numerous cells of the Polyzoön. It could not, therefore, be a sterile or any form of appendage, but must be looked upon as parasitic in the sense already explained by him and his colleague Mr. Jenkins. Of course there being no screws or pegs in palæozoic times, the *Palæocoryne* could only attach itself by a fusion of its hard parts with those of the Polyzoön. Such organic connexion is common enough between modern parasites and their hosts. He had carefully studied the morphology of *Palæocoryne* with Mr. Jenkins; and the drawings had been admirably executed by the artist; and in the course of their investigations such opinions as those expressed by Prof. Young had occurred to them. He was satisfied that the ornamentation of *Palæocoryne* was mimetic of that of the Polyzoön, and that the stems, capitulum, and arms were originally hollow. He exhibited drawings and specimens showing the fistulose condition of the arms (from the collection of the Geological Survey of Scotland). When the structures were perfectly fossilized they were of course solid; but the original central tube could be distinguished in most instances by the nature of the mineralization. Prof. Young had mistaken pieces of *Fenestella* for *Palæocoryne*, and had not distinguished the stolons of the Polyzoön from the arms of the hydroid.

Mr. JENKINS said that among recent Polyzoa *Bicellaria tuba* possesses an appendage superficially resembling *Palæocoryne*, but without its definite form and structure. This appendage, however, is very small in comparison with the individual Polyzoön to which it is attached, whilst the base of *Palæocoryne* covers a large number of the individual cells of the *Fenestella*. He thought it very un-

likely that any appendage, whether sterile or fertile, should be of such gigantic dimensions as to destroy so many of the individuals to one of which it was supposed to be an adjunct.

EXPLANATION OF PLATES XL.-XLIII.

[All the figures were drawn with the camera lucida: the natural size is indicated at the side of the figures.]

H. M. Hunterian Museum. Y. Mr. J. Young's Cabinet. T. Mr. J. Thomson's Cabinet.

PLATE XL.

1. *Actinostoma fenestratum*. Two branches of frond, poriferous face; partly worn. Hairmyres, E. Kilbride. H. M.
2. *A. fenestratum*. Non-poriferous face, showing ornament. Capelrig, E. Kilbride. Y.
3. *A. fenestratum*. Poriferous face. Capelrig. H. M.
4. *A. fenestratum*. Portion of irregular worn branch. Hairmyres. H. M.
5. *Glaucome stellipora*. Showing perfect and worn pores; *a.* branch with lateral end cells. H. M.
6. *G. stellipora*. Showing deformed branches. Gare, near Carluke. Y.
7. *G. stellipora*. Non-poriferous face. Hairmyres. H. M.
8. *G. stellipora*. Worn specimen; the two apertures laid into one cavity.
9. *G. stellipora*, var. *spinosa*. *a.* cell terminal of branch. Hairmyres. H. M.
- 10 & 11. *G. stellipora*, var. *spinosa*. Hairmyres. H. M.

PLATE XLI.

12. *Actinostoma fenestratum*. Sterile process, edge of frond; spiral fluting. Hairmyres. H. M.
- 13, 14, 15. *A. fenestratum*. Cell-apertures on base of sterile process; edge of frond. Hairmyres. H. M.
16. *A. fenestratum*. Fenestration irregular; sterile process derived from branches and dissepiments. Hairmyres. H. M.
17. *Fenestella plebeia*? Sterile processes with recurved spines; edge of frond. Auchinmead, near Dalry. T.
18. *F. membranacea*. Sterile processes, edge of frond. High Blantyre. Y.
19. Enlargement of part of 18.
20. *F. membranacea*. Sterile processes, non-poriferous face. Hairmyres. H. M.
21. *F. membranacea*. Sterile process, representing branches and dissepiments as in fig. 16. Hairmyres. H. M.
22. Non-capitulate process from non-poriferous face of *Fenestella*; *a.* poriferous face (compare fig. 30). High Blantyre. Y.
23. Sterile process with recurved spines, from edge of frond of *Fenestella* (?) cell-apertures occluded. Hairmyres. H. M.
24. Sterile process, tubercular, from edge of frond of *Fenestella* (?); cell-aperture encroach on base. Hairmyres. H. M.
25. Sterile process; *Fenestella*, sp. Hairmyres. H. M.

PLATE XLII.

26. *Palæocoryne*. Upper surface of capitulum. Gare. Y.
27. *Palæocoryne*. Upper surface of capitulum of smaller specimen. Gare. Y.
28. *Palæocoryne*. Under surface of capitulum. Roughwood, near Beith. T.
29. *Fenestella membranacea*. Confluent rootlets from base of frond. Broadstone, Beith. T.
30. *Palæocoryne*. Dactylose lobes continuous with frond of *Fenestella*: non-poriferous face. Gare. Y.

31. *Fenestella membranacea*. Sterile branches from upper edge of frond. Newfield, Blantyre. Y.
32. Enlargement of base of process *a* in fig. 31, showing equivalence of sterile process to poriferous branch.
33. *Palæocoryne*. Crushed capitulum; a radial arm bears recurved spines. T.
34. Process of *Fenestella membranacea* showing spines and fine beading. Gare. Y.
35. Process showing strong spines. Gare. Y.

PLATE XLIII.

36. *Fenestella nodulosa*. Sterile processes from edge of frond, the majority broken off close to base. Corrieburn, Campsie. Y.
37. *F. nodulosa*. Enlargement of marginal stem of frond, to show its cellular condition and cavity of processes seen in fig. 36; opposite *a* inner view of base of recurved spine.
38. *F. nodulosa*. Enlargement of base of process from opposite margin of same frond.
39. Bifurcating process showing strong recurved spine. Craigen Glen, Campsie. Y.
40. *Palæocoryne*. Specimen figured in Phil. Trans. 1869, pl. 66, fig. 8. Redrawn to show the cell-apertures at *b* and *c*; at *b* a tubercle is seen; *d* is a dactylose lobe; *e*, crack of stem, the surfaces above and below it are continuous. (*a* marks base of ray, which has been lost since 1869.) Roughwood, Beith. T.
41. *Palæocoryne* or sterile process from poriferous face of *Fenestella*; for comparison with fig. 40. Gare, near Carluke. Y.
42. *Palæocoryne* from Permian limestone. *Fenestella Schlotheimi* on same slab. H. M.
43. Whorl of rays without capitulum. High Blantyre. Y.
44. *a. Fenestella multiporata*: sterile processes from poriferous face. *b. Fenestella*, species, showing similar process. Millburn, near Campsie. Y.
45. Spinose process of undetermined species. High Blantyre. H. M.
46. Strong recurved spines on spirally fluted process. Gare. Y.











