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ADELAIDE
PHILOSOPHICAL SOCIETY.

ANNUAL REPORT AND TRANSACTIONS

FOR THE YEAR ENDING 30TH SEPTEMBER, 1865.

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1865.

ADELAIDE PHILOSOPHICAL SOCIETY.

PAPER BY THE REV. J. E. TENISON WOODS, READ BEFORE THE MEMBERS OF THE
PHILOSOPHICAL SOCIETY, MAY 2, 1865.

SUBJECT—"ON THE TERTIARY ROCKS OF SOUTH AUSTRALIA."

NO. II.—THE MOUNT GAMBIER FOSSILS.

I have said already that the strata at Mount Gambier contain but few shells. The deposit was thrown down from a deep sea, and however much that is known to teem with life, far more indeed than any one suspected until late years, yet of mollusca, properly speaking, the numbers are very few. It will be as well to point out here the significance of this fact. That the sea which formed these rocks was a deep one we may conclude from the peculiar shells which are there found (*Terebratella*, *Waldheimia*, and sea urchins), as well as from the nature of the beds; but the absence of any other shells tells us plainly that not only was the sea deep, but it was very far from any land whatever. For though very few of the mollusca live at a great distance from the shore, because few can exist at a greater depth than about 100 fathoms, yet these shells are carried by the waters often to considerable distances, and to depths far greater than they would reach living. Thus it is that in deep-sea dredging shells are found in considerable number of species, which are not ever seen at any great distance from the land. Mount Gambier, therefore, and Portland Bay contain rocks which represent the bottom of a former open ocean where very little of the Australian Continent could have existed.

The small number of the entombed mollusca is at the very outset a barrier to any comparison between the shells of our coast and those of the deposits. The first shells which attract attention, both for their number and diversity, are the *Pectenulae*. These are essentially deep-sea conchifera. Some are found at depths as small as 15 fathoms, but others range to 200 fathoms. They are especially numerous in the neighbourhood of coral reefs, but are found more or less in every locality and in every geographical situation. My impression is that the animals which lived in the shells found fossil at Mount Gambier have lived and died in the position where their remains lie entombed. Facilities for locomotion are not given to many of the mollusca; and though some *Pectens* can take surprising leaps, yet others are attached by a byssus, and in an allied genus—the *Hinnites*—by a calcareous incrustation on the lower valve. In a great many instances the valves of those found at the Mount are attached together, showing the tranquil state of the seabottom, and that the animal must have left his tenement in that position.

The *Pectenulae* would include, according to the present classification, many genera which are not represented at Mount Gambier or Portland. The *Pectens* proper have been also subdivided into the following genera:—*Pecten*, free, regular, auriculated equivalve shell, with a transverse hinge, without teeth, but in place a perfectly triangular pit for the ligament; surface of the shell with longitudinal ribs, and often transverse scales; ears unequal—the posterior one with a sinus for the byssus. This genus has been subdivided into—

Chlamys—A sub-equivalve *Pecten*, with striae in rays.

Dentipecten—Equivalve and obscurely marked; hinge teeth.

Pseudamussium—Vane-shaped, thin, smooth or delicately striated *Pectens*.

Vola—Superior valve, flattened or hollowed.

Janira—Superior valve, much smaller, inferior valve curving round at the umbo to meet the hinge (all fossils and secondary).

Neithea—Hinge with teeth, and the general form leading by a transition to *Trigonia*. These are also secondary fossils.

Pleuronectia.—Orbicular sub-equivalve, thin, gaping at each side; valves finely striated; ears nearly equal, the posterior presenting a sinus. This genus was proposed by Swainson as a subdivision in 1810, but it is not clearly distinct from the genus *Amussium* of Klein.

Hinnites—With the lower valve adherent.

The above divisions include all the forms which we know as *Pectens*. Some of them only occur as secondary fossils, and therefore are not likely to fall in our way here. The other subdivisions, with the exception of *Hinnites*, I shall not adopt, because, 1st, the divisions are artificial and are not formed up on clearly-defined generic characters; 2nd, intermediate forms by which the characters of one genus insensibly approach another are constantly being discovered either living or fossil. Having premised this I now proceed to describe the *Pectens* found at Mount Gambier.

Genus *Pecten*, *Bruguières*, 1789.—Shell free, regular, inequivalve, suborbicular resting on the right valve, usually ornamented with radiating ribs; beaks approximate, eared; anterior ears most prominent; posterior side a little oblique; right valve most convex with a notch below the front ear; hinge margins straight, united by a narrow ligament; cartilage internal in a central pit; adductor impressions double, obscure; pedal impression only in the left valve or obsolete. (Woodward's Man., Moll., p. 257.)

Pecten maximus, Linné.—Two or three fragments of what I believe to be this species have been found by me at Mount Gambier. They are rather worn, and therefore the identification might not appear satisfactory to every one; but as *P. maximus* is a very variable shell, and I have compared it with some half dozen specimens in my collection, I make no doubt whatever that it is the same. *Pecten maximus* is a Pliocene fossil, but it still exists in the European seas, the fish being used as food. The occurrence of the species in Australia is singular, but I am not aware that it is found in any but the fossil state. It affords a strong proof of the Pliocene age of the beds, and perhaps a solitary instance of a species which is fossil here, and has living representatives in Europe. It is not at all uncommon to find species living in the Oriental seas which have not lived in European waters since about the Middle Tertiary times, so that, as I shall subsequently show, European Miocene fossils being found in Australian formations are no proof that the age of the beds is Miocene also; but a Pliocene and recent European species occurring as a fossil alone in Australia is curious, and offers strong ground for concluding that the strata in which it occurs are of Pliocene age.

Pecten incertus. Plate 1, fig. 1.—Shell solid, thick, globose, inequivalve, very inequilateral; ears unequal and strongly ribbed; ribs on shell about 30, bifurcating at their ends, alternating towards the edge with smaller ones all covered with granular imbrications. This shell resembles *P. asper* in some respects, but it is much more inequilateral and the imbrications more regular and square, though sometimes rising into a sort of spine. Length 1.5, breadth 1.5 of an inch. I have described the species because I believe it to be new,

and because it strongly resembles a species found at Mount Gambier. The specimen, however, in my possession was not collected by me, and from its mineral appearance, and from the fact that I have never found the fossil in the Mount Gambier rocks, I very much doubt its occurrence there. It is, however, said to be common at the Murray beds and at Hamilton. The drawing represents a somewhat abnormal form.

Pecten Gambierensis. Plate 1, Fig. 2.—Shell somewhat thickened, corrugated, inequivalved very inequilateral; ears unequal—anterior one rudimentary; posterior one large, rounded, and strongly ribbed, with a sinuation for a byssus. Shell with from five to seven broad corrugations, which, together with the intercostal spaces, are covered with small imbricated and granular closely-set ribs; granulations rounded. Lines of growth strongly marked in some specimens, making transverse ridges, from which the ribs proceed at a lower level and at a different angle, giving the fossil the appearance of deformity. Length 1.5, breadth 1.4 of an inch.

Observations.—This fossil very much resembles the last, but is distinguished from it by the ribs being more closely set and never bifurcating or presenting incostal ridges towards their termination. The granulations, also, are always rounded, approximate, and depressed, never subspinous. *P. Gambierensis* may be said to be the characteristic shell of the formation. There are few places in it where some specimens are not found; but it is especially abundant in the lower strata at Beswick's Caves, Mount Gambier, and on the walls of the caves at Mosquito Plains. It has in the disposition of the larger ribs a faint resemblance to *Pecten plicata* of Linnaeus.

Pecten Foulcheri. Plate 1, fig. 3.—Shell thin, equivalve, inequilateral, with many fine radiating ribs and nine larger ones, on which are scattered coarse, unequal, laminated, or subspinous imbrications; length, 1.6 x 1.6 of an inch. Somewhat common at Mount Gambier, but nearly always found in a broken state.

Pecten Yahlensis. Plate 1, fig. 4.—Shell thin, equivalve, inequilateral; upper valve subconvex, lower valve much more so; upper valve covered with numerous regularly but faintly imbricated ribs; lower valve with about 30 well-marked but nearly smooth ribs; ears large and unequal, those of the lower valve sinuated with serrated fringe-like edges; upper ones ribbed and imbricated as on valve, with straight margin overlapped by lower; length 2.8, breadth 3 inches. The only perfect specimen of this beautiful species was got for me in sinking a well close to Yahl, Mount Gambier; but imperfect valves are not uncommon. The fringe-like serration of the ears give the shell a marked character, which distinguishes it from any other. It is certainly, without exception, the most beautiful fossil in the formation.

Pecten pleuronectes, Gmelin, *Pleuronectes Japonica* of some authors.—This fossil I have only found in two places, but I make no doubt that it is identical with the species now living in the North Australian seas. The shell is smooth, and on both the specimens in my possession there are most distinct traces of the rich reddish-brown colouring which is found on the upper valve of the living shell. *P. pleuronectes* is found as a fossil in the Upper Tertiary beds of the Department of Drome.

France, being one of a good many instances of fossils which lived in the Tertiary seas of Europe, but which are found living now only in Oriental seas.

General Observations.—The above forms a complete list of all the true *Pectens* which I have hitherto found in the Mount Gambier beds, and my search has now extended over a period of eight years. But though I have had facilities for the examination which could not fall to the lot of many, I am still of opinion that the beds have only been very slightly explored. Where the levels are so equal good sections are rare, and one has to depend entirely on caves or the sinking of wells for a knowledge of the fauna.

Wells, again, do not always reach the beds; for in a large portion of the district water is found in the Post Pliocene shell beds, which, together with the sands of the Newer Pliocene, cover very large areas. From the list of *Pectens* given, I think, however, that the Older Pliocene facies is strongly marked. *Pecten maximus*, if a correct determination, is certainly not an evidence of any other than Pliocene age. I look, however, on the occurrence of *P. pleuronectes* as of more significance because of its being fossil in Europe, and still existing in our tropical seas. For if it is granted that a migration eastwards of certain species of mollusca took place from Europe at the close of the Miocene period

(and this is an opinion which is held by most palaeontologists), then we should expect to find Miocene forms of Europe in Pliocene beds here. This, of course, supposes a migration of the species, not a restriction to a particular district of one formerly of world-wide distribution, because in that case *P. pleuronectes* might be Miocene or Pliocene. But it is a migration, I believe, which is held, while a more uniform type of molluscan life seems to have prevailed.

My next paper will include some of the *Brachiopoda*.