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Art. I.—*Further Preliminary Notice of Certain New Species of Lizards from Central Australia.*

By A. H. S. Lucas, M.A., B.Sc., and C. Frost, F.L.S.

[Read 9th May, 1895.]

The following contains a description of three New Species of Lizards collected in Central Australia by Professor Baldwin Spencer. The full descriptions accompanied by figures, together with a complete report, will be published in the volume dealing with the work of the Horn Expedition.

Ceramodactylus damæus, sp. nov.

Description.—Head large, high; snout obtusely pointed, a little longer than the distance between the orbit and the ear-opening. Ear-opening narrow, elliptical, oblique. Body slightly depressed. Limbs moderate, the fore-limb stretched forward reaches to between the eye and the nostril. Digits long, slender, inferiorly with small, imbricate, pointed scales. Head and upper surfaces of body, and limbs, covered with small granular scales. Rostral quadrangular, twice as broad as high, with median cleft above. Nostril pierced between the rostral, first labial, and four nasals, the supero-anterior nasals large, forming a suture with one another behind the rostral. Eleven or twelve upper and as many lower labials. Mental rather large, trapezoid; no chin shields. Gular scales very small, granular. Abdominal scales flat, subimbricate. Male with two or three blunt spines on each side of the base of the tail, and two widely separated præanal pores. Tail missing. *Colour.*—Pale whitish-grey above, darkest on the sides; a brownish, more or less broken band from the snout along each side of the back to tail; a broad, median whitish band from neck to base of tail; head spotted or reticulated with dark brown; sides with two longitudinal series of roundish white spots; limbs and under surfaces uniform whitish.

DIMENSIONS.

Head	11 mm.
Width of head	9 ,,
Body	37 ,,
Fore-limb	15 ,,
Hind-limb	20 ,,
Tail	missing.

Locality.—Charlotte Waters.

DIPLODACTYLUS BYRNEI, sp. nov.

Description.—Head short, convex; snout rounded, a little longer than the distance between the eye and the ear-opening; latter very small, rounded. Body short; limbs moderate, the fore-limb stretched forward reaches the anterior border of the orbit, the hind-limb to a little behind the axilla. Digits rather long, moderately depressed, inferiorly with transverse rows of discoid scales, usually two in a row; apical dilations small, the inferior plates sub-oval. Upper surfaces covered with minute granular scales, intermixed on the back with numerous regularly disposed rounded, or bluntly conical, tubercles. Rostral very low and broad, about four times as broad as high, without median cleft; nostril pierced in a swelling between the rostral, the first labial, and three nasals; internasal space concave. Eleven upper labials, the first very large and incompletely divided from the rostral; twelve lower labials, anterior very long, projecting behind the mental. Mental trapezoid, about as broad as long. Scales on the throat minute, granular; abdominal scales flat, roundish, juxtaposed, a little smaller than the dorsal tubercles. Tail cylindrical, tapering, with rings of scales convex above and flat, subquadrangular beneath. Male with three or four blunt spines on each side of the base of the tail. *Colour.*—Brownish-yellow above, with four broad, curved, dark brown bands on the body and five large spots on the tail: a dark brown spot behind the base of the hind-limb; most of the tubercles on the back dark brown; head from snout to behind the eyes uniform dull brown; under surfaces whitish.

DIMENSIONS.

Total length	77 mm.
Head	12 ,,
Width of head	9 ,,
Body	32 ,,
Fore-limb	15 ,,
Hind-limb	20 ,,
Tail	33 ,,

Locality.—Charlotte Waters.

DIPOROPHORA WINNECKEI, sp. nov.

Description.—Habit slender; head rather narrow, with distinct canthus rostralis; covered above with sub-equal keeled scales; nostril equally distant from eye and the tip of the snout; tympanum moderate. A slight transverse gular fold. Dorsal scales large, uniform, feebly keeled, the keels directed obliquely towards the middle of the back; gular scales smooth; ventral scales feebly keeled, a little larger than those on the middle of the back; lateral scales smallest, latero-ventral largest. Limbs and digits rather long, the adpressed hind-limb reaches the tympanum in the male, and the shoulder in the female. No pores in our specimens.

Colour.—Reddish above, with darker and lighter spots; a broad bluish vertebral band, divided on the tail by a narrow line of ground colour; a narrow white band on each side from behind the eye to the base of the tail, and sometimes a broader one from axilla to groin. Under surfaces whitish with two broad dark-edged, bright yellow bands, united on the chest, and again in front of the hind-limbs, a band of the same colour along the front of the hind-limb from its base to the knee. Tail with a series of broad dark spots or annuli.

DIMENSIONS.—*Male.*

Total length	215 mm.
Head	14 ,,
Width of head	9 ,,
Body	42 ,,
Fore-limb	24 ,,
Hind-limb	38 ,,
Tail	159 ,,

Female.

Total length	...	...	206 mm.
Head ...	...	...	16 ,,
Width of head	...	...	9·5 ,,
Body ...	...	...	45 ,,
Fore-limb	...	...	24 ,,
Hind-limb	...	...	39 ,,
Tail ...	...	...	145 ,,

Locality.—Charlotte Waters.

ART. II.—*Preliminary Description of Certain New Marsupials from Central Australia, together with Remarks upon the Occurrence and Identity of Phascologale cristicauda.*

By PROFESSOR BALDWIN SPENCER, M.A., C.M.Z.S.,

University of Melbourne.

[Read 13th June, 1895.]

The following includes a preliminary description of a new genus of the family Dasyuridæ and of a new species of the genus Sminthopsis from Central Australia, together with remarks upon the identity of *Phascologale cristicauda*, originally described by Krefft under the name of *Chætocercus cristicauda*.

My warmest thanks are due to my friend, Mr. P. M. Byrne, who, under difficulties of collecting and transit which cannot be fully appreciated unless one has personally endeavoured to collect in Central Australia during the hot season, secured the specimens which are now described. Thanks largely to the kindness of Mr. Byrne, I was able, during a visit paid to Central Australia in the recent summer, to secure several important forms of animal life which can only be met with after rain has fallen, and which are very characteristic of the Central fauna. The full description of these, together with those of the marsupials now dealt with, will be published in the volume dealing with the Horn Expedition.

Dasyuroides, gen. nov.

Size small compared to Dasyurus ; general build comparatively stout. Tail long.

Feet long and strong, not delicate as in Sminthopsis. Toes with strong, sharp, curved claws. Palms and soles very hairy, with the median part granulated. Soles with three well-marked pads placed on granulated elevations at the base of the toes.

Hallux entirely absent.

Pouch practically obsolete. Mammæ six.

Dentition $i.\ \frac{1.2.3.4}{1.2.3}.\ c.\ \frac{1}{1}.\ p.m.\ \frac{1.0.3.4}{1.0.3.0}.\ m.\ \frac{1.2.3.4}{1.2.3.4}$.

General dentition somewhat similar to that of those species of Phascologale in which the lower p^4 is wanting. Canines long and strong. Upper p^4 much smaller than p^1 and especially p^3. Lower p^4 entirely wanting.

Skull flattened in the frontal region as in Phascologale. The nasal bones very slightly expanded posteriorly. Bullæ very much swollen, the mastoid portion also inflated.

Habits.—Terrestrial; burrowing; insectivorous.

Range.—That of the only species.

Dasyuroides byrnei, sp. nov.

Size similar to that of the larger species of Phascologale. Form stout and strong. Fur close and soft, mainly composed of the under-fur. General colour a grizzled grey, with a faint rufous tinge, especially on the head and back.

Chin, ventral surface, inner sides of limbs and upper surface of hands and feet white.

Tail rufous coloured on rather less than its proximal half. The distal half thickly covered with long black hairs, which form a very well-marked dorsal and ventral crest.

Ears when laid forward reaching nearly to the anterior canthus of the eye.

Palms with five well-marked and faintly striated pads placed on granular elevations.

There is a small tuft of long white whisker-like hairs on the posterior surface of the fore-arm just above the wrist.

Soles with three well-marked pads placed on granular elevations at the base of the toes; the pads with fairly well-marked striations. The median part of the sole is naked and granulated. Each side has a strongly marked close set series of hairs bending over towards the middle line.

Tail fairly thick, but not incrassated.

Mammæ six. Pouch very slightly developed with two low lateral folds.

Skull flattened as in Phascologale but with the nasals very slightly broadened behind as in Sminthopsis.

Dentition $i.\frac{1.2.3.4}{1.2.3}$. $c.\frac{1}{1}$. $p.m.\frac{1.0.3.4}{1.0.3.0}$. $m.\frac{1.2.3.4}{1.2.3.4}$.

The dentition is somewhat similar to that of such a Phascologale as *Ph. apicalis*. Canines long and strong. That in the upper jaw measuring 3-4 mm. In the immature form the upper p^4 is wanting, in somewhat older specimen it is about the size of p^1, both of them being smaller than p^3. Lower p^4 quite wanting. Presumably there is no milk upper p^4.

Dimensions of Adult Male (in al.).

Head and body	...	...	182 mm.
Tail ..	...	...	130 ,,
Ear ...	...	...	18 ,,
Hind foot	...	...	38 ,,

Habitat.—Central Australia. Charlotte Waters. Terrestrial; burrowing; insectivorous. Nocturnal. I have much pleasure in associating with this species the name of Mr. P. M. Byrne.

I have felt considerable hesitation in assigning this species to a new genus, but after a careful examination of the seven specimens (six males and one female) now in my possession, I have come to the conclusion that, as the genera of the family Dasyuridæ stand at present, no other course is possible. It is undoubtedly closely allied to the genera Phascologale and Sminthopsis, and shows at the same time an approach towards Dasyurus. The relationship to the two former are shown in the following points:—

(1) The general form of the body closely resembles that of the larger Phascologales or of a very small Dasyurus, and is very different from that of even the largest Sminthopsis.

(2) The shape of the hind foot is neither that of a Phascologale nor of a Sminthopsis. Judging by the length only (the one dimension given in descriptions) it might naturally be supposed that the foot was similar in proportions to such a form as *Ph. wallacei*. This, however, is far from being the case, as the foot of *Dasyuroides byrnei* is very much narrower than that of *Ph. wallacei*, and the two, when drawings of both of them are compared, are seen to belong to entirely different types of feet. The pads also on the soles are quite unlike those of typical

Phascologales, though this by itself is not perhaps a matter of the greatest importance. On the other hand, the foot is much more stoutly built than in the genus Sminthopsis.

In the absence of hallux it is markedly distinct from the foot of either genus.

(3). The pouch is very slightly developed as in Phascologale, and the mammæ, six in number, and not eight or ten as in Sminthopsis.

(4). The skull is flattened in the frontal region as in Phascologale, but on the other hand it differs from the latter and agrees with Sminthopsis in the character of the nasal bones, which are only very slightly expanded behind. The bullæ differ from those of Sminthopsis in having the posterior mastoid portion strongly inflated.

(5). The dentition on the contrary is similar to that of certain species of Phascologale. The lower p^4 is lost, and the upper p^4 is much smaller than p^3. The canines also are remarkably strong. In dentition it shows an approach as do also certain Phascologales to Dasyurus.

It will be seen that as at present defined this species cannot be placed in either of the genera Sminthopsis or Phascologale. In certain respects it presents characters at present regarded as distinctive of one or the other while it differs markedly from both in the entire absence of hallux.

To have associated it with these forms would have necessitated the merging of the two genera into one another, and the additional widening of the characters so as to include a non-hallucated form. The only other alternative was the creation of new genus, and I therefore adopted this plan, though at the same time it may be pointed out that with an increase in our knowledge of old and new species of these genera, a revision of them will certainly become necessary.

Dasyuroides may be therefore regarded as a genus closely allied both to Phascologale and Sminthopsis, and as showing also an approach to Dasyurus.

Sminthopsis larapinta, sp. nov.

Size small, form light and delicate. Fur very soft and fine, moderately long, composed almost entirely of under-fur with few

longer dark hairs. General colour a mouse grey suffused on the dorsal surface with rufous. The sides, under surface of the body and head, and upper surface of the hands and feet, white. Ears large, when laid forward they reach considerably beyond the eye.

Palms naked, granulated.

Tail much longer than the head and body. Very stout in its proximal part, and strongly incrassated. Very much stouter, longer and more incrassated than in *S. crassicaudata*. Tapering to a long thin end. Strongly scaled at the proximal end with short hairs not hiding the scales. Distally the hairs are more numerous and somewhat longer toward the tip.

Dentition $i.\ \frac{1.2.3.4}{1.2.3}.\ c.\ \frac{1}{1}.\ p.m.\ \frac{1.0.3.4}{1.0.3.4}.\ c.\ \frac{1.2.3.4}{1.2.3.4}$.

Teeth as usual in the genus. Canines small and the premolars increasing in size backwards.

Dimensions of Adult Male (in al.).

Head and body	88 mm.
Tail	105 ,,
Length of hind foot ...	18.2 ,,
Ear	14 ,,
Width of hind foot ...	4 ,,

Habitat.—Central Australia, Charlotte Waters. Terrestrial.

The characteristic features of this form are (1) the remarkably long, very stout, and strongly-incrassated tail, and (2) the relative length of the foot as compared with *S. crassicaudata* or *murina*.

There is no difficulty in distinguishing it from the former, the specific name of which might with greater appropriateness have been applied to this species. I have some twenty adult specimens of *crassicaudata* from the same district, all agreeing closely with one another in relative dimensions, and markedly distinct from the species in question.

The specific name is adapted from the native name of the Finke River—the Larapinta—in which district it is found.

For the specimen upon which the species is founded I am indebted to Mr. P. M. Byrne.

Remarks upon the Occurrence and Identity of Phascologale cristicauda, Krefft.

The exact determination of this species is a matter of very considerable difficulty. It was originally described by Mr. Krefft from a single specimen under the name of *Chætocercus cristicauda*, and was subsequently placed by Mr. Thomas in the genus Phascologale.

Through the kindness of Mr. Byrne I received some six adult and four immature specimens—all of them females—of what was apparently a species of Phascologale, though at the same time it showed in the structure of the feet more the character of a Sminthopsis, rendering it a matter of some difficulty to which genus, as at present described, it should be referred. On a subsequent visit to Charlotte Waters I obtained, also through the kindness of Mr. Byrne, additional specimens, two of them being males, and was able to see the animal alive. My collection now includes fifteen specimens. The mature ones all agree fairly closely in size with the measurements given by Mr. Krefft from his single specimen of *Ch. cristicauda*. The dentition shows the peculiarity of the latter, viz., absence of the lower p^4 and tubercular nature of the upper p^4.*

The black crest, typical of Krefft's species, was present, but differed from that described by him in being developed on the ventral as well as on the dorsal surface.

The peculiarity of the dentition, the crested tail and the general measurements of the body led me to refer the animal to Krefft's species. Unfortunately Krefft did not describe the feet, and the soles are distinguished by the presence of three granulated elevations bearing pads, and not by the presence of the five striated pads characteristic of the genus Phascologale. In relative dimensions the foot may be regarded as intermediate between the latter genus and Sminthopsis.

Mr. J. J. Fletcher very kindly, in response to my request, inspected and sent me a description of the type specimen, and subsequently, through the courtesy of Mr. R. Etheridge, Jun., the Curator of the Sydney Museum, to whose kindness I am much

* Krefft, P.Z.S., 1866, and "Mammals of Australia."

indebted, I had the opportunity of examining the specimen itself. The latter when received by Krefft was in a very bad condition, but there is enough of the orignal animal and fur remaining to show that both the description and figure* given by Krefft are exceedingly unsatisfactory. The animal is nothing like so rufous as in the drawing, being of a darker mouse colour with a lighter undersurface. The tail is much more swollen proximally than in the figure, shows traces of a rufous coloured proximal part, was evidently incrassated, and had both a dorsal and a ventral crest of hairs. Under the circumstances, viz., an originally badly preserved type specimen, a drawing which could not in certain respects (as to tail and colouration) have correctly represented the animal, and a description which is not only far from complete but is incorrect, there is considerable difficulty in assigning with certainty any newly found specimens to the species in question.

We have however the dimensions given by Mr. Krefft, the corrections in the description of the animal which can be made after inspection of the type and the peculiarity in the dentition noted by Mr. Krefft. A re-description, taking all these points into consideration, would apply so closely to the specimens recently obtained from Central Australia, that I have thought it better to amend the description given by Mr. Krefft, and to refer my specimens to the same species rather than to create a new one for their reception.

The amended description may be given shortly as follows. I shall deal fully with my specimens in the volume dealing with the Horn Expedition.

Phascologale cristicauda, Krefft.

Size large. Form strong. Fur close and soft, and mainly composed of the under-fur.

General body colour, mouse grey, tinged with rufous dorsally. Under surface of head and body cream-white, as are also the upper and inner surfaces of the limbs.

Tail thickly covered on its upper and lateral surfaces with coarse chestnut-coloured hairs; ventrally the hairs are dark

* Krefft, P.Z.S., 1866.

brown. About the middle of its length it is covered with coarse black hairs, which increase in length distally on the upper and under surface until, especially on the upper surface, they form a distinct black crest, a smaller crest being present ventrally.*

The tail is considerably swollen out proximally, and somewhat incrassated.†

Palms with six granulated elevations.

Soles with three granulated elevations, each with a small, unstriated pad, at the base of the toes.

Pouch opening vertically downwards, with moderately developed lateral folds. Mammæ six.

Dentition $i.\ \frac{1.2.3.4}{1.2.3}.\ c.\ \frac{1}{1}.\ p.m.\ \frac{1.0.3.4}{1.0.3.0}.\ m.\ \frac{1.2.3.4}{1.2.3.4}.$

Canines long and strong; upper p^4 either absent or tubercular, lower p^4 always absent.

Dimensions.

	Type Specimen.	Adult ♂ in al.	Adult ♀ in al.
Head and Body - -	121	148	130
Tail - - -	83	89	85
Ear - - -	—	15·5	15.5
Hind Foot - - -	28	26	28

In the skull the frontal region is flattened, and the nasal bones are markedly broadened posteriorly. Bullæ much swollen: the posterior mastoid portion inflated.

Habitat.—South and Central Australia. The exact locality of Mr. Krefft's specimen is doubtful. He gives it as "probably Lake Alexandrina," that is, near the mouth of the Murray River. All of mine came from Central Australia. The animal

* This description, though considerably different from that given by Mr. Krefft, will still apply to the type specimen, as he appears to have quite overlooked the small crest on the under surface.

† This also applies to the type specimen.

is terrestrial in habit, burrowing in sandy and stony ground, and is nocturnal and insectivorous.

It will be noticed that the feet are, in regard to the pads, those of a Sminthopsis rather than a Phascologale. In reality, their dimensions are intermediate between those of the two genera; and as Phascologale is by no means so exclusively arboreal in habit as is usually supposed, I am inclined to lay less stress upon the presence of five striated pads on the sole of the foot than is usually done. I may here state that, as Mr. Thomas has pointed out, our knowledge of the forms comprised in the genera Phascologale and Sminthopsis is far from complete.

Mr. Zietz, of the Adelaide Museum, and myself have now a fair collection of the Australian representatives of those genera, and our work upon them has shown us that a revision of the genera, upon which we are now engaged, has become a matter of necessity.

ART. III.—*Catalogue of Non-Calcareous Sponges collected by J. Bracebridge Wilson, Esq., M.A., in the neighbourhood of Port Phillip Heads.*

PART II.

By ARTHUR DENDY, D.Sc.,

Professor of Biology in the Canterbury College, University of New Zealand; Corresponding Member of the Royal Society of Victoria.

INTRODUCTORY REMARKS.

The present contribution deals with the important Monaxonid family of the Desmacidonidæ. These are very abundant in Victorian waters. No less than fifty-eight species are here catalogued, of which twenty-eight appear to be new. It has been necessary to institute three new genera, for which the names *Microtylotella*, *Amphiastrella* and *Fusifer* are proposed.

Family DESMACIDONIDÆ.

Skeleton usually reticulate. Megascleres monactinal or diactinal. Microscleres always present, of various forms, but, with rare exceptions, including chelæ.

Sub-family ESPERELLINÆ.

Skeleton fibre not echinated by laterally projecting spicules.

Genus *Esperella*, Vosmaer.

Megascleres always monactinal, smooth styli or tylostyli. Microscleres palmate anisochelæ, usually with other forms associated.

Esperella enigmatica, Carter, sp.

Esperia parasitica, Carter, A.M.N.H., February, 1885, p. 108.

Pseudoesperia enigmatica, Carter, A.M.N.H., December, 1886, p. 455.

This species is well characterised by its massive form, thick, loose dermal membrane, very coarse, sandy fibre, and the rosettes of peculiar quadridentate anisochelæ. As Mr. Carter himself abandoned the name *parasitica* as founded on a misconception, I have no hesitation in following his example. It appears scarcely necessary to retain the genus *Pseudoesperia*.

R.N. 335 (7 f; "dull orange-yellow"); 439 (s. 9, 13 f; "ochre-yellow"); 611 (s. 6, 8 f; "ochre-yellow"); 713 (s. 8); 853 (s. 9); 860 (s. 9).

B.M. d. 111 ("*Pseudoesperia enigmatica* olim *Esperia parasitica*." Reg. 86-12-15-467).

Esperella phillipensis, n. sp.

The single specimen forms a rather thin, spreading crust, with irregular surface and few small vents.

Skeleton. The main skelton is very lax and irregular, consisting of loose fibres and whisps of spicules running towards the surface and branching repeatedly as they approach the dermal membrane. Very numerous megascleres are also scattered in the ground substance between the fibres. The dermal skeleton is a rather close reticulation of loose spicular fibre.

Megascleres, long, straight, slender tylostyli, with well-marked ovoid heads and rather abrupt, sharp points, measuring about 0·3 by 0·005 mm.

Microscleres, (*a*) moderately stout, palmate anisochelæ, of ordinary form, occurring abundantly in rosettes and singly, and measuring about 0·037 mm. long when fully developed; (*b*) slender sigmata, simple and contort, with short, abruptly recurved, sharp points, measuring about 0·045 mm. from bend to bend by 0·0015 mm. in thickness in the middle.

R.N. 827 (s. 10).

Esperella spongiosa, n. sp.

External form variable, from massive to flabellate or digitate. Soft and spongy, with thick, easily separable, reticulate dermal membrane. Vents commonly large and on prominent parts. Pale yellow in spirit. The colours in life recorded are dirty white, brown, vinaceous (purple), ochraceous buff, etc.; nothing very distinctive. Localities recorded: s. 1, s. 5, s. 9, x.

Skeleton. The main skeleton is a very irregular network of stout fibre, usually containing many spicules bound together by much spongin, often also containing much sand or broken spicules. Numerous megascleres are scattered in the ground substance. The dermal skeleton is a rather close reticulation of spicular fibre, echinated by abundant projecting spicules.

Megascleres, slender styli or tylostyli with feebly developed heads; gradually sharp-pointed at the apex; measuring about 0·158 by 0·0027 mm.

Microscleres, (*a*) slender palmate anisochelæ, scattered singly, about 0·025 mm. long and with narrow palm, of ordinary form: (*b*) some specimens contain a few slender, contort sigmata, about 0·066 mm. long from bend to bend. In many specimens there are scattered through the ground-substance, millions of minute, ovoid, highly refractive, very definite bodies, measuring about 0·0083 mm. in length. These occur in such numbers as to impart a peculiar opaque appearance to the whole sponge and also to sections. I do not at present understand their true nature.

This is a very unsatisfactory species, owing to the absence of constant and well-defined characters.

R.N. 280; 292; 350; 363; 372; 396; 408; 472; 525; 578; 579; 581; 588; 603; 648; 749; 805; 941; 968; 990; 1152; 1190; 1194.

Esperella arenicola, Ridley and Dendy.

Esperella arenicola, Ridley and Dendy, Challenger Monaxonida, p. 72, pl. xv., figs. 4, 4a; pl. xvi., fig. 8.

This species, already obtained by the Challenger from Bass Straits, is represented in the collection by two specimens from the Queenscliff jetty, which agree very closely with the original type.

R.N. 689; 693.

Esperella toxifer, n.sp.

Sponge massive, sessile, spreading, irregular. Surface uneven but subglabrous. Vents small, scattered on upper surface. Texture extremely soft and spongy, coarsely fibrous. Colour in spirit pale yellow: in life "wax ochre."

Skeleton, the main skeleton is very lax and irregular, consisting of branching, whisp-like, multispicular fibres, trending in a sinuous manner towards the surface, and branching freely, especially as they approach the surface; sometimes forming oblique anastomoses. A large quantity of very pale-coloured spongin invests these fibres. Very numerous megascleres are also scattered irregularly through the ground substance. There is no special dermal skeleton.

Megascleres, straight, slender tylostyli, gradually sharp-pointed and with fairly well developed ovoid heads; measuring about 0·2 by 0·004 mm.

Microscleres, (*a*) extremely minute and slender anisochelæ, only about 0·01 mm. long; (*b*) smooth, slender toxa, gradually sharp-pointed at the ends, measuring about 0·095 by 0·0017 mm.; (*c*) slender sigmata, simple and contort, measuring about 0·012 mm. from bend to bend, very rare.

R.N. 779 (Sorrento Jetty).

Esperella crassa, n. sp.

Sponge massive, irregular, lobose or ridged, with vents on prominent parts. Surface covered with delicate, minutely reticulate dermal membrane, with coarser reticulation of underlying parts showing through. Texture compact, incompressible, friable, intensely and coarsely sandy throughout. Dark brown in spirit.

Skeleton. The main skeleton is made up almost entirely of sand, not arranged in definite tracts or fibres, with the very much reduced proper spicules scattered in the soft tissues between. The dermal membrane is free from coarse sand but contains many foreign spicules arranged in a very loose and irregular network.

Megascleres, very slender styli or perhaps strongyla, commonly slightly curved, measuring about 0·16 by 0·002 mm. Most abundant just beneath the dermal membrane, pointing towards the surface.

Microscleres, minute, slender, palmate anisochelæ, of ordinary form, about 0·016 mm. long.

R.N. 521 (x, 20 f; "wood brown, the vents and inner surface sulphur yellow"); 939 (x A).

Esperella rara, n. sp.

The single specimen is massively lobose, very irregular. Surface irregularly conulose and rugose, with reticulate dermal membrane. Vents small, marginal and scattered. Texture very coarse, with much sand internally, compressible, resilient. Colour in spirit pale yellow.

Skeleton, composed largely of sand, arranged in coarse, loose, irregular fibres, with no evident cementing substance. The megascleres are very abundantly scattered in the soft tissues between, not arranged in definite fibres but in loose radiating whisps towards the surface. No special dermal skeleton.

Megascleres, straight slender tylostyli, sharply pointed and with small oval heads; measuring about 0·23 by 0·004 mm.

Microscleres, (*a*) slender, palmate anisochelæ, about 0·02 mm. long, often smaller; perhaps sometimes isochelæ; (*b*) short, slender trichodragmata, about 0·016 mm. long.

R.N. 1108 (x C).

Genus *Esperiopsis*, Carter.

Megascleres always monactinal, smooth styli or tylostyli. Microscleres isochelæ, to which other forms may be added.

Esperiopsis turbo, Carter, sp.

Holopsamma turbo, Carter, A.M.N.H., March, 1885, p. 213.

Sigmatella turbo, Lendenfeld, Monograph of Horny Sponges, p. 647.

This sponge is well characterised by its stipitate, pear-like shape, reticulate dermal membrane, skeleton of sandy fibres and greatly reduced spiculation. The megascleres are represented by slender styli, and the microscleres by very minute isochelæ, difficult to detect, both of which I have found in a fragment of Mr. Carter's specimen from the British Museum.

R.N. 265 (18 f; "dark purplish-brown"); 574 (x, 19 f; "brick red"); 647 (x, 20 f; "fawn colour over ferruginous"); 1050 (x B).

B.M. d. 50 ("*Holopsamma turbo*," Reg. 86-12-15-415).

Sub-genus *Pseudohalichondria*, Carter.

Differs from *Esperiopsis* only in the remarkable spined isochelæ.

Pseudohalichondria clavilobata, Carter.

Pseudohalichondria clavilobata, Carter, A.M.N.H., December, 1886, p. 454 ; pl. x., figs. 6-9.

This remarkable sponge, so well characterised by its spined isochelæ, appears to be not uncommon in Port Phillip.

R.N. 446 (s. 9, 17 f ; "ochre-yellow"); 709 (s. 8); 857 (s. 9); 966 (s. 6); 986 (s. 9).

B.M. sp. 38 (*"Pseudohalichondria clavilobata*, C. *Type ;"* Reg. 86-12-15-81); d. 14 (wrongly labelled "*Spongelia stellidermata ;*" Reg. 86-12-15-287).

Genus *Desmacidon*, Bowerbank.

Megascleres always diactinal, smooth oxea or strongyla. Microscleres isochelæ, to which others may be added.

Desmacidon australis, n. sp.

Massive, irregular ; with numerous vents scattered on prominent parts. Texture very sandy, sometimes with a dermal layer almost free from sand or with a beautiful minute sandy reticulation on the surface. Internally the sand is arranged in stout radiating columns whose ends may form pock-like markings on the surface. Grey in spirit.

Skeleton. The spicular skeleton is very much reduced, consisting mainly of slender strongyla scattered through the ground substance between the sandy columns and occasionally arranged in loose whisps, especially towards the surface. There may be a well-developed dermal reticulation of broken foreign spicules.

Megascleres, slender strongyla, measuring about 0·16 by 0·0028 mm.

Microscleres, (*a*) very slender tridentate isochelæ, about 0·012 mm. long, with small teeth ; (*b*) very slender simple and contort sigmata, measuring about 0·02 mm. from bend to bend.

R.N. 303 (18 f ; "dirty buff yellow"); 351 (19 f ; "yellowish-brown, pale"); 532 (x, 19 f ; "ochraceous"); 762 (s. 1); 929 (x A); 951 (s. 8); 999 (s. 1).

Desmacidon stelliderma, Carter sp.

Halichondria stelliderma, Carter, A.M.N.H., December, 1886, p. 451.

This species is characterised by its thick, lobose and compressed, or massively lobulate external form ; with small vents scattered on prominent parts ; soft and spongy texture and pale yellow colour in spirit. The main skeleton is a wide, sub-rectangularly meshed network of stout spicular fibre, containing very many slender spicules. At the surface radiating whisps of the same spicules surround the ends of the primary fibres in a stellate fashion. The megascleres are very slender, straight, smooth strongyla, commonly slightly inflated at the ends, and measuring about 0·18 by 0·0028 mm. The microscleres are thickly scattered through the ground substance and have the form of small tridentate isochelæ with strongly curved shafts and very minute flukes, the whole resembling a sigma and measuring about 0·01 mm. long.

R.N. 684 (s. 9) ; 710 (s. 8) ; 947 (s. 9) ; 955 (s. 6) ; 967 (s. 6).

B.M. sp. 29 ("*Halichondria stelliderma*, C. *Type*." Reg. 86-12-15-148).

Desmacidon intermedia, n.sp.

Subcylindrical or slightly compressed, irregularly branched. Main stem up to one inch in diameter, tapering gradually to apex, nearly a foot long ; branches much shorter and slenderer. Surface smooth and even, minutely reticulate, with thick dermal membrane, harsh to the touch. Vents very small, slightly prominent, uniserial or scattered on both margins. Firm, resilient, very tough. Very pale yellow in spirit, stained purplish on the surface.

Skeleton, a very irregular, coarse network of stout multispicular fibre, breaking up at the surface into close-set radiating tufts of oxea, whose shortly projecting points form the dermal reticulation. Many oxea are loosely scattered between the fibres, which themselves have no obvious cement.

Megascleres, rather stout, straight, sub-fusiform oxea, rather abruptly pointed at each end ; measuring about 0·25 by 0·01 mm.

Microscleres, small tridentate isochelæ, with fairly stout strongly curved shaft and small but distinct triangular flukes. Length of the whole about 0·016 mm. These spicules are thickly scattered through the soft tissues.

This very interesting species is evidently closely related to the succeeding (*D. carnosa*).

R.N. 1163 (x).

Desmacidon carnosa, Carter, sp.

Fibulia carnosa, Carter, A.M.N.H., January, 1886, p. 51.

This species closely resembles the preceding (*D. intermedia*), with its characteristic branched external form and strong spicular fibre composed of densely packed oxea, breaking up at the surface into a densely radiate dermal skeleton. The microscleres, however, are only minute C-shaped sigmata.

I have no doubt, from comparison with *D. intermedia*, that this is a *Desmacidon* with reduced or imperfectly developed chelæ. Even the sigmata appear sometimes to be absent (e.g. R.N. 354).

R.N. 354 (19 f; "bright orange-scarlet"); 402 (x, 19 f; "dull red"); 725 (s. 5; "orange-red"); 726 (s. 5; "orange-scarlet"); 852 (s. 9).

B.M. d. 112 ("*Fibulia carnosa*": Reg. 86-12-15-372).

Desmacidon (?) *arenifibrosa*, n. sp.

Erect, short-stalked, palmo-digitate, very irregular; branches short, blunt, compressed or subcylindrical. Surface subglabrous, very minutely reticulate; in parts with much projecting fibre, in parts minutely conulose. Vents small, scattered. Compressible, resilient, tough. Greyish-yellow in spirit.

Skeleton. The main skeleton is a very definite and fairly uniformly distributed but not very regular reticulation of stoutish pale coloured horny fibre, almost filled throughout with sand and broken spicules. The primary fibres, radiating to the surface, are about 0·1 mm. thick and the connecting fibres are rather slenderer. The meshes of the network are wide but extremely variable. There is a very well-developed, close-meshed dermal reticulation, composed of sand and broken spicules and with small rounded meshes.

Megascleres. Many foreign megascleres are present but I have not found any which can be safely regarded as belonging to the sponge.

Microscleres. Immense numbers of very minute isochelæ are scattered through the soft tissues. These are very slender and have sharply recurved, very slender median palms running almost parallel with the main shaft for about a third of its length, the lateral palms being inconspicuous. Length about 0·016 mm.

R.N. 979 (s. 5).

Desmacidon (?) *chaliniformis*, Carter, sp.

Dysidea chaliniformis, Carter, A.M.N.H., March, 1885, p. 217.

In the fragment of Mr. Carter's specimen sent to me from the British Museum I find numerous minute isochelæ of peculiar shape, sparsely and irregularly scattered through the dried-up soft tissues between the sandy fibres. These spicules measure about 0·012 mm. in length. They have a very slender, very slightly curved shaft, with apparently three very short, blunt teeth widely divergent from each end, but all apparently on the same side. It is very difficult to make out the exact form of the spicule, which makes a near approach to the minute amphiastra or birotulates of *Iotrochota*. The presence of these spicules seems to necessitate the placing of this species in the *Esperellinæ*. I have found no proper megascleres.

Whether all the specimens included by von Lendenfeld under the name *Phoriospongia chaliniformis** belong to the same species appears very doubtful.

B.M. d. 8 ("*Dysidea chaliniformis*." Reg. 86-12-15-341).

Genus *Iotrochota*, Ridley.

Megascleres styli, sometimes with diactinal forms also. Microscleres amphiasters (birotulates†). Colour usually dark purple.

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* Monograph of Horny Sponges, p. 600.

† Usually extremely minute.

Iotrochota coccinea, Carter sp.

Halichondria birotulata, Carter, A.M.N.H., January, 1886, p. 52.

Axinella coccinea, Carter, A.M.N.H., November, 1886, p. 378.

Erect, lamellar to digitate, or thickly lobose. Surface smooth, glabrous but uneven, sometimes minutely conulose. Vents rather small, scattered. Soft and spongy, resilient, rather tender. Very dark purple throughout, colouring the spirit.

Skeleton. The main skeleton is a coarse, subrectangular but irregular wide-meshed network of fibres containing many spicules and a great deal of spongin. The diameter of the meshes varies greatly. The primary fibres are about 0·09 mm. thick, the secondaries somewhat thinner, both multispicular. There is usually no skeleton at all in the dermal membrane, only occasionally a few scattered spicules. Spicules also occur scattered between the fibres of the main skeleton.

Megascleres, slender styli, straight or slightly curved, usually well-pointed, measuring about 0·2 by 0·004 mm. Slight variations in size and proportions occur, and I have also seen a few rounded at both ends (strongyla).

Microscleres. Excessively minute amphiastra (birotulates), very hard to find, very slender and only about 0·0072 mm. long. I have not been able to resolve the terminal knobs into teeth.

Mr. Carter identified this species with Higgin's *Halichondria birotulata*, which is also an *Iotrochota*. It seems to me better to keep them distinct, although the species of this genus are extremely hard to satisfactorily distinguish, and they may all be mere local varieties of Bowerbank's *I. (Halichondria) purpurea*. As Mr. Carter has described the same species (as shown by examination of his type from the British Museum) under the name *Axinella coccinea*, the name *coccinea* may be conveniently retained.

R.N. 332 (18 f; "black, with maroon purple tint in the juice"); 1064 (x A); 1164 (x); 1175.

B.M. sp. 37 ("[Iotrochota] [Halichondria] birotula Higgins;" Reg. 86-12-15-109); sp. 64 ("*Axinella coccinea* C. Type;" Reg. 86-12-15-8).

Iotrochota acerata, n.sp.

Compressed, lobose, sessile, irregular and somewhat cavernous. Vents small and scattered, some marginal. Surface glabrous but uneven; minutely reticulate in parts. Texture soft and spongy, but at the same time tough and fibrous. Colour in life and in spirit dark brown.

Skeleton, a very loose and irregular, rather small-meshed reticulation of multispicular fibre, usually with indistinct spongin. Many megascleres are loosely scattered between the fibres. There is no special dermal skeleton beyond a few sparse, radiating tufts of strongyla. The reticulate character of the dermal membrane is due to the arrangement of the underlying soft tissues.

Megascleres, (*a*) smooth styli, usually more or less curved; evenly rounded off at one end and sharply pointed at the other; size variable, say about 0·2 by 0·006 mm.: (*b*) smooth oxea, of about the same size and shape as the styli but sharply pointed at both ends: (*c*) smooth strongyla, straight or nearly so, and evenly rounded off at both ends, varying from a little shorter and stouter to a little longer and slenderer than the average styli. All these forms are abundantly intermingled in the deeper parts of the sponge, but the sparse dermal tufts appear to consist chiefly if not entirely of the strongylote megascleres.

Microscleres, the usual amphiastra, usually about 0·012 mm. long.

This species is distinguished by its brown colour, and by the presence of the abundant oxeote megascleres. From *I. coccinea* it is also distinguished by the much larger microscleres.

R.N. 434 (x, 19 f; "seal brown with a coating of olive yellow").

Genus *Forcepia*, Carter.

Megascleres usually diactinal, tylota or strongyla, sometimes becoming stylote. Microscleres isochelæ and forcipes, possibly with other forms.

Forcepia colonensis, Carter.

Forcepia colonensis, Carter, A.M.N.H., February, 1885, p. 110.
Suberites biceps, Carter, A.M.N.H., February, 1886, p. 117.

This remarkable sponge appears to be rare. Two of the specimens which I now refer to it (R.N. 599 and 1131) have very much smaller forceps spicules than the type and may possibly be distinct. The type of *Suberites biceps* in the British Museum contains spined forceps, isochelæ and (?) sigmata and is obviously referable to *Forcepia colonensis*.

R.N. 549 (x, 19 f; "geranium red"); 599 (x, 19 f; "poppy red"); 1131 (x).

B.M. d. 106 ("*Forcipia colonensis*," Reg. 86-12-15-363); sp. 12 ("*Suberites biceps, C. type*," Reg. 86-12-15-52).

Forcepia carteri, n. sp.

Sponge massive, irregular. Surface very uneven, with scabid, subdivided sandy areas. Texture cavernous, compact between, with large sandy tracts; firm. Greyish-yellow in spirit.

Skeleton, composed chiefly of sand, not arranged in fibres but in dense irregular accumulations with comparatively clear areas of soft tissue between. There are also numerous megascleres, mostly arranged in very loose and irregular whisps.

Megascleres, straight, slender strongyla, nearly cylindrical, sometimes swollen into a slight head at one end; measuring about 0·24 by 0·004 mm.

Microscleres, (*a*) slender tridentate isochelæ, about 0·012 mm. long, with strongly curved shaft and short teeth; (*b*) forcipiform, very slender, about 0·08 mm. long, like a pair of hair-like rhaphides united at one end and curving somewhat apart at the other. The two limbs often appear separately, and are then indistinguishable from ordinary rhaphides. These spicules are very numerous.

The species makes a near approach to Carter's *Forcepia crassanchorata** from Port Elliot, S.A., but differs in details of spiculation.

R.N. 607 (x, 20 f; "ochre yellow").

Genus *Microtylotella*, nov. gen.

Megascleres diactinal (tylota). Microscleres isochelæ and microtylota, to which others may be added.

* A.M.N.H., February, 1885, p. 111, pl. iv., fig. 3, a-g.

(The term "microtylota" is here proposed for an apparently new type of microsclere consisting of a long slender shaft with a knob at each end).

Microtylotella güntheri, n. sp.

Massive, solid and heavy. Vents (in one specimen) few, large, on broad rounded margin. Very hard; composed chiefly of coarse sand arranged in dense, stout, close-packed, radiating columns, whose ends may form a meandriniform pattern on the upper surface. Colour in spirit sandy brown.

The spicular skeleton is reduced to insignificance in comparison with the coarse sand, but slender spicules are abundantly scattered through the soft tissues.

Megascleres, long, slender, nearly straight tylota, with slightly developed heads; size about 0·28 by 0·003 mm.

Microscleres, (*a*) very minute, slender isochelæ, about 0·012 mm. long, of ordinary form like those figured by Carter for *Forcepia colonensis*; (*b*) smooth, slender toxa, of extremely variable dimensions, sometimes so long and so slightly curved as to resemble raphides; (*c*) microtylota, with very slender, straight or nearly straight shaft, which may be very faintly microspined, terminating at each end in a small button-like knob (perhaps slightly toothed); the whole about 0·08 mm. long and 0·0015 mm. thick in the shaft.

I have much pleasure in dedicating this remarkable species to Dr. Günther, of the British Museum, as a slight recognition of his many kindnesses.

R.N. 473 (x, 20 f; "bay"); 757 (s. 5, "vermilion").

Genus *Histoderma*, Carter.

Sponge consisting of a massive body throwing off hollow processes or fistulæ; with a more or less strongly-developed cortex of horizontally-placed megascleres. Megascleres usually diactinal, but ranging from tylota to styli. Microscleres isochelæ, to which others may be added.

Sideroderma, Ridley and Dendy, may possibly have to fall under this genus.

Histoderma verrucosum, Carter.

Histioderma verrucosum, Carter, A.M.N.H., December, 1886, p. 452.

Histioderma polymasteides, Carter, A.M.N.H., December, 1886, p. 453.

The isochelæ may be extremely rare. In *R.N.* 392 and 398 I have not been able to find any, and in *B.M.* sp. 36 I could only find one.

H. polymasteides would appear from the description to be merely a more robust variety, but I have seen no specimen.

R.N. 392; 398; 627 (x, 19 f; "buff"); 808 (s. 5); 1189.

B.M. sp. 36 ("*Histioderma verrucosum*," Reg. 86-12-15-74).

Genus *Amphiastrella*, nov. gen.

Sponge consisting of a massive body throwing off hollow fistulæ from the upper surface and (sometimes) with root-like processes below. Body with a dense cortex of horizontally-placed spicules. Megascleres diactinal, strongyla or tylota. Microscleres amphiasters (birotulates), to which others may be added.

The erection of a new genus for Carter's *Phlœodictyon birotuliferum* seems to me necessary. The name *Phlœodictyon* was first used by Mr. Carter for entirely different forms.

Amphiastrella birotulifera, Carter, sp.

Phlœodictyon birotuliferum, Carter, A.M.N.H., December, 1886, p. 447, pl. x., figs. 1-5.

As this very remarkable species is hitherto known only from a fragment (one of the branching tubes), I propose to supplement Mr. Carter's detailed account with the description of a second specimen dredged by Mr. Wilson.

Sponge massive, depressed, sessile, irregular, thickly encrusted with shell debris and other rubbish. Lower surface sending out numerous rather slender, elongated, rootlike processes, attached to which are pebbles, &c. Upper surfaces giving off a few irregular, slender, elongated fistulæ, most of which are closed at the apex (? two open naturally). These hollow fistulæ branch irregularly, and some have distinctly reticulate walls. The body of the sponge is dense and compact, and is enclosed on all sides

by a rather thin but very dense and hard cortex. Colour in spirit, where visible, pale yellow or brown.

Skeleton, in the interior of the body are scattered many megascleres, not arranged in definite fibres. In the cortex they are very densely packed, lying in various directions, more or less parallel to the surface, and forming a thick solid crust. In the walls of the fistulæ they are arranged in loose, stout bands or fibres, which form an irregular network, with many spicules scattered in the meshes between.

Megascleres, straight or slightly-curved strongyla or tylota, with slightly-developed oval heads ; size about 0·4 by 0·008 mm., but variable, sometimes much longer and slenderer.

Microscleres, (*a*) amphiasters (birotulates), varying in size up to about 0·05 mm. long, with shaft 0·0042 mm. thick. The shaft is commonly slightly constricted in the middle, and may be thickened at each side of the constriction. The umbrella-like ends may have as many as nine teeth or ribs : (*b*) slender sigmata, say 0·04 mm. from bend to bend, but variable. Neither kind of microsclere is abundant, and they might easily be overlooked.

R.N. 942 (x A).

B.M. sp. 35 ("*Phlœodictyon birotuliferum*," Reg. 87-7-11-12).

Genus *Damiria*, Keller.

Skeleton reticulate. Megascleres of two forms, both diactinal ; those of the main skeleton oxea, those of the dermal skeleton tylota (? sometimes strongylote or tornote).

Microscleres isochelæ, usually accompanied by sigmata.

Not having access here to Keller's original description, I owe my information as to this genus to Topsent's useful paper, "Une Réforme dans la Classification des Halichondrina."*

Damiria australiensis, n. sp.

Form very variable, ranging from massive to digitate ; with conulose or meandriniform surface and delicate dermal membrane between the projecting portions. Vents variable, large or small, scattered or on mammiform or digitiform projections. Texture soft and spongy. Colour in spirit pale yellow.

* Mémoires de la Société Zoologique de France. Tome VII., p. 5, 1894

Skeleton. The main skeleton is a dense, irregularly isodictyal network of oxea. Towards the surface this is replaced by radiating, branching whisps of tylota.

Megascleres, (*a*) rather slender, slightly curved, smooth oxea, gradually sharp-pointed at each end, measuring about 0·2 by 0·008 mm. (very rarely a stylote spicule occurs amongst them); (*b*) tylota, with well-developed oval heads, smooth, straight; about 0·25 by 0·005 mm.

Microscleres, (*a*) tridentate isochelæ like those of *Myxilla*; fairly stout and about 0·028 mm. long, but varying in size; (*b*) Sigmata, small, slender, simple and contort, about 0·02 mm. from bend to bend.

R.N. 361 (s. 15, 3 f; "bright orange red"); 451 (s. 9, 17 f; "rufous"); 662; 673 (s. 10); 717 (s. 10); 718 (Sorrento Reef); 719 (Sorrento Reef); 722 (Sorrento Reef); 836 (s. 10); 837 (s. 10); 838 (s. 10); 845 (s. 10); 861 (s. 9); 903 (s. 10); 919 (s. 10); 997 (s. 14).

Sub-family Ectyoninæ.

Skeleton fibre echinated by laterally projecting styli, usually spined.

Genus *Myxilla*, Schmidt.

Main skeleton reticulate, composed of usually spined styli, and sometimes echinated by spined styli or tylostyli of different form. Variously ended diactinal megascleres are also present, chiefly at the surface. There is usually very little spongin. Microscleres tridendate isochelæ, to which sigmata may be added.

Seeing that the type of this genus, *M. rosacea*, has no special echinating spicules, I cannot agree with Topsent in separating such forms as a distinct genus under Gray's name *Dendoryx*. *Myxilla* has several years' precedence over *Dendoryx*, and at present I propose to retain the name *Myxilla* both for species with and species without special echinating spicules (*vide* Challenger Report). Similarly, Topsent's *Lissodendoryx* falls under *Myxilla*, for the degree of spination of the styli varies so much that it is impossible to draw a hard and fast line between the two.

Myxilla isodictyalis, Carter, sp.

Halichondria isodictyalis, Carter, A.M.N.H., April, 1882, p. 285, pl. xi., fig. 2.

Halichondria isodictyalis, Carter, A.M.N.H., January, 1886, p. 52.

Halichondria incrustans, Coll. Brit. Mus.

The sponge is massive, sessile, usually with more or less conulose surface and rather large scattered vents. The skeleton is an isodictyal network of smooth styli, with tylota radiating in whisps towards the surface and scattered in the dermal membrane. The microscleres are small isochelæ and sigmata.

R.N. 690 (s. 7); 773 (Sorrento Jetty, "wax yellow"); 778 (Sorrento Jetty, "wax yellow"); 793 (Sorrento Jetty, "dull wax yellow"); 872 (s. 5); 886 (s. 9); 897 (s. 10); 953 (s. 6); 965 (s. 6).

B.M. d. 103 (labelled "*Halichondria incrustans*," which is explained by Mr. Carter's remarks *loc. cit.*, Reg. 86-12-15-391).

Myxilla victoriana, n. sp.

Halichondria pustulosa, Carter, A.M.N.H., December, 1886, p. 450.

Halichondria pustulata, Coll. Brit. Mus.

Not *Halichondria pustulosa*, Carter, A.M.N.H., April, 1882, p. 285, pl. xi., fig. 1.

Massive, irregular, with uneven, rugose or warty surface and scab-like pore-areas. Vents small and scattered. Texture fairly compact, but soft and spongy. Pale yellow in spirit.

Skeleton, the main skeleton is an irregular reticulation of spicular fibres, with rather strongly-developed multispicular primary lines running towards the surface. The fibres contain a considerable quantity of pale-coloured spongin, and are abundantly echinated by the spined styli. The dermal skeleton consists of the slender diactinal spicules (sometimes stylote) radiating in whisps at the surface, and especially developed in a beautifully radiate manner around the scab-like pore-areas.

Megascleres, (*a*) Main styli, smooth, slightly curved and gradually sharp-pointed, sometimes with a faint indication of spination at the base; size about 0·2 by 0·0082 mm.; (*b*) Echin-

ating styli, straight, gradually sharp-pointed and spined all over, size about 0·1 by 0·0082 mm.;* (*c*) Dermal spicules, straight, smooth, long and slender, varying in form from tylote to tylostylote, with feebly-developed oval heads; size about 0·25 by 0·003 mm.

Microscleres, rather stout tridentate isochelæ, of the usual *Myxilla* pattern, about 0·025 mm. long. Very abundant.

This species is evidently distinct from Carter's original *Halichondria pustulosa*, as is clearly seen by reference to his description and figures.

R.N. 492 ("brick red"); 835; 844; 895; 922. All from station 10.

B.M. d. 97 ("*Halichondria pustulata*," Reg. 87-7-11-26).

Genus *Microciona*, Bowerbank (emended).

Skeleton consisting of plumose columns. Megascleres all monactinal, smooth and spined. Typical microscleres isochelæ.

Microciona scabida, Carter, sp.

Halichondria scabida, Carter, A.M.N.H., February, 1885, p. 112, pl. iv., figs. 4, 5.

Halichondria scabida, Carter, A.M.N.H., December, 1886, p. 449.

This species appears to come much nearer to Carter's original "*Halichondria pustulosa*" than does *Myxilla victoriana*, which he referred to that species.

R.N. 413 (x, 19 f; "orpiment-orange"); 1025 (x B); 1038 (x B).

Genus *Clathria*, Schmidt.

Skeleton a reticulation of fibre, usually with much spongin, cored by smooth styli and echinated by spined styli. Typical microscleres small palmate isochelæ.

I propose to drop the genus *Rhaphidophlus* of Ehlers, which differs from *Clathria* only in the strongly-developed dermal crust of radiately-disposed styli. It is impossible to draw a sharp distinction between the two.

* The diameter given for spined styli is always exclusive of the spines.

Clathria typica, Carter, sp.

Echinonema typicum, Carter, A.M.N.H., May, 1881, p. 378.

Echinonema anchoratum, Carter, A.M.N.H., May, 1881, p. 379.

Echinonema flabelliformis, Carter, A.M.N.H., November, 1885, p. 352.

Echinonema pectiniformis, Carter, A.M.N.H., November, 1885, p. 353.

Phakellia ventilabrum, var. *australiensis*, Carter, A.M.N.H., November, 1886, p. 379.

This very common and variable species ranges from digitate to flabellate in shape. It is characterised by the stout, echinated, horny fibre and dermal crust of small styli. The megascleres are smooth styli, long and slender in and between the fibres, shorter at the surface, and short spined echinating styli. The microscleres are minute isochelæ, and very slender, hair-like toxa, often in bundles (toxodragmata). The latter, although not mentioned by Carter, are present in B.M. d. 96 and B.M. sp. 48. R.N. 383, 436 and 551 are distinguished from the majority of the specimens by the absence (apparently) of toxa and the more strongly-developed megascleres, but such differences are hardly of specific importance in the genus *Clathria*.

R.N. 359 (s. 15, 3 f; "dull dirty brick red"); 431 (x, 19 f: "salmon colour"); 438 (s. 14, 11 f; "vinaceous-rufous"); 677 (s. 5; "scarlet"); 797 (s. 9); 840 (s. 10); 900 (s. 10); 959 (s. 6); 1072 (x A).

Variety 383; 436 (x, 19 f; "brick red"); 551 (x, 19 f: subdued crimson).

B.M. sp. 48 ("*Echinonema pectiniformis*, C. type," Reg. 86-12-15-141); d. 85 ("*Phakellia ventilabrum*, var. *australiensis*," Reg. 86-12-15-422); d. 96 ("*Echinonema anchoratum*," Reg. 86-12-15-423).

Clathria angulifera, n.sp.

Sponge thinly lamellar, very proliferous, anastomosing, low-growing, spreading; vents small, scattered and marginal. Surface glabrous. Texture compressible, resilient, fairly tough. Colour in spirit, very pale yellow.

Skeleton, an irregular but well-defined and rather close-meshed network of rather slender fibre. The fibre is composed of very

pale spongin, cored by fairly abundant smooth styli and sparsely echinated by spined styli. The spicules occur irregularly in the fibres, not forming a compact axial core. Few spicules are scattered between the fibres. The dermal skeleton is composed of very loose radiating whisps of long slender styli.

Megascleres, (*a*) smooth, straight styli, in the fibres of the main skeleton, gradually sharp-pointed; size variable, say about 0·18 by 0·0042 mm.; (*b*) long, straight, slender styli or subtylostyli of the dermal tufts, say about 0·25 by 0·0035 mm.; (*c*) echinating styli; short, straight, gradually sharp-pointed, feebly spined; about 0·058 by 0·004 mm.

Microscleres, (*a*) extremely minute isochelæ, very slender and hardly 0·006 mm. long; (*b*) rather short, stout toxa, very strongly angulate* in the middle, sometimes forming almost a right angle with nearly straight limbs; smooth and sharp-pointed; size variable, up to about 0·07 mm. from point to point in a straight line, by 0·004 mm. in diameter. I have also observed a few hair-like rhaphides, possibly young forms of megascleres, and one stoutish contort sigma.

R.N. 1160 (x).

Clathria australiensis, Carter, sp.

Wilsonella australiensis, Carter, A.M.N.H., November, 1885, p. 366.

This appears to be simply a *Clathria* with a large amount of foreign matter (sand and broken spicules) in and between the fibres and on the surface. The sand is especially abundant in the primary fibres. A considerable amount of spongin is also present. In the three specimens which I now refer to the species I find a few slender toxa, which are not mentioned in the original description.

R.N. 748 (s. 1; "cherry red"); 969 (s. 5); 1002 (s. 1).

B.M. sp. 76 (*Wilsonella australiensis*, C. type," Reg. 86-12-15-43); d. 13 (wrongly labelled "*Spongelia*," Reg. 86-12-15-288).

Clathria echinonematissima, Carter, sp.

Wilsonella echinonematissima, Carter, A.M.N.H., March, 1887, p. 210.

* Whence the specific name.

There seems to be little doubt, from Mr. Carter's description, that this species is a Clathria, but I have not yet had the opportunity of examining it.

Clathria piniformis, Carter, sp.

Dictyocylindrus piniformis, Carter, A.M.N.H., November, 1885, p. 354.

This is apparently an aberrant *Clathria*. The sponge is erect, lobo-digitate or flabellate, with corrugated surface. There is a well-developed horny fibre, and the spicules are all very slender. The megascleres are long slender styli which may become oxeote, and short slender echinating styli, which may also become oxeote. The latter are spined as usual, and the oxeote tendency seems to be very characteristic. No microscleres are visible.

R.N. 412 (x, 19 f; "cadmium orange"); 508 (x, 20 f; "brick red").

B.M. sp. 75 ("*Dictyocylindrus piniformis*, C. type," Reg. 86-12-15-62).

Clathria alata, n. sp.

Sponge massive, irregular, with rugose or warty surface and thick, tough, smooth dermal membrane. Vents large and small, scattered. Texture fairly firm but compressible and resilient. Pale yellow or brown in spirit.

Skeleton, the spicular skeleton is very strongly-developed, partly in stout, whisp-like, multispicular fibres, enveloped in much spongin and forming a very loose, irregular network; the fibres are composed chiefly of the smooth styli. At the surface they break up into densely-packed, radiating tufts of smooth styli, forming a dermal crust. Very numerous loose megascleres are scattered between the fibres of the main skeleton.

Megascleres, (*a*) straight, smooth, rather slender styli; evenly rounded off at one end and fairly gradually sharp-pointed at the other; nearly cylindrical; size about 0·23 by 0·0042 mm.; (*b*) spined styli; straight, gradually sharp-pointed, apex free from spines; variable in size, usually rather short and stout, say about 0·1 by 0·0082 mm.

Microscleres, very numerous isochelæ. Resembling the ordinary *Clathria* type in general characters but comparatively large and

distinguished by a very thin wing-like expansion or fimbria along each side of the shaft.* Length about 0·022 mm.

R.N. 752 (s. 5; "light orange-brown"); 763 (s. 1); 792 (Sorrento Jetty; "greyish-brown"); 801 (s. 1; "orange-brown"); 842 (s. 10); 843 (s. 10).

Clathria myxilloides, n. sp.

Massive, depressed, cake-like. Surface rather uneven; villous with projecting fibres, although the dermal skeleton appears to be intact. Compact, soft, resilient. Pale greyish-yellow in spirit.

Skeleton, the main skeleton is a very loose and irregular network of stout, whisp-like, multispicular fibres, mostly running towards the surface. The fibres appear very lax and with little or no obvious spongin. They are made up of the smooth styli, irregularly echinated and accompanied by the spined styli. Between the fibres loose megascleres are abundantly scattered. The dermal skeleton consists of dense, radiating tufts of smooth styli.

Megascleres, (*a*) long, straight, slender, smooth styli; evenly rounded at one end and sharply pointed at the other; about 0·3 by 0·0042 mm.; (*b*) spined styli; straight and rather slender, gradually sharp-pointed and abundantly spined all over; about 0·13 by 0·005 mm.

Microscleres, tridentate isochelæ, resembling those of *Myxilla*, with strongly-curved shaft. Length about 0·025 mm.

This species at first sight closely resembles *Clathria alata* but differs in the form of the spicules very considerably.

R.N. 729 (s. 5).

Clathria imperfecta, n. sp.

Sponge compressed, cake-like, crumbling.

Skeleton, a very irregular reticulation of loose, whisp-like, multispicular fibre without obvious spongin, irregularly echinated and accompanied by spined styli, but composed principally of smooth styli. Many spicules are scattered between the fibres, especially spined styli, and at the surface there is a poorly-developed dermal skeleton of loose radially-disposed smooth styli.

* Whence the name of the species.

Megascleres, (*a*) smooth, straight styli, gradually sharp-pointed at the apex, and evenly rounded at the base: size about 0·2 by 0·0062 mm.; (*b*) spined styli; usually straight, tapering gradually to a fine point, richly spined all over; size about 0·1 by 0·005 mm.

This remarkable species, characterised by the entire absence of microscleres, should perhaps be considered as the type of a new genus. As regards external form and the general arrangement of the skeleton and the form of the megascleres it comes very near to *Clathria alata* and *C. myxilloides*.

R.N. 376 (18 f; "dull brown orange, yellower below").

Genus *Ophlitaspongia*, Bowerbank* (emend.)

Usually with strongly-developed horny fibre. Megascleres smooth styli, some of which echinate the horny fibre. Microscleres may or may not be present. External form not honeycombed.

This genus, as thus constituted, will be a very useful one differing from *Clathria* in the smoothness of the echinating styli, and from *Echinoclathria* in the external form. It has been pointed out by Topsent that the first described species of *Clathria (C. coralloides)* has smooth echinating spicules, but the genus was so imperfectly diagnosed by its author that we may accept the views of subsequent writers, who seem to be agreed in regarding the spined styli as characteristic. This view leaves the field open for Bowerbank's *Ophlitaspongia*, of which the type has smooth echinating styli.

Some species of the genus, in which the styli may be replaced by oxea, form an interesting link between the Ectyoninæ and Chalininæ, and I have little doubt that my *Siphonochalina hispiculata*, described in the first part of this catalogue, really belongs near here.

Ophlitaspongia subhispida, Carter, sp.

Echinoclathria subhispida. Carter, A.M.N.H., November, 1885, p. 356.

* Monograph of British Sponges, Vol., II., p. 14.

Echinoclathria gracilis, Carter, *op. et loc. cit.*

? *Axinella chalinoides*, Carter, A.M.N.H., November, 1885, p. 358.

? *Axinella chalinoides*, var. *cribrosa*, Carter, A.M.N.H., November, 1886, p. 377.

The sponge is branched, the branches being long and slender, subcylindrical or flattened. The skeleton is reticulate, consisting of strongly-developed horny fibre, in part cored and echinated by smooth styli. In addition to the spicules mentioned by Mr. Carter, I find in B.M. sp. 39 and in B.M. sp. 42 and in R.N. 310, slender toxa present.

R.N. 310 (20 f; "dark brownish red"); ? 628 (x, 19 f; "maroon").

B.M. sp. 39 ("*Echinoclathria gracilis*, C. type," Reg. 86-12-15-45); sp. 42 ("*Echinoclathria subhispida*, C. type," Reg. 86-12-15-70); ? d. 81 ("*Axinella chalinoides*," Reg. 86-12-15-402).

Ophlitaspongia nodosa, Carter, sp.

Echinoclathria nodosa, Carter, A.M.N.H., November, 1885, p. 356.

This species is branching, with the branches nodulated and sometimes anastomosing. The skeleton is reticulate, with well-developed horny fibre. The spicules are smooth styli, in and projecting from the fibre and scattered between. Special echinating spicules can hardly be said to exist, and I have seen no microscleres.

R.N. 264 (18 f; "brick red"); 644 (s. 5, 7 f; "crimson, with a very light wash of sepia"); 899 (s. 10).

B.M. sp. 41 (*Echinoclathria nodosa*, C. type," Reg. 86-12-15-96).

Ophlitaspongia tenuis, Carter, sp.

Echinoclathria tenuis, Carter, A.M.N.H., November, 1885, p. 355.

Phakellia papyracea, Carter, A.M.N.H., November, 1886, p. 379.

(Not *Phakellia papyracea*, Ridley and Dendy, Challenger Monaxonida, p. 172).

The sponge is stipitate, thin, flabellate. The main skeleton consists of a fairly regular, rather small-meshed, sub-rectangular network of strongly-developed horny fibre, cored and echinated by smooth, short, stout styli or subtylostyli of variable size. This skeleton is condensed in the central plane. There are also present long and very slender, smooth tylostyli, with well-developed heads. These appear to be very characteristic, they occur in longitudinal whisps and scattered towards the middle of the sponge, and in loose radiating tufts at the surface. No microscleres have been detected. The species is interesting because it shows a structure intermediate between the *Ectyoninæ* and *Axinellidæ*, so that it might, with almost equal justice, be placed in either group. Indeed, I find from examination of the British Museum specimens that Mr. Carter's *Echinoclathria tenuis* and *Phakellia papyracea* are identical.

R.M. 287 (18 f; "bright brick red"); 353 (19 f; "venetian red with yellow spots"); 1075 (x A).

B.M. sp. 43 ("*Echinoclathria tenuis*, C. type," Reg. 86-12-15-147); d. 88 ("*Phakellia papyracea*," Reg. 86-12-15-231).

Ophlitaspongia gabrieli, n. sp.

Sessile, spreading, encrusting: rising into short mammiform projections, each bearing a smallish vent. Surface uneven, with minutely reticulate dermal membrane in the depressed portions, more or less granular elsewhere. Texture soft, resilient; colour in spirit pale yellow.

Skeleton, the main skeleton is a sub-rectangularly meshed network of strongly-developed horny fibre. The primary fibres are about 0·055 mm., thick and sparsely cored with slender styli. The secondary connecting fibres are a little slenderer and without any spicular core. The dermal skeleton consists of sparse tufts of slender styli projecting very slightly beyond the dermal membrane.

Megascleres, smooth, straight styli, of two chief sizes, (*a*) comparatively short; hastately and very sharply-pointed at the apex, and evenly rounded off at the base; measuring about 0·09 by 0·0042 mm. These occur pretty abundantly scattered in the soft tissues between the fibres; a very few of them echinate

the fibres; a very few oxea of about the same proportions also occur. The styli coring the main fibres are of about the same length but much slenderer; (*b*) comparatively long; gradually sharp-pointed at the apex, and evenly rounded off at the base; measuring about 0·19 by 0·003 mm.; occurring in the dermal tufts and scattered between the fibres.

Microscleres, a very few long, slender oxeote spicules, slightly angulated in the middle, may perhaps represent toxa. They measure up to about 0·25 by 0·002 mm.

I have much pleasure in dedicating this species to Mr. J. Gabriel, to whose dredging operations I am indebted for many Victorian sponges.

R.N. 915 (s. 5).

Ophlitaspongia axinelloides, n. sp.

Sponge erect, lobose, stipitate. Vents small, marginal. Surface smooth, minutely reticulate. Colour in spirit pale yellow.

Skeleton, the main skeleton is a rather close sub-rectangularly meshed network of strongly-developed horny fibre. The primary lines are about 0·07 mm. thick and pretty abundantly cored by the short, smooth styli, many of which are arranged in an Axinellid manner, with their apices projecting obliquely upwards and outwards from the fibre. The secondary, connecting fibres are a little slenderer, sparsely cored and rarely echinated by scattered styli. Numerous styli are irregularly scattered in the soft tissues between the fibres. The dermal skeleton is not very strongly developed and consists of rather sparse, radiating tufts of styli supported on an underlying reticulation of horny fibre belonging to the uppermost part of the main skeleton.

Megascleres, smooth, straight, styli; usually short and stout, evenly rounded and slightly narrowed at one end and tapering gradually to a fine point at the other; measuring about 0·1 by 0·0082 mm. Such spicules are the most abundant in all situations; they are occasionally replaced by sharp-pointed oxea of about the same dimensions, while longer and slenderer styli of variable size occur plentifully scattered amongst them. The latter are sometimes of almost hair-like proportions.

R.N. 329 (18 f; "deep blood red").

Genus *Echinoclathria*, Carter.

Sponge made up of a honeycomb-like mass of anastomosing, flattened trabeculæ. Skeleton reticulate, horny, with or without spicules in the fibre. Megascleres smooth, either styli or tylota; smooth echinating styli commonly present. Palmate isochelæ may be present.

Echinoclathria favus, Carter.

Echinoclathria favus, Carter, A.M.N.H., October, 1885, p. 292.

Echinoclathria favus, Ridley and Dendy, Challenger Monaxonida, p. 160, pl. xxxi., figs. 4, 5, 5*a*.

It is rather curious that this species, which would seem, from Mr. Carter's original description and from the "Challenger" Collection, to be not uncommon in Bass Straits, is unrepresented in Mr. Wilson's later collections.

Echinoclathria glabra, Ridley and Dendy.

Echinoclathria glabra, Ridley and Dendy, Challenger Monaxonida, p. 163, pl. xxix., figs. 11, 11*a*; pl. xxxi., fig. 2.

This species was described from a single specimen collected by the "Challenger" in Bass Straits. Mr. Wilson has added three more.

R.N. 691 (s. 7, Queenscliff Jetty); 696 (s. 7, Queenscliff Jetty); 707 (s. 3; "yellowish grey").

Echinoclathria arenifera, Carter.

? *Holopsamma laminæfavosa*, Carter, A.M.N.H., March, 1885, p. 212.

Echinoclathria favus, var. *arenifera*, Carter, A.M.N.H., November, 1885, p. 350.

The sponge is honeycombed as usual but intensely sandy. The spicules are difficult to make out, apparently smooth, echinating subtylostyli and slender linear spicules only. B.M. d. 54, 55 and 58 all contain proper spicules, while their presence is doubtful in d. 49 and 56.

R.N. 308 (20 f; "sandy sponge colour"); 557 (x. 19 f; ochraceous buff"); 698 (s. 7, Queenscliff Jetty); 830 (s. 10); 833 (s. 10); 849 (s. 10).

B.M. ? d. 49 ("*Holopsamma laminæfavosa*," Reg. 86-12-15-420); d. 54 ("*Holopsamma laminæfavosa*," unregistered); d. 55 ("*Holoposamma liminæfavosa*," Reg. 86-12-15-491); d. 56 ("*Holopsamma lamina*", Reg. 86-12-15-490); d. 58 (*Holopsamma lamina*," Reg. 86-12-15-312).

Genus *Plumohalichondria*, Carter.

Skeleton arranged in plumose columns. Megascleres smooth diactinal and spined monactinal. Typical microscleres isochelæ.

Plumohalichondria cæspitosa, Carter, sp.

Echinonema cæspitosa, Carter, A.M.N.H., November, 1885, p. 352.

The massive, proliferous, coralloid external form and columnar structure with the plumose skeleton columns are very characteristic of this species.

R.N. 485 (s. 10, 8 f; "salmon colour"); 565 (s. 10, 8 f; "orange"); 664; 901 (s. 10).

B.M. sp. 45 ("*Echinonema cæspitosa*, C· type," Reg. 86-12-15-97).

Plumohalichondria uncifer, n. sp.

Sponge thin, encrusting, with minutely conulose surface and columnar structure. Colour in spirit pale yellow.

Skeleton composed of short, stout, plumose columns, running from the base to the dermal membrane and branching slightly in their course. These columns consist chiefly of spined styli, whose basal portions are connected together by much spongin; accompanied by a few slender oxea. The oxea become more abundant towards the surface, radiating off from the plumose columns in tufts to the dermal membrane.

Megascleres, (*a*) long, straight, slender oxea: smooth and rather abruptly pointed; measuring about 0·16 by 0·0027 mm.; (*b*) spined styli; rather slender, straight or slightly curved, tapering very gradually to the apex, the neighbourhood of which alone is free from spines; varying much in size, about 0·18 by 0·0083 mm. when fully grown.

Microscleres, (*a*) robust tridentate isochelæ, with strongly-curved shaft and short blunt teeth. These spicules vary up to about 0·04 mm. in length. What I take to be young forms are extremely abundant. The smallest are very slender and the developing teeth gives them a peculiar appearance; (*b*) rather slender, simple and contort sigmata; measuring when fully grown about 0·033 mm. from bend to bend. Both forms of microscleres are very abundant.

This species appears to be nearly related to *P. cæspitosa*, but is distinguished by the thin habit, the more robust chelæ and the presence of abundant sigmata.

R.N. 1047 (x B).

Plumohalichondria gravida, n. sp.

Massive, compact, solid. Intensely and coarsely sandy. Sand arranged in stout vertical columns ending in slight conuli on the surface. Surface subglabrous between the sandy points. Vents rather large, scattered, with wide, vertical oscular tubes. Texture hard, friable. Colour in spirit sandy brown, with grey flesh.

Skeleton, composed chiefly of sand, with numerous spined styli echinating the sand grains, and other spicules scattered between. At the surface the oxea form radiating tufts.

Megascleres, (*a*) straight, smooth, slender oxea, rather abruptly pointed: about 0·14 by 0·0027 mm.: (*b*) short, slender, straight, finely pointed and entirely spined styli; about 0·06 by 0·004 mm.

Microscleres, (*a*) tridentate isochelæ, up to about 0·023 mm. long, but commonly much smaller: (*b*) rather slender, simple and contort sigmata, about 0·03 mm. from bend to bend.

R.N. 716 (s. 8): 881 (s. 9).

Plumohalichondria incrustans, Carter, sp.

Echinonema incrustans, Carter, A.M.N.H., November, 1885, p. 353.

Plumohalichondria mammillata, Carter, A.M.N.H., November, 1885, p. 355.

Plumohalichondria mammillata, Ridley and Dendy, Challenger Monaxonida, p. 156, pl. xxx., figs. 4, 4*a*; pl. xlvii., figs. 4, 4*a*.

The British Museum specimens show conclusively that *Plumohalichondria mammillata* is a mere synonym of *Echinonema incrustans*.

R.N. 496 (s. 10, 8 f; "scarlet vermilion").

B.M. sp. 46 ("*Echinonema incrustans*, type," Reg. 86-12-15-123); d. 98 ("*Plumohalichondria mammillata*, unregistered"); d. 107 ("*Plumohalichondria mammillata*," Reg. 86-12-15-249).

Plumohalichondria arenacea, Carter.

Plumohalichondria arenacea, Carter, A.M.N.H., November, 1885, p. 367.

This is probably merely a variety of *P. incrustans*, of very robust habit, with sandy fibre and dermal crust of spined styli. There is no tangible difference in the spiculation of the two. The external form varies from massive to flabellate.

R.N. 323 (18 f; "pale grey buff with a red tint on the projecting parts"); 528 (s. 1, 14 f; "between vermilion and ochraceous-rufous"); 675 (s. 5); 682 (s. 5); 708 (s. 5; "flesh to brick red"); 924 (s. 1); 974 (s. 5); 1084 (x A).

B.M. sp. 67 ("*Plumohalichondria arenacea*, C. type," Reg. 86-12-15-80).

Plumohalichondria purpurea, Carter.

Plumohalichondria plumosa, var. *purpurea*, Carter, A.M.N.H., November, 1886, p. 376.

This is a remarkable species intermediate in characters between *Plumohalichondria* and *Echinodictyum*; it differs from the typical *Plumohalichondria* in that the microscleres are entirely wanting. The name was unfortunately chosen because the purple colour is not characteristic and was probably adventitious in the type. There is only one specimen in the collection and that is extremely irregular, massive, proliferous; with conulose and rugose but subglabrous surface, and firm, compact texture. The colour in spirit is pale yellowish-grey; in life it was buff.

R.N. 759 (s. 1; "buff.")

B.M. sp. 47 ("*Plumohalichondria plumosa*, var. *purpurea*. Carter. Type of var.," Reg. 86-12-15-127).

Plumohalichondria tenuispiculata, n. sp.

Sponge forming a thin crust, rising up into small, irregular, branched, coralloid processes. Surface very uneven. Consistence pretty firm and compact. Nearly white in spirit.

Skeleton, very confused, consisting of very abundant slender spicules, in great part scattered quite irregularly but often collected into loose, whisp-like, irregularly-branching fibres, with no obvious spongin. The axial portions of the fibres consist of the slender oxea and they are irregularly echinated by the spined styli.

Megascleres, (*a*) very slender, long, straight oxea, measuring about 0·2 by 0·002 mm.; (*b*) comparatively short, straight, spined styli; gradually and finely pointed, spined all over but most abundantly at the base; size about 0·08 by 0·004 mm.; (*c*) very long and slender spined styli, gently curved and drawn out gradually into long fine points, the spines dying away towards the apex; measuring up to about 0·25 by 0·0027 mm. Intermediate forms of spined styli are also met with.

The species is nearly related to *P. purpurea*, but differs in the much more slender spicules and perhaps also in the external form. There are no microscleres.

R.V. 1024 (x B).

Genus *Echinodictyum*, Ridley.

Skeleton usually reticulate. Megascleres smooth diactinal in the fibre and spined monactinal echinating the fibre. Smooth styli may also be present. No microscleres.

Echinodictyum ridleyi, n. sp.

Sponge lamellar to flattened digitate; may be stipitate, proliferous and bushy. Lamellæ usually thin. Vents small and marginal. Surfaces usually smooth and glabrous. Texture compressible, resilient, tough. Colour in spirit pale greyish yellow.

Skeleton, the main skeleton is an irregular network of well-developed horny fibre of pale colour, cored by numerous smooth oxea in the main fibres. These spicules are commonly arranged in a very loose, whispy manner; they may be absent from some

of the short connecting fibres. The spined echinating styli are but sparingly developed. The smooth styli are very irregular in their distribution ; they may be abundant towards the dermal surface, projecting obliquely from the horny fibre in a plumose fashion. There is usually no special dermal skeleton, but in one specimen there are loose dermal tufts of the slender oxea which give the surface a hispid character.

Megascleres, (*a*) long, smooth, straight, slender oxea ; rather abruptly pointed ; size about 0·27 by 0·0042 mm. ; (*b*) very slightly curved, smooth, gradually and usually finely-pointed styli or subtylostyli ; size about 0·19 by 0·0072 mm. ; (*c*) spined styli ; short, straight, gradually sharp-pointed, sparingly spined ; size about 0·1 by 0·006 mm.

R.N. 269 (20 f ; "dull brownish red") ; 633 (x, 19 f ; "ochraceous-rufous") ; 928 (x A) ; 1033 (x B).

Echinodictyum spongiosum, n. sp.

Encrusting, irregular ; may be massive, proliferous, lobulated. Vents minute or of fair size, scattered. Texture soft and spongy. Colour in spirit pale greyish-yellow.

Skeleton a very loose network of multispicular, whispy fibres, mostly branching off from one another at acute angles and running towards the surface. The tylote spicules, of which the fibre is chiefly composed, are invested and held together by a considerable amount of very pale-coloured spongin, and are here and there echinated by spined styli. The fibres divide up into almost single spicules as they approach the surface, but there is no properly developed dermal skeleton. The whole skeleton is very lax, and a good many loose spicules are scattered between the fibres.

Megascleres, (*a*) straight or nearly straight, slender tylota ; with cylindrical shaft and small ovoid head at each end ; size about 0·19 by 0·0028 mm. ; (*b*) spined styli or substylostyli ; straight, sharply pointed, with small sharp spines irregularly distributed but most abundant at the base ; size about 0·087 by 0·0042 mm. As compared with the tylota these spicules are very scarce, and their presence might easily be overlooked.

R.N. 790 (Sorrento Jetty ; "sponge grey") ; 946 (s. 9).

Echinodictyum arenosum, n. sp.

Massive, depressed, spreading. Upper surface even, almost flat, with meandriniform sandy pattern and minutely-reticulate dermal membrane between. Vents minute, scattered. Incompressible, intensely sandy and friable, with radiately columnar structure, due to the arrangement of the sandy tracts. Colour in spirit pale grey and sandy.

Skeleton, composed chiefly of sand arranged in dense tracts as above described. Between these sandy tracts are scattered numerous slender tylostrongyla or tylota, without definite arrangement except towards the surface, where very loose, whisp-like fibres terminate in a dense layer of short, radiating tufts which support a small-meshed reticulate dermal skeleton of abundant tangentially-placed tylostrongyla or tylota. The sand grains in the interior of the sponge are sparsely echinated by spined styli.

Megascleres, (*a*) tylostrongyla; straight or slightly curved, slender, with very slightly-developed head at one end and bluntly rounded off at the other, or with a small head at each end (tylote); measuring about 0·19 by 0·003 mm.; (*b*) spined styli or tylostyli; straight, slender, minutely spined all over, gradually and finely pointed; size about 0·083 by 0·003 mm.; scarce.

R.N. 925 (s. 1).

Genus *Raspailia*, Nardo.

Sponge usually consisting of long slender branches; with a dense central axis of spiculo-fibre containing much spongin, from which loose tufts of spicules radiate to the surface. Smooth monactinal (sometimes diactinal) megascleres are present, and also spined echinating styli*. No microscleres.

I agree with Topsent in removing this genus from the *Axinellidæ* to the *Ectyoninæ*, although it is certainly intermediate in structure between these two groups.

Raspailia pinnatifida, Carter, sp.

Dictyocylindrus pinnatifidus, Carter, A.M.N.H., November, 1885, p. 353.

* Often extremely rare and hard to detect, perhaps sometimes absent.

? *Axinella chalinoides*, var. *glutinosa*, Carter, A.M.N.H., November, 1885, p. 359.

Axinella setacea, Carter, A.M.N.H., November 1885, p. 359.

? *Axinella cladoflagellata*, Carter, A.M.N.H., December, 1886, p. 464.

The sponge has the typical external form of the genus, consisting of long, slender "rat's-tail" branches. The spined echinating styli are very scarce, but I have found them also in the type of *Axinella setacea* from the British Museum.

R.N. 385; 443 (s. 9, 16 f; "seal brown"); 851 (s. 9); 888 (s. 9).

B.M. sp. 74 ("*Dictyocylindrus pinnatifidus*, C. type," Reg. 86-12-15-50); sp. 66 ("*Axinella setacea*, C. type," Reg. 86-12-15-61); ? d. 82 ("*Axinella cladoflagellata*, seu *A. chalinoides*, var. *glutinosa*," Reg. 86-12-15-407).

Raspailia atropurpurea, Carter, sp.

Axinella atropurpurea, Carter, A.M.N.H., November, 1885, p. 359.

The sponge consists of a stipitate bunch of short branches of a dark purple colour, retained for a long time in spirit. The arrangement of the skeleton is that usually found in the genus, with larger stylote or tylostylote megascleres embedded in much spongin in the interior, and much smaller styli in radiating tufts at the surface. The original description makes no mention of the spined echinating styli, which are fairly numerous and which I have found also in the type specimen from the British Museum. These are short, straight, usually bluntly-pointed, and covered with small spines all over; they measure about 0·083 by 0·006 mm.

R.N. 638 (x, 19 f; "seal brown, very dark").*

B.M. sp. 63 ("*Axinella atropurpurea*, C. chief type," Reg. 86-12-15-1).

Raspailia vestigifera, n. sp.

The sponge consists of a stipitate bunch of few, slender, rather short, stiff, erect, subcylindrical branches. The surface is

* In spirit the colour is dark purple, fading to brown on the outside.

strongly hispid. The texture is firm and very tough, and the colour in spirit is rather dark brown.

Skeleton, the skeleton consists of a very dense central axis of laminated brown spongin, apparently originally made up of a close irregular network of stout horny fibres. This central axis is very thick and is continued in short, stout, radiating fibres towards the surface. Imbedded in this abundant horny matrix are very numerous large oxeote spicules, mostly lying more or less parallel to the long axis of the sponge, but many curving outwards towards the surface in the radiating fibres. At the surface are arranged, at fairly regular intervals, beautiful radiate tufts of small slender megascleres. From the centre of each of these tufts a very large oxeote spicule projects outwards, approximately at right angles to the surface of the sponge and imbedded in the sponge for only about a quarter of its length.

Megascleres, (*a*) long and rather slender, gently-curved oxea, sharply and gradually pointed at each end and resembling those of *Halichondria*: size about 0·9 by 0·013 mm.; found in the horny fibre in the interior of the sponge with many smaller ones; (*b*) the very large oxea of the surface, in shape like those of the interior, but measuring about 1·47 by 0·055 mm.; (*c*) the spicules of the surface tufts; sub-oxeote or stylote, gradually sharp-pointed at the outer end, but more or less rounded off at the inner; long, slender, gently curved; size about 0·35 by 0·004 mm.; (*d*) small spined styli; short, straight, gradually and finely pointed and minutely spined all over; size about 0·066 by 0·004 mm.; very rare, echinating the horny fibre in the interior of the sponge; probably to be regarded as merely vestigial structures.

R.N. 655 (x, 20 f; "bottle green with a wash of sepia").

Raspailia cacticutis, Carter, sp.

Dictyocylindrus cacticutis, Carter, A.M.N.H., November, 1885, p. 354.

This is a very remarkable species, easily recognisable by its cactiform external appearance and nearly black colour. The skeleton is composed chiefly of an irregular network of very stout horny fibre, sometimes with and sometimes without axial

spicules, and more or less abundantly echinated by short spined styli. The large, smooth styli or tylostyli occur most abundantly in the strongly-developed surface projections, accompanied by much spongin. There are no surface tufts of spicules, but the dermal membrane is glabrous and has a beautiful reticulate appearance between the projections.

R.N. 346 (20 f; "dark grey-brown"); 399; 425 (x, 19 f; "clove brown, with a slight green tinge); 1157 (x); 1174.

B.M. sp. 70 ("*Dictyocylindrus cacticutis*, C. type," Reg. 86-12-15-120).

Genus *Fusifer*, n. gen.

Sponge massive, with fistular projections. The only known species has an intensely sandy body, covered by a thin dermal membrane. Megascleres monactinal, smooth and spined styli or tylostyli. Characteristic microscleres microxea, to which others may be added.

This is a very remarkable genus indeed, strongly characterised by its external form and by the beautiful spindle-shaped microscleres (microxea). The external form and the character of the dermal membrane approach those of *Histoderma*, but the well-developed and abundant spined echinating styli show it to be an undoubted Ectyonine.

Fusifer fistulatus, n. sp.

Sponge consisting of a massive, irregular, intensely and coarsely sandy body; invested in a thin, delicate membrane rising up above into rather short, hollow, thin-walled processes, some widely open and some closed. Body sand-coloured, projections pale yellow in spirit.

Skeleton, the main skeleton of the body is a dense agglomeration of sand grains with spicules in the interstices. The sand may be arranged in stout, flattened columns, running vertically upwards and appearing on the surface in the form of meandering sandy tracts. Many of the sand grains are abundantly echinated by spined styli. The other spicules are scattered irregularly between them, but the tylostyles may be partly collected into stout fibres running towards the surface. The dermal skeleton is a very irregular reticulation, either of single spicules (tylostyli)

placed tangentially and crossing one another in every direction, or of similar spicules more or less collected into loose fibres.

Megascleres, (*a*) long smooth tylostyli, with a slightly-developed oval head at one end and gradually sharply pointed at the other; commonly more or less curved; size variable, say about 0·54 by 0·007 mm. when fully developed; (*b*) spined styli; straight or slightly curved, slender, gradually and finely pointed, covered pretty evenly all over with small spines; commonly about 0·07 by 0·003 mm. but sometimes nearly twice as long.

Microscleres, (*a*) smooth, straight, spindle-shaped microxea, tapering equally from the middle to a fine point at each end; size about 0·046 by 0·002 mm.; pretty abundantly scattered between the sand grains and in the dermal membrane; (*b*) very slender smooth toxa varying immensely in length (measured up to about 0·3 mm., but many only about 0·013 mm. long); abundant.

R.N. 6; 501 (x, 20 f; "drab, the projections ochre-yellow"); 683 (s. 9); 1045 (x B).

Genus *Acarnus*, Gray.

Megascleres styli and cladotylota ("grapnel-spicules"), to which tylota may be added. Microscleres may be present in the form of palmate isochelæ and toxa.

Acarnus tenuis, n. sp.

This species occurs in the form of small thin crusts on the surface of other sponges. On one specimen of *Clathria typica* (R.N. 1072), for example, there are dozens of such crusts. They are subcircular or irregular in outline, and the largest are only about a quarter of an inch in diameter. They are thin and flat and have no visible vents. In spirit they are of a pale yellow colour. I have also found them on *Plumohalichondria arenacea* (R.N. 974) and on *Tedania digitata* (R.N. 991).

Skeleton, composed of a very loose network of irregularly-interlacing spicules, with no visible spongin.

Megascleres, (*a*) stylote or strongylote (perhaps sometimes subtylostylote); straight, smooth, long and very slender, measuring about 0·18 by 0·002 mm.; comparatively scarce; (*b*) cladotylote, straight (or nearly so), long and very slender; with a

well-developed ovoid head at one end and several well-developed, recurved, sharp teeth at the other. The usual number of teeth appears to be five, but I should doubt if this is constant. The spicule is about 0·16 mm. long, and the shaft is scarcely 0·002 mm. thick for the greater part of its length, but increases in diameter at each end; the teeth are about 0·004 mm. long. These "grapnel-spicules" are not echinating; indeed, there is no fibre for them to echinate, but they are extremely numerous. They occur scattered irregularly and also in loose bundles, in which they lie parallel to one another, with some of the grapnels at one end of the bundle and some at the other, each spicule extending the whole length of the bundle, or very nearly so.

As might naturally be expected, a few spicules of the sponge on which the specimen has grown may occur as foreign bodies. I have found no microscleres. The soft tissues are densely charged with spherical cells about 0·006 mm. in diameter.

This is one of the most remarkable sponges in the entire collection.

Art. IV.—*Evidence of the Existence of a Cambrian Fauna in Victoria.*

By R. Etheridge, Junr., Corr. Memb.

(Curator of the Australian Museum, Sydney).

(With Plate I.)

[Read 8th August, 1895.]

Geological research has, so far, made known in Australia and Tasmania three groups of rocks believed to be of Cambrian age, as evidenced by Palæontological evidence.

The beds in question, in the order of their reported discovery, are :—

1. Caroline Creek beds, Mersey River District, Tasmania, containing Trilobites and a limited Molluscan fauna.*
2. York Peninsula Series, South Australia, and northern extension of the same in the Flinders Ranges, with Trilobites, Mollusca and a low form of Coral life.†
3. Kimberley beds, N.W. Australia, with a Trilobite, and a possible Pteropod.‡

The locality of the Kimberley fossils is not definitely known. I have searched both the late Mr. E. T. Hardman's Reports,§ without finding any record of this occurrence.

Until the appearance of Messrs. Selwyn and Ulrich's "Notes on the Physical Geography, Geology and Mineralogy of Victoria,"‖ no direct reference to rocks older than Silurian in Victoria had been made. Therein Sir Alfred (then Mr.) Selwyn contented himself by remarking that westward of Melbourne "there seems to be a very gradually descending series, and towards the extreme

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* See T. Stephens, Papers and Proc. Roy. Soc. Tas. for 1874 [1875], p. 27; Etheridge, Junr., *Ibid*, for 1882 [1883], p. 151.

† See H. Woodward, Geol. Mag., 1884, I. (3), p. 343; Etheridge, Junr., Trans. Roy. Soc. South Australia, 1890, xiii., Pt. I., p. 10; Pritchard, *Ibid*, 1892, xv., Pt. II., p. 179; Tate, *Ibid*, p. 183.

‡ See Foord, Geol. Mag., 1890, vii. (3), p. 98.

§ 1st and 2nd Reports on the Geology of the Kimberley District, Western Australia (folio, Perth, 1884-85).

‖ 8vo. Melbourne, 1866 (p. 10).

limits of the colony, west of the Grampians, a group of strata is exposed consisting of foliated micaceous and chloritic talcose, and serpentinous schists. . . . . Little is yet known of the relations of these beds, and whether they represent a series older than lower silurian . . . . is uncertain."

In the "Table of Geological Formations" given in Murray's "Geology and Physical Geography of Victoria"* these beds are spoken of as "Crystalline (Azoic)." He further speaks of the Lower Cambrian and Laurentian as "not yet recognised and probably not occurring in Victoria," and says: † "The metamorphic rocks of the series, among which may possibly be representatives of the Lower Cambrian and Laurentian groups, appear between the Wannon and Glenelg Rivers westward of the Grampians . . . . and in the north-eastern or Omeo district . . . . but in geological age they appear to be Silurian as regards the period of their deposition." From this it would appear that up to 1887 no evidence, beyond that of mere speculation, existed of true Cambrian rocks in Victoria. Sir F. McCoy, however, in 1892 published the following remarks: ‡ "Some specimens from a recently-observed group of rocks in the Heathcote district, which Mr. E. J. Dunn believed to be older than Silurian, were submitted to me to determine whether the markings were of organic origin. These were cylindrical, flexuous markings, from one to two, or scarcely three, inches in length, mineralogically different from the matrix. These markings are not organic in themselves, but are usually attributed to annelid burrows, and are common in Cambrian rocks. . . . . There is no reason for supposing from these specimens that the rock is older than Cambrian or Lower Silurian." I know of no other direct evidence of the supposed occurrence of Cambrian rocks in Victoria beyond this. Quite recently, however, Mr. E. Lidgey has expressed the opinion that Pre-Silurian rocks existed within the boundaries of Quarter Sheet No. 80, N.W. (Parishes of Heathcote, Costerfield, Knowlesley), in the neighbourhood of Mount Ida, but I am not aware that this was substantiated

* 8vo. Melbourne, 1887 (p. 16).

† *Loc. cit.* p. 33.

‡ Report on Palæontology of the Geological Survey for the Year 1891. *Ann. Report Secy. for Mines Vict.* for 1891 [1892], p. 30.

on anything more than mere stratigraphical evidence. Mr. Lidgey speaking of the metamorphic rocks of the area in question says:* "These rocks have already been reported on by Mr. E. J. Dunn, who classes them as Pre-Silurian," but I regret that I cannot at this moment call to mind the report of the latter gentleman. The Pre-Silurian rocks in question, Mr. Lidgey further adds, are succeeded by others of Lower Silurian age, occupying "rather less than one-fourth of the area mapped in this quarter-sheet, lying to the west of the Mount Ida Range, overlying the metamorphic rocks, and being covered on the west by glacial conglomerate (Mesozoic)." These micaceous mudstones are further stated to contain "casts of Trilobites." Whether the specimens about to be described are from the metamorphic area, or from the supposed Lower Silurian mudstones, I am unable to say, but I presume from the latter.

Again, Mr. W. H. Ferguson, reporting on the rocks at Dookie, says:† "The rocks which outcrop at Dookie township appear to belong to the same formation as a series of very ancient rocks which occur in the Heathcote district. They are quite distinct from the Silurian formation of the gold-fields, or from the granite and metamorphic rocks of the north-eastern district, or those of the county of Dundas." Lastly, Mr. James Stirling, in "Notes on the Silver Deposits and Limestone Beds of Waratah Bay,"‡ remarks that "the sedimentary deposits at Point Grinder, between Cape Liptrap and Waratah Bay, rest unconformably under [*sic*] hard felsitic rocks. . . . These may be either Silurian or Pre-Silurian." In sketch section No. 1, on the opposite page of this Report, these beds are indicated as Cambrian, pure and simple. On the next plate but one—a sketch of Waratah Bay—the same are presumedly given as Pre-Silurian, but again on the succeeding plate to this Mr. Stirling reverts to the use of the word Cambrian.

In January of last year (1894), Mr. Ferguson was good enough to forward to me a few Trilobite remains from near Heathcote, for an opinion as to their identity. In a letter, dated 19th January, he says:—"We think the rock is Lower

* Geol. Survey Victoria, Progress Report, viii., 1894, p. 44.

† Progress Report viii., *l.c.*, p. 44.

‡ *Ibid*, p. 68.

Silurian in which they occur." On 12th April of the same year Mr. Ferguson forwarded additional material, with the permission of Mr. R. A. F. Murray, Government Geologist. In this communication he remarked:—"The fossils were found and collected by myself in a very limited outcrop of shale near Heathcote. The rock is regarded by Mr. E. J. Dunn as Lower Silurian. It occurs between L.S. slates and a bed of conglomerate and breccia, and the fossiliferous U.S. sandstone beds of Mount Ida." On the 13th April, Mr. G. Lidgey kindly supplemented these fossils with others from the same locality—"N. 13° W. of Mount Ida, 230 chains."

On receiving these Trilobite remains, I at once saw that they had the aspect of very old forms, but neither the collections nor works of reference then at my command enabled me to determine their systematic position with accuracy. Grasping the fact that a very large amount of work amongst Cambrian Faunas had been accomplished by our American co-workers, I sent sketches, very carefully prepared by Mr. P. T. Hammond (late of the Geological Survey of New South Wales), to Mr. C. D. Walcott, Director of the U.S. Geological Survey, who has laboured very extensively amongst the life of these old rocks. In due time his reply came, to the effect that the "general facies of the specimens is so much like that of the Middle Cambrian Fauna, that I should not hesitate, were it found in America, to include it within it!" The sketches further impressed Mr. Walcott as representing forms such as occur in the slates of the Middle Cambrian of Newfoundland, New Brunswick, and the Rocky Mountains. In a second communication the same eminent authority observed:—"The fossils undoubtedly belong to the Middle Cambrian Fauna, as they are not of the type found in the Upper or Lower Cambrian." One of the sketches sent to him, Mr. Walcott definitely referred to the type of *Olenoides quadriceps*, Hall and Whitfield, sp., a Middle Cambrian species. This opinion, emanating from so high an authority as Mr. Walcott, cannot but have due weight.

The Trilobite remains consist wholly of portions of cephalic shields—the glabella—and pygidiums, with the exception of one or two indistinct fragments of free cheeks. They are all simply decorticated specimens, without any trace of the original test remaining, but even in this condition are fairly well preserved.

I have submitted these fossils to a most careful examination and long consideration, and having exhausted all means of comparison at my disposal, the conclusion is forced on me that they represent to us in Australia, at least, an undescribed genus. Neither do the specimens seem absolutely in accord with any of the American or European genera, descriptions of which are available. Under these circumstances, I propose describing the Heathcote Trilobites under the new name of *Dinesus*,* and the trivial appelation of *ida*, with the view of recording their place of occurrence. The combined generic and specific description will be followed by some observations on the alliances of the new genus.

DINESUS IDA, *gen. et sp. nov.*

Chars.—Cephalic shield sub-semicircular; frontal border raised, nearly straight centrally, separated from the glabella and fixed cheeks by a frontal furrow. Glabella oblong, or long oval, slightly convex, straight-sided, and rounded in front; no furrows: basal circumscribed lobes pyriform, separated completely from the glabella by deep grooves; axial grooves very wide and deep, bifurcating near the fore-end of the glabella, one branch proceeding round the latter and joining the frontal groove, the other round the fixed cheeks on each side, leaving between them and the frontal groove somewhat triangular circumscribed lobes. Fixed cheeks more or less elongately triangular, wider behind, very gently convex; eye-lobes small, slightly projecting; ocular ridges extending obliquely across the fixed cheeks to the anterior corners of the glabella; facial sutures convex in front of the eyes, curving inwards and cutting the frontal border in line with the outer edge of the fore circumscribed lobes, and, posterior to the eye-lobes convex also, dividing the posterior border of the head-shield near the position of the genal angles. Neck ring strong, convex, and devoid of a spine; neck furrow wide and flattened, the lateral furrows similar. Surface, although devoid of the test, frosted with minute granules.

Pygidium sub-semicircular to obtusely triangular, truncate behind; axis flattened, of five segments; pleurae flattened, of a

* ἡ νησος an island, and δι in allusion to the two basal circumscribed lobes.

similar number of coalesced segments, with a flattened limb produced into five or six short somewhat posteriorly-directed spines on each side.

This description, although imperfect in many respects, must suffice for the present, as it embodies all that can be gleaned from the specimens. For instance, we know nothing of the thorax, whilst the form of the free cheeks and condition of the genal angles, spined or not spined, is doubtful. The all-important points to be noted, however, are the facial sutures, simply convex before and behind the eyes, the peculiarly squarish-oblong outline of the glabella, triangular fixed cheeks, and the very straight run of the axial grooves, together with the entire absence of glabella grooves. These characters are supplemented by the presence of the anterior and posterior distinctly circumscribed lobes. The eye-lobes are certainly small and non-olenelloid in appearance. Associated with these glabellæ are pygidiums possessing few segments, and a fimbriated margin. The presence of a pleural groove is questionable.

The two pygidiums figured (Pl. I., Figs. 5 and 6) differ slightly in outline, the smaller being sharper at the anterior lateral angles, and more generally triangular in shape; this last point, however, may be only a matter of preservation. Furthermore, there are in one (Pl. I., Fig. 5) five lateral spines extending from the limb, and in the other (Pl. I., Fig. 6) six similiar appendages. Possibly the two may represent distinct species, but at this early stage of the enquiry it is impossible to arrive at a satisfactory conclusion.

The above points are those it will be necessary to use in comparing the Heathcote fossils with probable allies, or genera to to which they might possibly be referable. The genera it is my intention to bring into comparison with the fossils, irrespective of horizon within the Cambrian system, are: *Ptychoparia*, Corda; *Liostracus*, Angelin; *Solenopleura*, Angelin; *Bathyurus*, Billings; *Lloydia*, Vogdes; *Olenoides*, Meek; *Protypus*, Walcott; *Avalonia*, Walcott; and *Dorypyge*, Dames.

Although the form of the glabella in some apparently aberrant forms of *Ptychoparia* is similar to that in *Dinesus*, the pronounced strength of the glabella furrows, and the direction of the facial suture in the type species, *P. striatus*, Emmrich,

sp.,* curving as it does outwards anterior to the eyes, and from the glabella, will, I think, at once debar the Victorian fossils from incorporation in that genus, to say nothing of the entire margin of the pygidium in *Ptychoparia*. It is true that in a few species of the latter a glabella and fixed cheeks occur akin somewhat to those of *Dinesus*, for instance in the Lower Cambrian *P.? Fitchi*, Walcott.† The latter, however, departs in a very marked manner from the regular *Ptychoparia* type, and resembles our fossils in the "elongate, unfurrowed glabella, wide fixed cheeks, and granulose surface," and apparent absence of glabella grooves.

In *Liostracus* the similarity in the square-oblong outline, and unfurrowed state of the glabella in the type species, *L. aculeatus*, Angelin, and *L. muticus*, Angelin,‡ to that in *Dinesus* is strong, but the facial suture is organised on the same plan as in *Ptychoparia*, although, perhaps, to a lesser extent. Still, there is no trace either in *Ptychoparia* or *Liostracus* of the circumscribed lobes, and the pygidium in the latter again presents an entire margin.

Solenopleura, as exemplified by the type species *S. holometopa*, Angelin,§ possesses facial sutures as different to those of *Dinesus* as those of *Ptychoparia*. But Mr. Walcott has described two doubtful species, *S. ? nana*, Ford, and *S. ? tumida*, Walcott,‖ that certainly appear to be near our Trilobite, although Lower Cambrian forms, and which he admits "appear to belong to a genus distinct from the typical species of *Solenopleura*." One in particular (*S. ? tumida*) has small circumscribed lobes at the hinder portion of the glabella, moderately straight and parallel axial furrows, and small eye-lobes, but with fixed cheeks hardly as wide as in our specimens, and no frontal furrow to speak of. *S. ? nana*, on the other hand, possesses the latter, but no circumscribed lobes. In typical *Solenopleura* the margin of the pygidium is again entire.

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* See Barrande, Syst. Sil. Boheme, 1852, I., t. 14, f. 1-7; Walcott, Bull. U.S. Geol. Survey, 1884, x., t. 6, f. 4.

† 10th Ann. Report U.S. Geol. Survey, 1890, p. 650, t. 96, f. 5.

‡ Pal. Scandinavica, 1854, Pt. II., p. 27, t. 19, f. 2 and 3.

§ Pal. Scandinavica, Pt. II., 1854, p. 26, t. 18, f. 8.

‖ 10th Ann. Report U.S. Geol. Survey, 1890, p. 658, t. 98, f. 1 a-c, 2, 3, 3a.

In connection with the last-named genus, a very interesting group of Trilobites described by the late Mr. Billings as *Bathyurus** must be referred to. Unfortunately, many of the species placed by Billings in *Bathyurus* seem to belong to other genera; certainly the earlier described species† differ a good deal from the later, although Vogdes, in his admirable "Bibliography of the Palæozoic Crustacea" (2nd edition),‡ retains most of them under the old name. Walcott, however, remarks§: "Solenopleura appears to be of the same character as many of the species placed under the genus Bathyurus by Mr. Billings, and I think can be used for such forms as *Bathyurus gregarius*, Billings, and nearly all the species referred to the genus Bathyurus from the Cambrian."

Many of Billings' *Bathyuri*, more especially the later-described ones, such as *B. capax*, *B. dubius*, *B. Saffordi*, *B. Cordai*, and *B. quadratus*,‖ possesses the same square-oblong glabella as *Dinesus*, but comparatively small fixed cheeks, and quite different facial sutures, the latter being straight and almost parallel to the axial grooves. The same objection also applies to those that I have previously mentioned in the case of other Trilobites, viz.—the entire absence of the circumscribed lobes. There is one species, however, *B. bituberculatus*, Billings,¶ that possesses these lobes at the base of the glabella, and on this account has been separated by Capt. Vogdes as a distinct genus, under the name of *Lloydia*.†† Indeed, perhaps, the before-mentioned Trilobite, *Solenopleura ? tumida*, in which the basal lobes are also developed, will fall into *Lloydia* as well, although it must be mentioned that in *S. ? tumida* there are ocular ridges, whilst in Billings' species these are not represented. In the absence of these ocular ridges and the anterior circumscribed lobes, and its perfectly concave facial sutures, *Lloydia* differs essentially from *Dinesus*.

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* Pal. Foss. Canada, Pt. 5, 1865, p. 409.

† Canadian Nat. and Geol., 1859, iv., p. 364.

‡ Occasional Papers, Californian Acad. Sci., 1893, iv., p. 280.

§ Bull. U.S. Geol. Survey, 1884, No. 10, p. 36.

‖ Pal. Foss. Canada, Pt. V., 1865, p. 409, 411.

¶ Pal. Foss. Canada, Pt. V., 1865, p. 409, f. 391.

†† Bull. U.S. Geol. Survey, 1890, No. 63, p. 97.

In *Olenoides*, Meek, taking the type species, *O. typicalis*, Walcott,* I fail to trace any resemblance to our fossils, for, although the glabella is square-oblong, with parallel straight sides, the furrows on the glabella are well-marked; there are no circumscribed lobes; the eye-lobes are very long, approaching those of *Olenellus*, whilst the fixed cheeks and facial sutures are quite unlike those of *Dinesus*. On the other hand, the pygidium in *Olenoides* is provided with spines along the margin. When, however, we examine *O. quadriceps*, Hall and Whitfield, sp., the form indicated by Mr. Walcott in his letters to me, the resemblance is very much stronger. There is the same almost quadrate, or square-oblong glabella, straight parallel sides, small eye-lobes, but with faint grooves on the glabella, and no circumscribed lobes. Whilst admitting a resemblance, it does not seem to me to be of that intimate character necessary for the incorporation of our specimens in the same genus with *O. quadriceps*. At the same time the latter does not strike me as possessing much in common with *Olenoides*, as typified by *O. typicalis*, Walcott.

Dames refers *O. quadriceps* to his genus *Dorypyge*;† but Walcott‡ thinks that the latter may be only synonymous with *Olenoides*. As defined by its author, *Dorypyge* possesses three pairs of glabella furrows, and a facial suture not unlike that of my proposed new genus, but without any trace of circumscribed lobes. On the other hand the margin of the pygidium, as in *Dinesus*, is spined, and closely allied to that of the latter. As regards *Dorypyge* generally, Mr. Walcott makes the following remarks:§ "I have placed the two species‖ under the genus Olenoides while waiting for proof of the character of the border of the pygidium of the genus. I have very little doubt of its being spinous, and if it is so, the species described by Dr. Dames will probably fall within its limits, and the genus Dorypyge be placed as a synonym of Olenoides. In the event of *Olenoides nevadensis* being generically distinct from *Dorypyge Richthofeni*,

* Bull. U.S. Geol. Survey, 1886, No. 30, p. 183, t. 25, f. 2. The actual type of the genus is *O. nevadensis*, Meek, but of this the cephalic-shield is unknown.

† Richthofen's China, 1883, iv., p. 23.

‡ Bull. U.S. Geol. Survey, 1886, No. 30, p. 222.

§ Bull. U.S. Geol. Survey, 1886, No. 30, p. 222.

‖ *Olenoides quadriceps*, H. and W., and *O. wahsatchensis* (=*Dikelocephalus? gothicus*, H. and W.)

Dames, then *Olenoides typicalis*, *O. Marcoui*, *O. spinosus*, *O. levis*, *O. flagricaudus*, *O. expansus*, *O. quadriceps*, and *O. wahsatchensis* may be referred to the genus Dorypyge." It will be observed that Mr. Walcott here suggests the possibility of *Olenoides quadriceps*, the presumed ally of our Heathcote fossils, being a *Dorypyge*.

Protypus, Walcott,* is another peculiar genus. One of its species, *Bathyurus senectus*, Billings,† resembles our fossils quite as much as does *Olenoides quadriceps*, although the type of the genus, *P. Hitchcocki*, Whitfield,‡ does not. In *P. senectus* we observe the same peculiar glabella, fixed cheeks, and small eye-lobes, but there is neither frontal groove, circumscribed lobes, nor ocular ridges. The pygidium of this species is unknown, but in the type of the genus it is small, and with an entire margin.

Avalonia, Walcott, with *A. manuelensis*§ as its type, although a Lower Cambrian form, may be referred to in passing from the similarity of its glabella to that of *Dinesus*, but three pairs of grooves are said to be present, and possibly a long narrow eye-lobe, as well as a peculiar narrow furrow on each fixed cheek between the axial grooves and the facial sutures, occupying the position of the ocular ridges.

Lastly, from *Protolenus*, Matthew,* the new genus differs much in the same way as from *Ptychoparia*, except that, as in the latter, the eye-lobes are short and small.

It may be that I have laid too much stress on the presence of the supplementary circumscribed lobes, but these, taken in conjunction with the form of the glabella and fixed cheeks, small ocular lobes, and the direction of the facial sutures, lead me to regard these Victorian Trilobites as generically distinct, not only from *Olenoides*, the genus suggested by Mr. Walcott, but also from any others I have been able to study through the works of reference at my command.

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* Bull. U.S. Geol. Survey, 1886, No. 30, p. 211.

† Bull. U.S. Geol. Survey, 1886, No. 30, p. 211, t. 31, f. 2, a-c.

‡ Bull. U.S. Geol. Survey, 1886, No. 30, p. 211, t. 31, f. 4.

§ 10th Ann. Report U.S. Geol. Survey, p. 646, t. 95, f. 3, 3a.

‖ Bull. Nat. Hist. Soc. N. Brunswick, 1892, No. 10, p. 34.

How far the presence of *Dinesus* alone will tend to prove the occurrence of a Cambrian area in Victoria, future research in the field must prove, but it lends colour to such a suggestion, and this is supported by the association of the Trilobites with a little Brachiopod of a decidedly Cambrian type. This will be referred to again.

Touching the other Trilobites of Cambrian age that have already been described from Australian rocks, the following remarks may be made :—No relation exists between *Dinesus* and *Protolenus Forresti*, Foord, from the Cambrian rocks of Kimberley, nor is it directly related to either of the species from the Parara Limestone of Yorke Peninsula, South Australia, viz.: *Ptychoparia australis*, Woodw., *Dolichometopus ? Tatei*, Woodw., *Olenellus ? Pritchardi*, Tate,* or *Microdiscus subsagittatus*, Tate.

The Tasmanian species from the Caroline Creek series are much more difficult of comparison from their poor state of preservation. Amongst them there seems to be a *Ptychoparia* or *Protolenus* (*P.? Stephensi*, Eth. fil.), and a possible *Dikelocephalus* (*D. ? tasmanicus*, Eth. fil.), with several other peculiar forms. Of the latter, little definitely can be said at present, for my paper† was founded on very poor and indefinite material, as evinced by the fact that I did not attempt to name the glabellæ (for such is their nature) in question. There is now, however, this amount of interest about them, that in all four the glabella is very much akin to that of *Dinesus*, but two possess well-marked furrows; a third has circumscribed basal lobes and no furrows, and may *possibly* be allied to Vogdes' *Lloydia ;* whilst the fourth is furnished with neither lobes nor furrows of any kind. There for the present the comparison must rest.

The little Brachiopod referred to on a previous page consists of the specimen and its counterpart. It is quadrate in form, and measures only 7 mm. in length. It probably represents the two valves crushed together, with a nearly horizontal hinge line, and showing through the substance of the shell a strong septum, probably that of the dorsal valve. It is covered with very delicate concentric lines, representing the original sculpture of

* This Trilobite seems to me hardly separable from *Dolichometopus Tatei*, Woodw.

† Papers and Proc. Roy. Soc. Tas. for 1882 [1883], p. 156, t 1, f. 8–11.

the surface. A tentative opinion, however, can only be passed as to the identity of this little fossil; but on passing in review the lower forms of Brachiopod life, one is struck with the resemblance, in a general sense, with two genera described by Dr. Waagen from the Cambrian series of the Salt Range, India, viz.—*Neobolus** of the family Obolidæ, and *Lakhmina*, Oehlert;† a member of the Trimerellidæ. No trace of internal structure being preserved in our fossil beyond a septum, as previously stated, it is impossible to decide satisfactorily to which of the two it is most nearly allied. Viewed exteriorly, the resemblance to *Lakhmina linguloides*, Waagen,‡ is very strong, particularly in the form and sculpture. It is, therefore, quite possible that it may be referable to this curious genus. At any rate, it is a form entirely new to Australian Palæontology, and I am much indebted to my assistant, Mr. W. S. Dun, for the trouble he has taken in unravelling its possible affinity.

The drawings have been executed with care and exactitude by Mr. Edgar R. Waite, to whom I also beg to express my thanks.

DESCRIPTION OF PLATE.

Dinesus ida (Eth. fil.).

Fig. 1.—Glabella and fixed cheeks, with circumscribed lobes, frontal border, neck-ring, and ocular ridge on the left fixed cheek.

Fig. 2.—A smaller but similar specimen.

Fig. 3.—Glabella and fixed cheeks, with the anterior circumscribed lobes, and the left ocular lobe.

Fig. 4.—Specimen similar to Fig. 1, somewhat obliquely pressed, showing distinctly the left eye lobe and ocular ridge.

Fig. 5.—Pygidium of five coalesced segments, but wanting the posterior apical margin. The limb is produced into five spines.

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* Pal. Indica (Salt Range Fossils), 1885, I., Pt. 4, fas. 5, p. 756.

† Waagen, *loc. cit.*, 1889, iv., Pt. I., p. 81; 1891, iv., Pt. 2, t. 2, f. (= *Davidsonella*, Waagen, non M. Chalmas, *ibid*, 1885, I., Pt. IV., fas. 5, p. 761.

‡ *Loc. cit.* 1891, iv., Pt. II., t. 2, f. 3 and 4 (= *Davidsonella linguloides*, Waagen, *ibid*, 1885, I., Pt. IV., fas. 5, p. 764, t. 85, f. 3-6.

Fig. 6.—A smaller and somewhat more triangular tail, also of five segments, but with six lateral spines.

Fig. 7.—Pustular ornamentation of the glabella and fixed cheeks.

Lakhmina ? sp.

Fig. 8.—One or two (?) compressed valves showing a strong septum through the test, also a fine concentric line sculpture.

Figs. 1, 6, and 7 are magnified twice.

Fig. 8 highly magnified.

Art. V.—*Note on the Customs connected with the use of the so-called Kūrdaitcha Shoes of Central Australia.*

By P. M. Byrne.

(Communicated by Professor Spencer).

[Read November 14th, 1895.]

The following notes were written in 1892 in response to the request of a correspondent, and are the result of careful inquiries conducted amongst the blacks in the Charlotte Waters district. As they have been gathered at first hand and are somewhat more detailed than any yet published, it has been suggested to me that it would be worth while placing them on record.

I have been for many years well acquainted with the natives of this district, but owing to the fact that it is now more than twenty years since the custom was practised, considerable care has to be taken in order to secure authentic information. Any blackfellow will give the inquirer replies to his questions, but it is only after making a great number of inquiries and obtaining corroboration from various sources that it is possible to arrive at a conclusion as to what is and what is not reliable information.

There are in this district only two old men who have ever worn the shoes themselves; the younger men only know of the custom from the elders of the tribe, and in a few years it will probably be forgotten. The shoes are now only made to supply the orders of the whites, or perhaps to enable the old men to illustrate the deeds of other days before the half-admiring, half-sceptical members of the younger generation.

The shoes themselves have been previously described. They consist of a sole made of human hair and a great number of intertwined emu feathers, a certain amount of human blood being used as a kind of cementing material. The whole form a large pad, flat above and convex below, with the two ends rounded off so that there is no distinction between them. The upper part is in the form of a net, made of human hair, with a central opening for the foot, across which stretches a cord of hair which serves as a strap for the instep.

The shoes themselves in this district are known by the name of "Urtathurta," and the occasion on which they were used is spoken of as "Kūrdaitcha lūma" (Kūrdaitcha—a bad or evil spirit, and lūma, to walk).

The wearing of the Urtathurta and going Kūrdaitcha lūma appears to have been the medium for a form of vendetta, though it was quite distinct from the "Adninga" or war party which was always despatched to avenge the death of a native supposed to have been killed by spells or to recover a lubra who had been stolen.

When any native threatened the life of a member of a different tribe, the threatened man could await his enemy's attack or take the initiative himself. If he decided upon the latter course the medicine man was consulted and a "Kūrdaitcha lūma" arranged. In either case the attacking native was called Kūrdaitcha. A medicine man always accompanied the latter, and both were similarly attired.

The head-dress worn consisted of a bunch of feathers in front and a bundle of green leaves behind. As a disguise the face was blackened with charcoal, the whiskers tied back behind the neck, and a broad white stripe of powdered gypsum was drawn from the top of the forehead down the nose to the bottom of the chin, while a similar stripe extended across the chest from shoulder to shoulder.

A girdle made from the hair cut from the head of a blackfellow after death was worn round the waist. This special form of hair girdle is supposed to serve the double purpose of increasing the strength of the wearer, his courage, and the accuracy of his aim —it embodied, in fact, all the warlike attributes of the dead warrior—and at the same time it produced inaccuracy of aim in the enemy.

Ordinary hair-string was worn round the legs for the purpose, as the blacks say, of protecting them against snake-bite.

Both medicine man and Kūrdaitcha carried a sacred stone, the possession of which is supposed to be even more efficacious than that of the hair girdle.

In addition, the medicine man carried in his girdle a live lizard.

On leaving his camp the Kūrdaitcha walked in front, followed at a short distance by the medicine man, both armed with spears,

and carrying the Urtathurta, or shoes. When hidden from view of the camp they put on the shoes, and proceeded towards the enemy's camp. The Kūrdaitcha always led the way, and every precaution was taken to prevent their advance being seen. On arriving at the camp the Kūrdaitcha crept forward alone, holding the sacred stone between his teeth, and (if successful) speared his enemy dead. The medicine man then came up and inserted the head of the lizard which he carried into the wound. The lizard was supposed to drink up the blood, and so to remove evidence of the manner in which the deed had been done. Sometimes the wound was seared to prevent its being recognised as a spear wound. Almost invariably the attack was made at night and, when successful, the Kūrdaitcha and medicine man started back at once, halting some distance from their camp to remove and conceal the shoes before going in. If by chance the tracks of the Kūrdaitcha were seen they were avoided, and the threatened camp merely kept on the alert. If the Kūrdaitcha himself were seen in the vicinity of the camp he was at once attacked and, if possible, killed. The medicine man who accompanied him was, in all cases, allowed to return uninjured to his camp.

When the body of a man murdered by a Kūrdaitcha was discovered no attempt was made to track the latter, but the medicine man immediately appointed a relative of the murdered man or, failing a relative, one of the same group (a Kūmarra if he were a Kūmarra or a Panunga if he were a Panunga, etc.) to avenge him. This was done by going as a Kūrdaitcha in the way described. If the Kūrdaitcha were unable to find the particular man he wanted he would spear a man belonging to the same tribe, but this seems to have been of rare occurrence.

Immediately a Kūrdaitcha was seen near a camp the man who detected him informed the others of the fact by saying, "Udnurrah pitchimi" (Udnurrah, a wild dog; pitchimi, is coming). He did not mention the word Kūrdaitcha, but his meaning was understood and preparations were made for an attack on the Udnurrah. In this connection one of the head men of the tribe informed me that, when a blackfellow reported "Udnurrah pitchimi" the medicine man could appoint a Kūrdaitcha who had the power of accosting the other Kūrdaitcha and of compelling him to return to his camp, but I have been

unable to fully corroborate this, though it seems possible that, when the custom prevailed to an abnormal extent, such a course was adopted to prevent excessive bloodshed.

It is usually stated that the object of the curious shape of the shoes was to prevent the tracks of the Kūrdaitcha from being recognised. This may have been the case to a certain extent, but at the same time it must be remembered that in certain respects the blacks have a very powerful imagination, and their idea of not being able to track a Kūrdaitcha is very possibly an example of this. There is practically little doubt but that if a blackfellow really tried to track a Kūrdaitcha he would do so well enough—a stick or a stone turned out of the way or the nature of the impress of the rounded sole in sand would be quite sufficient clue to an expert tracker, such as these natives are, to show him the direction in which the Kūrdaitcha had passed. Most probably it is, one might call it, an article of faith that a Kūrdaitcha cannot be tracked. There is something mysterious about him—he wears the sacred stone and hair girdle which are supposed to give him special powers ; the carrying of a sacred stone when fighting is even supposed to make a man invisible to his enemies, and he commits the deed under the cover of darkness.

It would probably be more correct to say, not that the wearing of the shoes makes it impossible to track the Kūrdaitcha, but that the blacks make themselves believe that it does so.

Art. VI.—*Notes on Didymograptus caduceus, Salter, with Remarks on its Synonymy.*

By T. S. Hall, M.A.

Demonstrator and Assistant Lecturer in Biology in the University of Melbourne.

[Read November 14th, 1895.]

This species is very well known to Australian geologists, its occurrence in Victoria having been announced by Professor Sir Frederick McCoy in 1861,* and in 1875 he figured it in his Prodromus of the Palæontology of Victoria,† giving at the same time a very full and careful description, and enumerating several of the variations under which it presents itself.

While it is fairly constant in form, it shows a great range of variability in several points, such as the width of the stipe, the number of hydrothecæ in a given length, and the size of the sicula. In one point I have, however, not been able to confirm the exactness of the figures in the Prodromus, though, as will be presently seen, I do not deny the possibility of the occurrence of specimens exhibiting this feature.

The examination of a large series has shown that the first two hydrothecæ formed are in contact by their inferior margins for from about a quarter to three-quarters of their length, leaving between the outer extremities of these margins a more or less deep, acute, V-shaped space, the apex of which is rounded, probably by an extension of the periderm between the two hydrothecæ. In one example from Castlemaine the margins only of the hydrothecæ are preserved in this region, being shown as a fine black line. In this specimen the concrescence of the margins of the first two hydrothecæ is clearly seen for a portion of their length; they then diverge, leaving between them a space which is acutely pointed below, no extension of the periderm being seen. From its position, immediately over the broad extremity

* Exhibition Essays, 1861, p. 161, reprinted in A.M.N.H., vol. ix., 1862.

† Decade II., plate xx., figs. 3, 4, 5.

of the sicula, it is improbable that the slight extension of the periderm represents a median azygos hydrotheca, and from the fact that it is clearly seen to be closed below in some specimens it cannot represent the upper open end of the sicula. The figures in the Prodromus, above alluded to, apparently show the first two hydrothecæ in contact by their inferior margins throughout their whole length, and since they are certainly in contact in most specimens for a part of their length, there is nothing inherently improbable in this occurrence; still, I have not seen an instance of it. Sir Frederick McCoy has kindly allowed me to examine closely the examples of this species in the National Museum, including the two larger specimens figured in the Prodromus. The specimen from which figures 5 and 5*a* were taken could not, however, be identified. The two larger specimens figured are not sufficiently well preserved to allow of an expression of opinion one way or the other. All the well-preserved specimens in the Museum showed the character I have drawn attention to. Nearly 150 specimens in my own collection and ninety-six in the collection of Mr. G. B. Pritchard (which were kindly placed at my disposal by him) showed the same structure. Mr. J. A. Atkinson has obligingly examined about fifty examples which he has from Castlemaine, and has shown me four in which the separation of the distal ends of the margins is not clear; but as the examples are not very well preserved, and are, I think, slightly distorted, they cannot be taken into account. Thus in fully 300 examples which were in a fairly good state of preservation the character is constant, and the only specimens in which it was not clearly shown were either damaged, weathered, or distorted by cleavage.

Dr. Perner has recently figured two examples from Bohemia,* which are, however, so imperfectly preserved and distorted in the sicular region that the original form of this portion is quite indecipherable.

Synonymy.

Considerable confusion exists as to the generic position and correct name of this species. *Didymograptus caduceus* was

* Etudes sur les Graptolites de Bohême, 2ième partie, pl. vi., figs. 9, 10, 11.

originally founded by Salter on some specimens from Canada submitted to him by Dr. Bigsby,* and was subsequently recognised by its describer in the Skiddaw slates of England.† James Hall‡ referred Salter's species to a form which he named *Graptolithus bigsbyi* (a Tetragraptus), and which appears to be regarded by some authors as a synonym of *T. bryonoides* (*T. serra*).

If the reference were correct, then Salter's name should stand and not Hall's, a fact already pointed out by Herrmann.§ However, the identity is by no means clear. Salter's figures plainly show a form in which the width of the stipe immediately over the sicula is as great as that of its more distal portion; while from the minor end of the sicula the prolongation of the virgula, so characteristic of the species, is represented as a fine, hair-like line; moreover, he begins his description with the words "D. stipite filiformi longo." In Hall's figures, on the other hand, the median process is clearly a third branch, and in no way resembles the delicate thread shown by Salter, and which in our specimens is certainly not a branch.

Professor H. A. Nicholson, in his paper on the Skiddaw graptolites,‖ states that from an examination of *Tetragraptus bryonoides* he is inclined to agree with James Hall, and refer all the specimens in the *caduceus* form which he has seen to that species. At the same time he says that "whilst it is possible that there may really exist a distinct species with the characters of *D. caduceus*, Salter, it certainly appears not to occur in the Skiddaw slates, since all the specimens which could be referred to this species, when well preserved, show traces of a third and even sometimes of a fourth stipe." At a subsequent date¶ he found a species in the Skiddaw slates which seems to agree perfectly with Salter's Canadian species. This species he named *D. gibberulus*. As a justification of his position he says that

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* Quart. Journal Geol. Society, ix., p. 87.

† *id.*, xix., p. 136.

‡ Graptolites of the Quebec group, pp. 42, 87.

§ See Geological Magazine for 1886.

According to Perner (Etudes sur les Grap. de Bohême, pt. ii., p. 20) the reference to the species as *Tetragraptus caduceus* is due to Brögger, but the paper by the latter author is inaccessible to me, and as Perner's paper only arrived in Melbourne the day before this article was appointed to be read, I have left the reference as it stands.

‖ Quart. Jour. Geol. Soc., vol. xxiv., pp. 131-133.

¶ Annals and Mag. Nat. Hist. 4, xvi., 271.

Salter's *original* specimen was beyond doubt an example of *Tetragraptus bryonoides* or *T. bigsbyi*, and that Salter then confused an English species with it. It seems to me, however, that Professor Hall has by no means proved that Salter made a mistake, for he apparently did not see Salter's species—at any rate, he does not figure it. The Skiddaw slates and the Quebec group are on the same horizon, so there is nothing improbable in Salter's species being found in England. From this it would appear that *D. gibberulus* must be relegated to synonymy, for it does not seem separable from *D. caduceus*.

Mr. R. Etheridge, jun., in his paper on the Victorian graptolites,* when dealing with *T. bryonoides*, accepts the decision that *D. caduceus* is referable to that species. At the same time he suggests the advisability of keeping Salter's name for a variety which he recognises as constant in its characters, and as agreeing with Salter's figures and descriptions.

In a previous paper† I tacitly accepted the identity of *Tetragraptus bigsbyi* and *Didymograptus caduceus*, and, as Salter had clear priority, called the species *T. caduceus*, in this following Herrmann's lead. At the same time I kept *T. bryonoides*, Hall, (= *T. serra*, Brong.) distinct. I now regard Salter's species as a clear *Didymograptus*. I examined a very large number, probably some thousands, in the field during my residence in Castlemaine, where it occurs in profusion, and gathered every specimen that appeared to point to its being a *Tetragraptus*. These I have repeatedly examined carefully and without any hesitation refer all the forms with more than two arms to *T. serra*, Brong. The distinguishing points are just those that Professor Nicholson drew attention to when describing *D. gibberulus*. The distinction is that the first developed hydrothecæ of *D. caduceus* are as large as any subsequently formed, and that their long axis agrees with that of the sicula; whereas in *T. serra* (= *T. bryonoides*) they are invariably much smaller and diverge greatly from the sicular axis usual in Didymograpti. The result of this is that the stipe of the latter species is much contracted or narrowed in the sicular region, while in the former species it practically reaches its full width at once.

* Annals and Mag. Nat. Hist., 4, iv. † Proceedings Royal Soc. Victoria, 1894.

The Synonymy may then be expressed as follows:—

Didymograptus caduceus, Salter.

Didymograptus caduceus, Salter, Q.J.G.S., ix., 87, fig. 1, *id.* xix., p. 136, figs. 13*a*, *b*; McCoy, Prodromus of the Palæontology of Victoria, Decade ii., pl. 20.

Graptolithus bigsbyi, pars. J. Hall, Grap. Quebec Group, pp. 42, 87.

Tetragraptus bryonoides, pars. Nicholson, Q.J.G.S., xxiv., pp. 131, 133; R. Etheridge, junior, Ann. and Mag. Nat. Hist., 4. iv., pl. iii., figs. 3, 4.

Didymograptus gibberulus, Nicholson, A.M.N.H., 4, xvi., p. 257.

Tetragraptus caduceus, Herrmann, Nyt. Mag. for Naturvid, xxix., translated in Geol. Mag., 1886; ? Brögger, Die Silurischen Etagen im Christianiagebiet.

Art. VII.—*A Revision of the Fossil Fauna of the Table Cape Beds, Tasmania, with Descriptions of the New Species.*

(Plates II., III., IV.).

By G. B. Pritchard,

Lecturer in Geology, Working Men's College, Melbourne.

[Read 10th October, 1895.]

The present paper is the outcome of the study of the very fine collection of fossils from the Table Cape beds made by Mr. E. D. Atkinson. The collection was some short time ago left in the charge of Mr. C. French, Government Entomologist, through whose kindness and influence the request of Professor Spencer that the collection should be deposited on loan in the Biological Museum at the Melbourne University, to be named and worked out, was at once complied with. I have to thank these gentlemen for allowing me the privilege of attempting the work. The collection is made up as follows:—Gastropoda, ninety-two species; Lamellibranchiata, thirty-nine species; Brachiopoda, seven species; Echinodermata, three species; Corals, three species; making a total of 144 species, including among the mollusca twenty new species and two new varieties, which are herein described.

I have given full references to each described species and remarks on the species where deemed necessary, and wherever I have departed from the usual identifications I have given my reasons in full for so doing.

During the study of the above I thought it well to find out what further material might be obtained from the collection from this locality presented by Mr. Gronow to the Ballarat School of Mines Museum, accordingly I obtained from Mr. Alex. Purdie, the present curator, a list of their fossils, which number fifty-one species, the more important of which, for my present purpose, were very kindly forwarded to me for examination. I tender Mr. Purdie my best thanks for his ready response.

Upon asking the former curator, Mr. F. M. Krausé, who was responsible for the naming of the Ballarat collection, he informed me that it was examined and named by himself.

There appear, however, to be only three additional species to those in the Atkinson collection, and these I have referred to in what follows.

Having gone so far, I have thought it well to add as an appendix as complete a list as possible of the records from these beds. This appended list includes 114 species, and in the classes I have not touched in this paper Mr. R. M. Johnston records twenty-three species. We have thus the grand total of 281 species referable to this horizon. The complete summary being—

Mammalia	1
Pisces	3
Cephalopoda	1
Gastropoda	153
Lamellibranchiata	65
Brachiopoda	17
Polyzoa	9
Echinodermata	3
Zoantharia	19
Foraminifera	10
	281

From this it can be seen that we have 219 species of mollusca proper, and included amongst these there are seven living species. As, however, two of the latter, namely, *Limopsis aurita* and *Chamostrea albida*, are exceedingly doubtful records, it is, I think, reasonable to leave them out of consideration for the present. Taking into account, then, the remaining five, the percentage of living species for these beds is just about a fourth over two per cent.

When it is taken into consideration that as many as twenty different living molluscan species have been recorded as occurring in these beds, and that subsequent examination of the shells has brought this list down to the above, we are not surprised at the confusion that has existed as to the age of the beds.

For the geological features of the Table Cape beds we are indebted to Mr. R. M. Johnston, who has given full details in his papers contributed to the Royal Society of Tasmania, yet when writing these papers he was in no wise certain as to the correct age to which they should be assigned.

In 1876* Mr. Johnston was of the opinion that sufficient was not then known of either the living or extinct forms, and on that account any attempt at classification would be premature and misleading.

In 1879† Mr. Johnston states :—"Of the testacea only about five per cent. are known to exist. This continual lessening of the percentage of living to extinct forms as our knowledge increases is most significant. According to the principle which has been adopted by Mr. Lyell, and through him by nearly all the English geologists, this low percentage of living representatives indicates rather more an eocene than a miocene age for our marine beds at Table Cape."

In 1884‡ the same author remarks :—"If we are not prepared to reject the *percentage* method in the determination of the great divisions of the tertiary period, we must assuredly refer the Table Cape beds not to the *miocene*, but to the *eocene* or "early dawn" of the tertiary period in Australia. Also : "The investigations carried on by Professor Tate and other indefatigable workers since that time [1879] have placed this matter beyond all reasonable doubt, and now there is every reason to believe that the Table Cape beds, with their Australian equivalents, mark the earliest dawn of the eocene period in Australia."

Yet following this, in 1887,§ and again in 1888,‖ Mr. Johnston seems to have had some misgivings, as he apparently could not then see his way clear to adopt any more definite classification for the Tasmanian tertiaries than that indicated by the introduction of such terms as palæogene and neogene.

From the percentage of living species herein stated it can, I think, be seen that we cannot do otherwise than regard these beds as of eocene age. I am also of the opinion that further investigation of the fauna of these beds will tend rather to lower

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* Proc. Roy. Soc. Tas., 1876, p. 89.
† *Op. cit.*, 1879, pp. 86, 87.
‡ *Op. cit.* 1884, p. 224.
§ *Op. cit.*, 1887, p. 135 *et seq.*
‖ Geology of Tasmania, p. 208 *et seq.*

than raise the percentage of living forms, for it is a very noticeable and important fact that in the collection at present under examination, although it consists almost wholly of large species, there are upwards of twenty new forms included in less than 150 species. When the small shells are more thoroughly known, the list of species ought to be very materially increased; and judging from the fauna of similar beds in Victoria, the recent species are not likely to be largely increased, if at all.

Mr. Johnston's section* of the Table Cape beds is as follows:—Cap of recent basaltic tuff and wacke, 80 feet; calcareous sandstone and frequent bands, containing abundant remains of corals, echinoderms, and brachiopods, 78 feet; Crassatella bed, 80 feet, which apparently indicates a thickness of 158 feet for the marine beds; yet subsequently† the same author states that "nowhere along the Tasmanian coast does the marine group exceed 70 feet in thickness." I fail to comprehend what this means. The present collection of fossils came principally from the lower deposits locally known as the Crassatella bed, and judging from the fossils I regard this zone as the direct equivalent of the so-called middle beds of the Spring Creek section in Victoria. The coarseness of the material in which a number of the Table Cape fossils is preserved, the worn character of many of the species, and the abundance of fragments of shells, clearly indicate the littoral character of the deposit, and as an attendant fact of some importance we have certain faunal characteristics indicative of the same feature. On the other hand the clayey portions at least of this zone at Spring Creek do not appear to have been quite so close to land, as evidenced by the finer sediments, and the absence hitherto of any specially littoral fossil forms. The comparatively slight differences existing between these two representatives of what I regard as the same zone appear to me to be adequately accounted for by the fact that the one set of deposits was laid down very much closer to the then existing shore line than the other.

Another representative of this horizon in Victoria appears to be the clay beds of Cape Otway, as evidenced by the fossils

* Proc. Roy. Soc. Tas., 1876, section opposite p. 90.

† Geology of Tasmania, pp. 244, 245.

recently recorded by Messrs. Tate and Dennant.* The upper calcareous sandy beds at Table Cape most probably belong to the same horizon as the Crassatella beds, merely showing a certain amount of lithological variation, a feature which is also well displayed in this zone at Spring Creek.

The types of the species described in this paper, unless otherwise stated, are at present deposited on loan in the Biological Museum of the University of Melbourne.

List of Abbreviations.

P.R.S.Tas. = Proceedings of the Royal Society of Tasmania.

P.R.S.N.S.W. = Proceedings of the Royal Society of New South Wales.

Trans. Phil. Soc., S.A. = Transactions of the Philosophical Society of Adelaide.

T.R.S.S.A. = Transactions of the Royal Society of South Australia.

Trans. N.Z. Inst. = Transactions of the New Zealand Institute.

A.M.N.H. = Annals and Magazine of Natural History.

Prod. Pal. Vic. = McCoy's Prodromus of the Palæontology of Victoria.

Geo. Tas. = Geology of Tasmania, 1888, by R. M. Johnston.

Q.J.G.S. = Quarterly Journal of the Geological Society of London.

Akad. d. Wiss. = K.K. Akademie der Wissenschaften, Wien.

Cat. Aust. Foss. = Catalogue of Australian Fossils, by R. Etheridge, jun.

Gast. I. = Transactions of the Royal Society of South Australia, vol. x., 1888. Gastropoda of the Older Tertiary of Australia, part i., by Professor Ralph Tate.

Gast. II. = *Op. cit.*, vol. xi., 1889, Gastropoda, part ii.

Gast. III. = *Op. cit.*, vol. xiii., part ii., 1890, Gastropoda, part iii. Plates deferred to vol. xv., part i., 1892.

Gast. IV. = *Op. cit.*, vol. xvii., part ii., 1893, Gastropoda, part iii.

Lam. I. = *Op. cit.*, vol. viii., 1886, Lamellibranchs, part i.

Lam. II. = *Op. cit.*, vol. ix., 1887, Lamellibranchs, part ii.

* Trans. Roy. Soc. S.A., 1895, vol. xix., pt. i., p. 3 *et seq.*

TABLE CAPE FOSSILS.

GASTROPODA.

1. Murex (Pteronotus) calvus, Tate.

Id., Tate, Gast. I., 1888, p. 96, pl. i., fig. 11.

2. Murex (Phyllonotus) eyrei, T. Woods.

M. eyrei, T. Woods, P.R.S. Tas., 1876, p. 93.

M. (Phyllonotus) eyrei, Tate, Gast. I., 1888, p. 103, pl. iv., fig. 8.

M. eyrei, Johnston, Geo. Tas., 1888, p. 237.

Observations.—The shell figured by Mr. R. M. Johnston in his Geology of Tasmania, plate xxxi., figs. 3 and 3*a*, and referred to in the explanation of the plate as *M. eyrei*, T. Woods, is not that species, but may probably represent *Rapana aculeata*, Tate, which also occurs in the Table Cape beds.

3. Murex minutus, Johnston.

Id., Johnston, P.R.S. Tas., 1879, p. 32.

Id., Tate, Gast I., 1888, p. 107, pl. x., fig. 14.

Id., Johnston, Geo. Tas., 1888, p. 237, pl. xxix., fig. 7.

4. Typhis maccoyii, T. Woods.

T. maccoyii, T. Woods, P.R.S.Tas., 1875, p. 22, pl. i., fig. 5.

T. hebetatus, Hutton, Trans. N.Z. Inst., vol. ix., 1877, pl. xvi., fig. 1.

T. maccoyii, Tate, Gast. I., 1888, pp. 91, 92.

T. maccoyii, Johnston, Geo. Tas., 1888, p. 237, pl. xxix., fig. 11.

5. Rapana aculeata, Tate.

R. aculeata, Tate, Gast. I., p. 113, pl. ii., fig. 8.

Murex eyrei, R. M. Johnston (*non* T. Woods), Geo. Tas., pl. xxxi, figs. 3, 3*a*.,

6. Trophon selwyni, sp. nov. Plate II., fig. 7.

Shell small, rather thin, sometimes very thin and fragile, with an elevated and prominent acute spire of strongly convex and

costated whorls, ending in a full ventricose body-whorl with a comparatively large aperture, and with a very short twisted canal.

Apical angle about fifty to fifty-five degrees. Apex consists of about two smooth, well-defined convex embryonic whorls, with a centrally immersed tip. Embryonic whorls succeeded by five gradually increasing, markedly convex whorls, with a well-defined and somewhat impressed suture, occasional specimens being more constricted at the suture than the usual type. The greatest convexity about the middle of each whorl, with a tendency to shouldering at about the posterior third, as a consequence of the slope of the posterior third of each whorl being somewhat more sudden and flatter than the more regularly convexly rounded anterior two-thirds. Spire-whorls terminate in a broad ventricose body-whorl, with a rather large oval aperture.

Outer lip thin and sharp at the outer edge, slightly thicker internally, and bearing about twenty to twenty-two close, narrow, and short ridges in its full length from its junction with the anterior canal to the posterior suture. Inner lip very thin and concavely arched to the columella, the latter being rather strongly twisted. Canal very short, strongly bent to the left, finally somewhat reverted, and at the same time upwardly raised.

Surface ornamented with transverse costæ crossed by relatively coarse and fine spiral threads. The earlier half of the first spire-whorl is finely and very closely costate, bearing about five or six fine costæ. Subsequently the costæ become relatively broader and much wider apart. The ordinary costæ are narrow, with much broader interspaces between them, fade out before reaching the posterior suture, and usually developed right up to the anterior suture. In number they run from about nine to eleven to a whorl, and in some specimens show a tendency to become obsolete on the body-whorl. The costæ and interspaces are traversed by lines of growth and fine close striæ parallel to them. The transverse striæ are occasionally more noticeable on the posterior whorls, where they are sometimes sufficiently strong to give rise to a fine cancellated ornament by being crossed by the spiral threads. The whole of this transverse ornament is crossed by spiral threads, from five to seven of which are stouter than the remainder; and of these, three or four on the anterior slope of

each whorl are the stoutest and most prominent where they cross the costæ. Between the coarser threads is intercalated a finer thread which has a still finer thread on either side of it, more easily seen on the body and penultimate whorls than on the earlier spire whorls.

Dimensions.—Length, 16 mm.; breadth, 10 mm.; length of aperture, 6 mm.; breadth of aperture, 4 mm.; length of canal, 3 mm. Some of the Table Cape specimens are relatively smaller than given above, one of these examples giving the following dimensions:—length, 12 mm.; breadth, 7 mm.

Locality.—Not uncommon in the lower beds of the lower eocene of Spring Creek, near Geelong, Victoria. Also in the eocene beds of Table Cape, Tasmania, three examples.

Observations.—I am not at present wholly satisfied with the generic position of this species, but merely place it here tentatively whilst awaiting further examination of other material. The faint development in some specimens of what I cannot but regard as a tendency towards varices, taken together with the other characters displayed by the shell, seem certainly to indicate that it should be placed in the Muricidæ. It may at once be separated from any of our previously described tertiary species referred to this genus by its very short canal, its prominent spire, ventricose whorls, and the constricted suture. So far as the present specimens go, the Table Cape representatives seem to be hardly so ventricose in the body-whorl as those from Spring Creek, the difference in aspect being no doubt due to the fact that the costæ have become obsolete. In other respects the shells are in my opinion sufficiently close to be regarded as identical.

Species' name in honour of Sir A. R. C. Selwyn, late Director of the Geological Survey of Canada, and formerly Director of the Geological Survey of Victoria, to whom we are indebted for much of the best geological work done in this colony. Type specimen in my own collection.

7. Triton abbotti, T. Woods.

T. abbotti, T. Woods, P.R.S.Tas., 1874, p. 24, pl. i., fig. 8.

T. abbotti, Tate, Gast. I., 1888, p. 117.

Tritonium abbotti, Johnston, Geo. Tas., 1888, p. 237, pl. xxix., fig. 13.

8. Triton tortirostris, Tate.

T. minimum, T. Woods (non Hutton), P.R.S.Tas., 1876, p. 107.
T. tortirostris, Tate, Gast. I., 1888, p. 123, pl. v., fig. 7.
Tritonium minimum, Johnston, Geo. Tas., 1888, p. 237.

9. Fusus acanthostephes, Tate.

F. acanthostephes, Tate, Gast. I., 1888, p. 133, pl. vii., fig. 7.
F. spiniferus, Tate, *op. cit.*, p. 134, pl. vii., fig. 1.

Observations.—I have no hesitation whatever in regarding *F. spiniferus*, Tate, as a synonym of the above in view of my examination of a large series of specimens. Among the principal differences upon which Professor Tate has apparently relied for the specific distinction of *F. spiniferus* are the shorter spire, the variable apex, and the difference of ornament, particularly the absence of spiral ornament on the posterior slope of the whorls. The Table Cape specimens are a particularly interesting series, as some are ornamented in an exactly similar manner to *F. spiniferus* from the River Murray Cliffs, as proved by the comparison of actual specimens; but their spire is as long as that in the ordinary type of *F. acanthostephes*, and the embryonic whorls are also identical with those in the latter species. Other specimens approach *F. acanthostephes* in ornament and are important connecting links. A further examination of a large number of specimens from Muddy Creek and Mornington clearly and amply confirms the above conclusion, and it is at once seen that *F. acanthostephes* varies in the length of its spire, the fulness and size, and on that account appearance of the embryonic whorls, and in its ornament, to such an extent that *F. spiniferus* cannot possibly be regarded as specifically distinct.

10. Fusus meredithæ, T. Woods.

F. gracillimus, T. Woods (non Adams and Reeve), P.R.S. Tas., 1875, p. 22.
F. meredithiæ, T. Woods, *op. cit.* Explanation to pl. i., fig. 6.
F. meredithæ, Tate, Gast. I., 1888, p. 140.
F. meredithæ, Johnston, Geo. Tas., 1888, p. 237, pl. xxxi., fig. 9.

11. Fusus johnstoni, T. Woods.

F. johnstoni, T. Woods, P.R.S.Tas., 1876, p. 94.

F. johnstoni, Tate, Gast. I., 1888, p. 136, pl. xii., fig. 4*a*, 4*b*.

F. johnstoni, Johnston, Geo. Tas., 1888, p. 237, pl. xxix., fig. 9, and pl. xxxi., figs. 7, 8, 10 and 17.

12. Latirofusus cingulata, sp. nov. Plate II., figs. 5 and 6.

Shell elongate and narrowly fusiform, consisting of an obtuse embryonic portion of about two-and-a-half smooth convex whorls, the apex of which is central, succeeded by from six to eight gradually increasing very slightly convex whorls.

Apical angle from about twenty to twenty-five degrees. The smooth embryonic portion makes the apex of the shell obtuse, as its whorls are shorter, more convex, and slightly wider than the succeeding spire-whorl. Suture most distinct between the earlier or posterior spire-whorls, becoming less marked anteriorly; the convexity of the whorls also slightly stronger posteriorly, with a tendency to become flatter anteriorly, greatest convexity in the anterior half of each whorl. Aperture oval, peristome much thickened at the suture in adult specimens, outer lip with a thin, sharp and crenulated outer edge, thickened and ridged internally, about six well-defined widely separated internal ridges. Posterior of the aperture slightly channelled, anterior prolonged into a long narrow canal, which is a little more than one-third the length of the shell. Columella long and straight, and furnished at the anterior end of the aperture, just above the canal, with one strong oblique plait.

Surface ornamented with spiral threads crossed transversely by costæ, striæ, and lines of growth. Of the spiral threads there are four or sometimes five, which are strong, well-raised, and convexly rounded, with a much finer intercalated thread between, the latter, almost in some specimens and wholly in others, filling the intermediate space between the stronger spiral threads. The transverse ornament crossing the spiral consists, first, of close, regular, convexly-rounded costæ, about eight in number on the earlier or posterior whorls, increasing anteriorly to about fourteen on the body-whorl. The costæ are strongest about the middle of each whorl, and fade away towards the posterior and anterior

sutures. They are also stronger on the posterior whorls, becoming less distinctly defined anteriorly. Secondly, there are the lines of growth and the fine parallel striæ transverse to the spiral ornament.

Dimensions.—The Table Cape specimens are unfortunately imperfect examples, but the measurements which have been made are as follows: Length (apex and end of canal wanting), 22 mm.; breadth, 7 mm.; length of aperture, 4 mm.; breadth of aperture, 2·5 mm; length of canal (incomplete), 7 mm.

I happen to be fortunate enough to have some perfect though smaller and apparently younger examples of what I regard as the same species from the Spring Creek beds, near Geelong, and on account of their better state of preservation I make one of these specimens the type of the species, the following being its dimensions:—Length, 17 mm.; breadth, 4 mm.; length of aperture, 3 mm.; breadth of aperture, 1·5 mm.; length of canal, 7·5 mm.

Locality.—Eocene beds of Table Cape, Tasmania. Two examples. Also not uncommon in the lower beds of the lower eocene series of Spring Creek, near Geelong, Victoria.

Observations.—Up to the present time there has been only one described fossil species referred to this genus from the Australian tertiary deposits, and this has hitherto been obtained rather commonly from the eocene beds of Muddy Creek, Mornington, and from beds of equivalent horizon at several other Victorian localities. This form was originally described by Professor Tate under the name of *Fusus aciformis*, but was recently altered by him to *Latirofusus aciformis*.* The present described species may be readily distinguished from *L. aciformis* by its smaller embryonic whorls, by the greater convexity of the spire-whorls, and by its very distinct ornament, having a few strong spiral threads with finer intercalated ones, and a distinct transverse costation, instead of the fine, cancellated ornament of *L. aciformis*. From the Parisian eocene fossils, and also from the living species referred to this genus, the present eocene form is, as far as I have been able to make out, specifically distinct. Type specimen in my own collection.

* Proc. Roy. Soc. N.S.W., 1893, p. 171.

13. **Clavella tateana**, T. Woods.

Fusus tateana, T. Woods, P.R.S.Tas., 1876, p. 94.

Fusus tateanus, Tate, Gast. I., 1888, p. 141, pl. xiii., fig. 5.

Fusus tateana, Johnston, Geo. Tas., 1888, p. 237, pl. xxix., fig. 6.

Clavilithes tateanus, Tate, P.R.S.N.S.W., 1893, p. 170.

14. **Pyrula altispira**, sp. nov. Plate III., figs. 2 and 3.

Shell pyriform, very thin, with a well-elevated obtuse spire, consisting of an embryonic portion of about three smooth, regularly convex, gradually increasing whorls, succeeded by four rapidly increasing ventricose whorls.

Apical angle about one hundred degrees. Earlier spire-whorls convex, penultimate slightly shouldered, body-whorl distinctly shouldered. In the neighbourhood of the aperture that part of the shell between the suture and the shoulder is almost perfectly flat, though gently sloping down to the shoulder, which is at a somewhat lower level than the suture; posteriorly this portion becomes gradually more and more convex, ultimately losing entirely the appearance it possesses near the aperture. Greatest width of body-whorl a little below the shoulder, thence gradually contracted to the somewhat long and arched canal. Aperture elongate and narrowly oval; outer lip simple and sharp, at the posterior end straight from the suture to the convexly rounded shoulder, thence gradually and regularly convexly arched to the anterior end of the canal. Columella simple, faintly enamelled, slightly arched to the right, then to the left. Canal long, rather wide, and slightly bent to the left. Surface ornamented with fine, regular, flatly rounded spiral threads, about ten in number in the space between the suture and the shoulder of the body-whorl, and about ten or twelve on the spire-whorls. On the body-whorl, at about its greatest breadth, the spiral threads are coarsest and reach nearly half a millimetre in thickness, thence anteriorly and posteriorly becoming much finer, ultimately very fine at the anterior end of the shell and just discernible on the posterior spire-whorl. Interspaces between the spiral threads about twice the width of the threads, flat and shallow. Both interspaces and spiral threads finely spirally striate, most notice-

able in the interspaces, which carry, where they are about one millimetre in width, five spiral striæ, distinct under a lens. At the anterior end of the shell there is occasionally a finer intercalated spiral thread developed. The spiral ornament is crossed transversely by lines of growth and by fine, strong, close-set striæ parallel to the lines of growth, thus completing the very fine, close, and neat ornament of this species.

Dimensions.—Type, length, 62 mm. : breadth, 37 mm. ; length of aperture and canal, 54 mm. : greatest breadth of aperture, 18 mm. A smaller specimen gives the following dimensions :— Length, 51 mm. ; breadth, 31 mm. ; length of aperture and canal, 43 mm. ; greatest breadth of aperture, 15 mm.

Locality.—Eocene beds of Table Cape, Tasmania. Two examples.

Observations.—No species of this genus have hitherto been described from our eocene beds, but the occurrence of the genus at Table Cape has been recorded by Professor Tate in his paper on the "Unrecorded Genera of the Older Tertiary Fauna of Australia"* in the following language :—"This genus is represented in the eocene beds of Table Cape, Tasmania, by a large species, known to me by two examples in the collection of Mr. T. Atkinson ; it is undescribed." The specimens referred to above by Professor Tate are those herein described. The elevated spire, the shouldered body-whorl, and the strong spiral ornament, are eminently characteristic of this species, and readily separate it from any of the living species with which I am at present acquainted.

15. Siphonalia roblini, T. Woods.

Fusus roblini, T. Woods, P.R.S.Tas., 1876, p. 22, pl. i., fig. 7.
Siphonalia roblini, Tate, Gast. I., 1888, p. 143.
Fusus roblini, Johnston, Geo. Tas., 1888, p. 237, pl. xxix., fig. 8.

16. Fasciolaria decipiens, Tate.

F. decipiens, Tate, Gast. I., 1888, p. 150, pl. viii., fig. 1.
Observations.—Professor Tate has already recognised (*loc. cit.*, pp. 60, 61) that the Table Cape form of this species differs in

* Proc. Roy. Soc. N.S.W., 1893, p. 173.

several respects from the typical form of *F. decipiens*, from Muddy Creek, and has suggested that it may be desirable when fuller material is at hand to apply distinctive names to them. The material now before me does not seem to justify more than a varietal distinction for the Table Cape form, which only differs from the ordinary Muddy Creek type of the species in that it has a shorter spire, and is a relatively broader and more ventricose form.

17. Peristernia transenna, T. Woods.

Fusus transennus, T. Woods, P.R.S.Tas., 1876, p. 94.

Peristernia transenna, Tate, Gast. I., 1888, p. 157, pl. xi., fig. 10.

18. Peristernia affinis, Tate.

P. affinis, Tate, Gast. I., 1888, p. 157, pl. xi., fig. 7.

19. Peristernia aldingensis, Tate.

P. aldingensis, Tate, Gast. I., 1888, p. 156, pl. viii., fig. 8*a*, 8*b*.

Observations.—I have very little hesitation in referring the present Table Cape specimens to the above Aldingan species, as I have made careful comparisons not only with Professor Tate's original description and figures of the shell, but also with actual examples of the species from the type locality. Judging, however, from the figures and the dimensions given by Professor Tate, and the specimens from Aldinga in my own collection, the Table Cape specimens are of larger dimensions and are much more solid shells, the dimensions of the latter being as follows :— Length (embryonic whorls and end of canal incomplete), 51 mm. ; breadth, 22 mm. ; length of aperture, 16 mm. ; breadth of aperture, 10 mm. ; length of canal (incomplete), 9 mm.

20. Peristernia murrayana, Tate, var. costata, var. nov.

Plate II., fig. 4.

P. murrayana, Tate, Gast. I., 1888, p. 155.

Observations.—There are ten examples of this shell in the collection, and after careful study I cannot regard it but as a variety of *P. murrayana*, Tate, a very common fossil in the

eocene beds of the River Murray Cliffs. I happen to have examples of this species from the type locality, as well as from some Victorian localities; and as these agree exactly in every particular with the original description and dimensions given by Professor Tate, I feel every confidence in drawing attention to some of the characteristics of the Table Cape form, which shows a sufficient divergence from the typical Murray Cliffs shell to warrant its recognition as an unrecorded variation to which this species is liable.

The whorls of the Table Cape shell are not so distinctly angulated, and instead of being only tuberculated at the anterior suture of the spire-whorls and at the periphery of the body-whorl, the tubercles are extended into distinct and slightly sigmoidal costæ, which are most highly elevated about the middle of each whorl. The costæ also appear to become more numerous than the tubercles, for Professor Tate states "tubercles small, eight to a whorl," whereas in the present form the costæ increase from about eight in number on the posterior whorl to twelve or thirteen on the body-whorl.

The ornament of the Table Cape shell may be described as follows:—Spiral ornament consisting of a few strong spiral threads with several finer threads intercalated between them. Each whorl bearing from about eight to twelve prominent threads, the three or four on the anterior portion of each whorl usually being the most prominent, with five much finer threads in the interspaces between; of the latter threads the middle one is much stronger than the other two on either side of it. The spiral ornament is crossed transversely by lines of growth, fine sigmoid striæ, and distinct costæ.

The spiral ornament of the Murray Cliffs shell is identical with the above, though one would not be able to judge so with certainty by comparison with the original description instead of with actual specimens.

The dimensions of the largest and best-preserved example from Table Cape are as follows:—Length, 34 mm.; breadth, 16 mm.; length of aperture, 11 mm.; breadth of aperture, 7 mm.; length of canal, 11 mm.

21. **Peristernia semiundulata**, sp. nov. Plate II., figs. 10 and 11.

Shell small, ovately fusiform, moderately thick, with convex or subangulated and strongly costated whorls, and a compatively short canal.

Apical angle about fifty degrees. Embryo consisting of about two-and-a-half convex whorls, the apex of which is slightly excentric. The anterior fourth of the last embryonic whorl, just before joining the first spire-whorl, is closely and slenderly costate, the costæ numbering about six or seven, gradually strengthening anteriorly, the remainder of the embryo being smooth. The spire consists of five very gradually increasing, convex, but occasionally subangulated whorls, with a well-defined and undulating suture. Aperture oval, outer lip thin at the outer edge, but rapidly thickening internally, where it is strongly ridged from the anterior canal to the suture, bearing in this space about twelve or thirteen long ridges, the shallow interspaces being about twice the width of the ridges. Columella bearing one oblique plait at the anterior end of the aperture. Canal somewhat short, very slightly bent to the left and faintly recurved.

Surface ornamented with transverse costæ, striæ, and lines of growth closely crossed by spiral threads. The costæ are well elevated and strongest in the anterior half of each whorl, close set, and convexly rounded, the interspaces usually narrower than the costæ. In number the costæ increase from nine on the posterior whorl to twelve or thirteen on the body-whorl, and are traversed by parallel lines of growth and fine striæ, the latter being usually most noticeable on the posterior slope of each whorl. The transverse ornament is crossed by spiral threads, of which there are about four stronger than the rest developed on the anterior portion of each whorl, and the posterior slope usually bears about three or four finer regularly undulating threads, and in the interspaces there are five much finer threads, of which the middle one is stronger than the pair on either side of it. The intercalated threads are, as a rule, more distinctly visible on the anterior than on the posterior of the whorls. Body-whorl with about twelve of the stronger threads, and with the finer intercalations as above.

Dimensions.—Length, 16 mm.; breadth, 8 mm.; length of aperture, 4·5 mm.; breadth of aperture, 3 mm.; length of canal, 4 mm.

Locality.—Eocene beds of Table Cape, Tasmania. Three examples. Also in the lower eocene beds of Spring Creek, near Geelong, Victoria.

Observations.—The present species apparently shows more affinity with *P. affinis*, Tate, from the same beds than any other hitherto described species, as far as I can make out, but owing to the very brief original description of this species it was not an easy matter to fix its representatives with certainty. From the specimens in the present collection I have identified as *P. affinis* the present described species differs in that the whorls are slightly more convex, the costæ do not extend from suture to suture, but fade away before reaching the posterior suture, the costæ are broader, and on that account appear more crowded, the stronger spiral threads are finer and closer together, and the intercalated finer threads are fewer and not of a uniform size, as in *P. affinis*, which has six or seven fine intercalated threads of uniform size. Further, in *P. affinis* the transverse striæ are much more strongly developed, being nearly as strong as the intercalated threads, thus giving rise to a very fine, neat, and regular cancellation ; also the crossing of the regular and narrow costæ with the stout spiral threads gives rise to a coarse cancellation, which is entirely absent in the new species. Also the columella of the new species is more slender and the canal narrower. This new species shows a certain amount of variability in the number and development of its costæ, but the remainder of its characters appear to be fairly constant. In the Spring Creek representatives the costæ are as a rule fewer in number, ranging from about eight to eleven on the body-whorl.

22. Ricinula purpuroides, Johnston.

Ricinula purpuroides, Johnston, P.R.S.Tas., 1879, p. 33.
Pisania purpuroides, Tate, Gast. I., 1888, p. 165, pl. xi., fig. 6.
Ricinula purpuroides, Tate, P.R.S.N.S.W., 1893, p. 173.

23. Zemira præcursoria, Tate.

Id., Tate, Gast. I., 1888, pp. 163, 164, pl. xi., fig. 5.

24. Phos liræcostatus, T. Woods.

Cominella lyræcostata, T. Woods, P.R.S.Tas., 1876, p. 108.
Phos liræcostatus, Tate, Gast. I., p. 167, pl. xi., fig. 12.

25. **Lyria semiacuticostata**, sp. nov. Plate II., fig. 8.

Shell somewhat thin, ovate-fusiform, with a well-elevated acute spire, and with the anterior truncated at the end of the short broad canal.

Apical angle about fifty degrees. Spire consisting of a very small obtuse embryo of two-and-a-half smooth, gradually increasing, slightly convex whorls, the apex of which is central, succeeded by six or seven much more rapidly increasing, slightly convex and costated whorls, with a rather deeply impressed and well-defined suture. Spire-whorls somewhat shouldered at the suture, owing to the form of the transverse costæ, otherwise regularly convex, with their greatest convexity about the middle of each whorl.

Aperture oval, acute posteriorly, and opening into the short broad canal anteriorly; outer lip much thickened, smooth within, gently sloping from the suture, then more suddenly and obliquely inwards as it joins the anterior end of the canal; inner lip with an enamel coating which is thickest at the extremities, almost thinning out medially. Columella with three strong oblique plaits at the anterior end, the medial one being the strongest; these are succeeded by about twelve ridges, gradually diminishing towards the posterior end, the latter being furnished with a strong tooth-like projection a little below the junction of the outer lip with the body-whorl. Canal slightly bent to the right, then recurved.

Surface ornamented with slender, acute, very slightly oblique, transverse costæ, which are most regularly and strongly developed on the earlier or posterior spire-whorls, and tend to become obsolete on the body-whorl, though still visible in some specimens as short angular elevations in the neighbourhood of the suture. The costæ have a more gradual lateral slope on their left side than on their right, where they are much more abrupt, this feature being most noticeable at the posterior suture of each whorl, as it gives rise to the sharp angular terminations at this extremity. Towards their opposite extremity they tend to fade away entirely, as may be noticed on the penultimate and more so upon the body-whorl. In number the costæ are slightly variable, some specimens being more closely costate than others. In all

they increase in number from behind forward, there being about thirteen on the posterior spire-whorl, increasing to from twenty to twenty-seven on the body-whorl. Surface also marked transversely by lines of growth and by very fine parallel striæ.

Dimensions.—Type, length, 30 mm.; breadth, 14 mm.; length of aperture, 15 mm.; breadth of aperture, 5 mm. A larger specimen gives the following dimensions:—length, 36 mm.; breadth, 17 mm.; length of aperture, 18 mm.; breadth of aperture, 6 mm.; and the largest specimen yet to hand has a length of 43 mm., and a breadth of 20 mm.

Locality.—Eocene beds of Table Cape, Tasmania. Three examples. An undescribed species of Lyria has been obtained by Mr. J. Dennant from the lower eocene beds at Spring Creek, near Geelong, which is, I believe, a representative of the above species.

Observations.—Two species of this genus have already been described, *L. harpularia*, Tate, a common eocene shell, and *L. gemmata*, Tate, a rare miocene species. The present species makes the second eocene form and shows many features of general resemblance to our living *L. mitræformis*, from which, however, it is readily separable upon critical examination. The principal differences whereby our fossil may be distinguished from this living species are the less robust shell, the much smaller embryo, more acute spire, less convex whorls, shorter and narrower canal, and its slender, acute and gradually fading costæ, and the absence of spiral grooving at the anterior end of the body-whorl. From our previously described eocene shell, *L. harpularia*, Tate, it may be at once separated by its smaller embryo, more acute spire, less defined shouldering at the suture, non-persistent costæ, and the absence of the spiral striæ, which are usually most distinct at the anterior end of that species. From the miocene shell, *L. gemmata*, it is still further removed and admits of easy distinction, and on that account I think it is hardly necessary to draw attention to any special differential characters.

26. Voluta anticingulata, McCoy.

V. anticingulata, McCoy, Prod. Pal. Vic. Dec. I., pp. 24-26, pl. vi., figs. 2 to 4.

V. antiscalaris, Johnston (*non.* McCoy), Geo. Tas., 1888, p. 237, pl. xxx., figs. 5, 5*a*, 5*b*, and 8.

V. anticingulata, Tate, Gast. II., 1889, pp. 133, 134.

Observations.—The shell figured by Mr. R. M. Johnston in his Geology of Tasmania is undoubtedly *V. anticingulata*, McCoy, as has already been pointed out by Professor Tate when dealing with this species, and not *V. antiscalaris*, McCoy, which was the name attached by Mr. Johnston to his figure in the explanation of his plate. The record of *V. antiscalaris*, McCoy, must therefore be expunged from the list of Table Cape fossils. *V. anticingulata*, McCoy, is apparently very common at Table Cape, as I now have before me a very large series of specimens which show the same amount of variation in form and ornament as has already been pointed out by Sir F. McCoy as occurring in the specimens from the lower eocene beds of Spring Creek, near Geelong. Thus as the extremes of variation we have *V. anticingulata*, var. *indivisa*, McCoy, in which the subsutural sulcus is entirely absent, the ribs fewer and more sigmoidal, and the shell narrower than in the typical form of the species, also the body-whorl and ribs are often smooth owing to the absence of spiral striæ on that part of the shell; and the other varietal form, to which the name of *V. anticinguiata*, var. *persulcata*, McCoy, has been attached, is also well represented, though not so abundant as the preceding variety, and this is characterised by the more numerous and straighter ribs and by the very strongly developed spiral striæ present on the whole of the body-whorl and spire. Many intermediate forms leading up to these varieties are not of uncommon occurrence, which clearly shows that the way in which this species has been treated by Sir F. McCoy is most certainly correct.

27. Voluta weldii, T. Woods.

V. weldii, T. Woods, P.R.S.Tas., 1875, p. 24, pl. i., fig. 2.

V. weldii, Johnston, Geo. Tas., 1888, p. 237, pl. xxx., figs. 6, 6*a*, 6*b*.

V. weldii, Tate, Gast. II., 1889, pp. 134, 135.

Observations.—This species is also very common at Table Cape, and shows a considerable amount of variation in form, and especially in the thickness of the shell, the width of the

body-whorl, and in the development of the nodulations on the angulation of the whorls, in some forms being very faint or almost entirely absent, while in others they are very strongly marked.

28. Voluta strophodon, var. stolida, Johnston.

V. strophodon, McCoy, Prod. Pal. Vic. Dec. IV., pp. 25, 26, pl. xxxvii., figs. 2–4*c*.

V. stolida, Johnston, P.R.S.Tas., 1880, p. 36, and Geo. Tas., 1888, p. 237, pl. xxx., figs. 4, 4*a* and 7 (*V. weldii*, Johnston).

V. strophodon, Tate, Gast. II., 1889, p. 134.

Observations.—Mr. Johnston in the work quoted above figures a shell (pl. xxx., fig. 7) as *V. weldii*, T. Woods, which is clearly not that species. Professor Tate apparently regards it as *V. strophodon*, McCoy ; for my own part I regard it as the young of Johnston's *V. stolida*, figured on the same plate. With regard to *V. stolida*, Johnston, Professor Tate places it amongst the list of unclassified species in his Gastropoda, Part II., p. 121, and merely remarks that it is related to *V. strophodon*. With this I agree, but as the shell shows distinct variation from the typical form of *V. strophodon*, as figured by Sir F. McCoy, it seems to me to be the most satisfactory course at present to retain a varietal name for this form, and it is in this sense that I use Mr. Johnston's name *stolida*.

29. Voluta tateana, Johnston.

V. tateana, Johnston, P.R.S.Tas., 1879, p. 37, and Geo. Tas., 1888, pl. xxx., figs. 3, 3*a*.

V. tateana, Tate, Gast. II., 1889, p. 132, pl. ii., fig. 5.

30. Voluta mortoni, Tate.

Id., Tate, Gast. II., 1889, p. 124, pl. ix., figs. 1, 2.

31. Voluta stephensi, Johnston.

V. stephensi, Johnston, P.R.S.Tas., 1879, p. 35, and Geo. Tas., 1888, pl. xxx., fig. 1.

V. stephensi, Tate, Gast. II., 1889, p. 122.

Observations.—Professor Tate regards this species as being closely related to *V. heptagonalis* and *V. alticostata*, but, appa-

rently based upon Mr. Johnston's description, differing from them in that it occupies an intermediate position between the two with regard to proportions, in having a greater number of ribs on the body-whorl, which also increase more rapidly in number on the posterior whorls, and in the absence or indistinctness of spiral sculpture. The last mentioned difference does not exist, unless it be in very much rolled and beach-worn specimens. It must have been a very ill-preserved example that came under Mr. Johnston's notice to have enabled him to make such a statement, for the four specimens which I have had the opportunity of examining show strong spiral threads, which number about twenty-four on the posterior whorls, and usually a much finer thread is developed between the strong spiral threads.

32. Voluta ancilloides, Tate.

Id., Tate, Gast. II., 1889, p. 126, pl. iii., fig. 7.

33. Voluta maccoyii, T. Woods.

V. maccoyii, T. Woods, P.R.S.Tas., 1876, p. 95.

V. lirata, Johnston, P.R.S.Tas., 1879, p. 37, and Geo. Tas., 1888, pl. xxx., fig. 10 (*V. allporti*, Johnston, non 1880) (non *V. lirata*, Tate, Gast. II., 1889, p. 130, pl. ii., fig. 4).

V. agnewi, Johnston, Geo. Tas., 1888, pl. xxx., fig. 9 (non *V. agnewi*, Johnston, 1880).

V. maccoyii, Tate, Gast. II., 1889, p. 126, pl. ii., fig. 2.

V. polita, Tate, *op. cit.*, p. 127, pl. ii., fig. 7.

Observations.—Considerable confusion has existed with regard to this species, which may now, I think, be cleared up in the following manner. The Rev. J. E. T. Woods in 1876 described *Voluta maccoyii* from the Table Cape beds, and the species described by him is represented in the present collection by twelve examples. In his description he mentions that the whorls have "no other marks than the lines of growth." In some specimens, however, which cannot be separated from this species, some of the lines of growth on the posterior whorls are so much stronger than others that the shells are distinctly lirate posteriorly, at the same time every gradation may be traced between the smooth and lirate forms. Mr. R. M. Johnston in 1879 described

a volute from Table Cape under the name of *V. lirata*; some of the specimens I have of *V. maccoyii*, T. Woods, agree well with the description and dimensions given by Mr. Johnston, and I have therefore no hesitation whatever in regarding the shells before me as Mr. Johnston's species. In 1888 Mr. Johnston published his Geology of Tasmania, and in that work figures a number of Table Cape fossils, amongst which we have, on pl. xxx., fig. 10, a shell evidently intended for *V. lirata*, but for some unknown reason it is referred to in the explanation of the plate as *V. allporti*, Johnston; the latter shell, though somewhat vaguely described, is stated by the author of the species to be the largest volute in the Table Cape beds, somewhat resembling *V. macroptera*, McCoy, but without the wing-like extension of the lip. In view of the above, it is evident that the figure referred to cannot possibly represent *V. allporti*, whereas it agrees fairly well with the description of *V. lirata*.

Mr. Johnston also figures in the same work on pl. xxx., fig. 9, a shell which is called *V. agnewi*, Johnston, which can hardly be said to agree with this description of that species given in 1880. I am inclined to agree with Professor Tate that this figure may represent a form of *V. maccoyii*, T. Woods.

In 1889 Professor Tate figures and describes a shell under the name of *V. lirata*, Johnston, which is most distinctly not that species, but is undoubtedly the same species as that described by him as *V. costellifera*, the latter species being subject to a certain amount of variation in the length of its spire, the breadth of the body-whorl, and the strength or development of the ribs or liræ. *V. lirata*, Johnston, must therefore be expunged from the lists of fossils from the lower beds (eocene) of Muddy Creek, Victoria.

In the same year Professor Tate redescribes and figures *V. maccoyii*, T. Woods, and records it as occurring in the lower beds at Muddy Creek and in the blue clays at Schnapper Point. The Victorian fossil as a rule shows some points of variation from the typical Table Cape form in that it is generally a somewhat more fragile and slender shell, and only occasional specimens show faint transverse liræ on the posterior whorls.

Professor Tate also describes in the same work a shell under the name of *V. polita*, which I am unable to regard as specifically distinct from *V. maccoyii*, T. Woods. Professor Tate distin-

guishes the former from the latter entirely on account of it being proportionately broader, with more convex whorls, a larger though similar pullus, and the presence of five columellar plaits instead of four. After examining fifty-five examples of *V. maccoyii* from the Victorian beds, together with the twelve specimens from Table Cape, I find considerable variation in the proportion of length to breadth, in the convexity of the whorls, in the size of the pullus, and though four columellar plaits seem to be the usual number, I have nine examples of the slender form with five columellar plaits and one example of the broad form with four columellar plaits. It is hardly necessary to mention that, if extreme forms of this species be taken for comparison with one another, one might at first sight experience considerable difficulty in regarding them as the same species, but when a large series of specimens is critically and carefully examined, one is forced to the conclusion that the best method is to regard the species as a variable one, and when we see that this is not an uncommon feature in our Volutes—for example, *V. anticingulata*, McCoy, *V. antiscalaris*, McCoy, *V. strophodon*, McCoy, and *V. weldii*, T. Woods—considerable strength is lent to this conclusion.

34. Voluta pellita, Johnston.

Id., Johnston, P.R.S.Tas., 1879, p. 36, and Geo. Tas., 1888, pl. xxx., fig. 2.

Observations.—Professor Tate places this species in his unclassified list, remarking that it may possibly be *V. ancilloides*, Tate, or *V. macroptera*, McCoy. I cannot regard it as identical with either of these species. *V. ancilloides*, Tate, is a common Table Cape fossil, and the present species differs from it in a very marked manner in general habit and dimensions; the pullus is smaller, less convex, and has a prominently exsert tip; the spire is much more slender; the apertural characters are, however, of the same type in both species. I have not yet seen any examples of *V. macroptera*, McCoy, from the Table Cape beds. Professor Tate records this species based upon examples in the Hobart Museum. It is, however, just possible that imperfect examples of *V. pellita*, Johnston, may have been mistaken for this species. *V. pellita* differs from *V. macroptera* in that the whorls are not

so regularly convexly rounded, in the absence of the wing-like extension of the outer lip, which is thickened as in *V. ancilloides*, in the much smaller pullus and its more marked centrally exsert tip, and in the presence of fine spiral threads, which tend to become obsolete on the body-whorl. Of our other continental species, that to which it is most closely related, and with which it may ultimately prove to be identical, is *V. capitata*, Tate, founded upon one specimen said to have come from a well-sinking in the Murray desert. Apart from size, some of the principal points of divergence appear to be the greater number of turns in the pullus and the presence of an extra plait on the columella of *V. capitata.*

35. **Voluta spenceri**, sp. nov. Plate IV., figs. 1 and 2.

Shell large, moderately thick, broadly fusiform, with an obtusely rounded mammilate apex, and a few strongly nodose and angular whorls, ending in a long and comparatively narrow aperture.

Apical angle about fifty-five degrees. The mammilate embryo consists of about two smooth convex whorls, which are enrolled obliquely, the apex being excentrically immersed. Embryonic whorls narrower than the succeeding spire-whorl, and the axis of their enrolment makes an angle of about one hundred and forty-five degrees with the axis of enrolment of the spire-whorls. Spire consists of five very rapidly increasing strongly nodose-angulose whorls. The angulation of the whorls is situated about the middle of each whorl, becoming slightly nearer the anterior suture anteriorly; the posterior slope is distinctly concave, as is also the case, but to a much less extent, with the more abrupt anterior slope. The posterior slope becomes less steep and more deeply concave as we proceed towards the body-whorl. Aperture elongate and narrowly oval, very acute and drawn out posteriorly, anterior end unfortunately incomplete in the specimens yet to hand. Outer lip very slightly thickened internally, thickest at the suture, near the outer edge it is gently rounded off from within, and ascends as high as the nodulations on the penultimate whorl, its outer margin being faintly undulatory. Inner lip rather thin, thickest near the posterior of the aperture, convexly arched to the columella. Columella slightly twisted and compara-

tively long, bearing a little below the middle of the aperture three unequally-sized oblique plaits, the anterior of which is the strongest. Earliest portion of spire-whorl at first only finely transversely striate, with very faint spiral threads, then bears fine and close transverse ridges or costæ, which become coarser and more nodulose in appearance anteriorly. From this onwards the whorls are strongly nodulose at the medial angulation, the nodules being closer and more numerous on the posterior whorls, where they number about twelve or fourteen, decreasing anteriorly, the body-whorl having only nine; with the decrease in number there is, however, a marked increase in strength and prominence. The nodulations are bluntly rounded, and, as a rule, slightly more abrupt on their right face than on the left, and on the penultimate and earlier part of the body-whorls are extended anteriorly into distinct bluntly rounded, faintly arching costæ, the last four nodules of the body-whorl not being thus extended. The whorls are also traversed by fine and close, yet distinct, transverse striæ and lines of growth, and are further ornamented by numerous (about twenty and upwards on the earlier whorls, increasing in number anteriorly) fine spiral threads with shallow, flat, intermediate furrows. The spiral threads tend to become obsolete on the anterior slope, being entirely absent from this part of the body-whorl, though still discernible on the posterior slope.

Dimensions.—Length (pullus and anterior end of canal incomplete), 100 mm; breadth, 60 mm.; length of aperture (incomplete), 66 mm.; breadth of aperture, 25 mm. In another specimen the pullus is 5 mm. high and 7 mm. broad.

Locality.—Eocene beds of Table Cape, Tasmania. One example (type). Also from the eocene clays of Curlewis, Bellarine Peninsula, Victoria.

Observations.—This species shows so many characteristic features of its own that it is at once separable from all our hitherto described fossil species, and I am unacquainted with any recent form to which it shows any close resemblance. Amongst our fossil species a certain amount of affinity may perhaps be made out with *V. stephensi*, Johnston; but from this it differs particularly on account of its smaller pullus, its broader form, different shaped whorls, the prominent nodules at the angulation, and also

some of the characters of the aperture. Specific name in honour of Professor W. Baldwin Spencer, of the Melbourne University.

36. Voluta atkinsoni, sp. nov. Plate III., fig. 1.

Shell large, with a mammilate apex and a short conical spire, succeeded by a very large, broad, and strongly shouldered body-whorl, bearing coarse oblique nodosities at the shoulder, with an aperture more than twice the length of the spire.

Apical angle about sixty degrees. Mammilate apex of about one-and-a-half smooth embryonic whorls, which are obliquely enrolled, extreme tip eroded in the example before me, but probably somewhat exsert from its appearance. Succeeding whorls five, suture defined, faintly undulatory, but not impressed. Spire very short, conical, with a slightly concave slope, rather suddenly expanded into the large broad body-whorl, which is nearly four times as long as the spire and a little more than twice as broad. Spire-whorls bearing short, broad, costæ-like nodules, which number about ten to a whorl, reaching from the anterior suture to about the middle of the whorls, thus making the anterior slope of these whorls a little convex, whereas the posterior slope is concave. Body-whorl strongly shouldered, posterior slope concave, anterior slope gently convexly sloping to the attenuated anterior end; on the shoulder there are ten strong oblique nodulations, some of which tend to extend down the whorl and develop into sigmoid costæ.

Aperture prolate-ovate, somewhat effuse anteriorly. Inner lip with a moderately thick enamel pad at the posterior end, posterior canal shallow and narrow; outer lip thick, bevelled off from within, with a moderate outward reflection and a steep and rapid ascent to the nodulations of the penultimate whorl; anterior end of margin where it joins the short and rather broad canal is a little shorter than the columella side. Columella long, stout, slightly twisted, bearing rather high up three unequally sized oblique plaits, the anterior of which is the strongest; the plaits are not easily seen from a front view, as they are situated well within the interior of the aperture.

Surface ornament in addition to the nodular characters already described consists of fine close spiral threads, with shallow inter-

vening furrows, on the spire-whorls, becoming obsolete on the body-whorl, also transverse lines of growth and fine parallel striations, which become more distinct and somewhat sigmoid on the body-whorl.

Dimensions.—Length, 133 mm.; breadth, 67 mm.; length of aperture, 92 mm.; breadth of aperture, 31 mm.

Locality.—Eocene beds of Table Cape, Tasmania.

Observations.—This very fine volute I have named as a compliment to Mr. E. D. Atkinson, whose careful and extensive collecting from the Table Cape beds has so enriched our knowledge of this particularly interesting fauna. This new species evidently belongs to that group of our eocene volutes typified by *V. hannafordi*, McCoy, but as it does not show any very close relationship to any of our hitherto described species, and has so many characteristic features of its own, any differential remarks seem to be at present unnecessary. There is, however, a very closely related if not identical form from the eocene beds of Birregurra, Victoria, procured by Mr. T. S. Hall from material from that locality; but at present I refrain from expressing an absolute opinion, in the hope that I may be able to obtain more specimens for closer examination.

37. **Voluta halli**, sp, nov. Plate II., figs. 1, 2 and 3.

Shell large, elongate-fusiform, with a small mammilate apex and a long slender spire, terminating in a large, elongate body-whorl, usually with a long and comparatively broad aperture ending in a short, broad canal. Well preserved examples still retaining a high polish.

Apical angle about forty degrees. Embryo mammillate, three to four millimetres in diameter, consisting of about one-and-a-half obliquely enrolled, smooth whorls, the axis of enrolment making an angle with the axis of the spire of about one hundred and forty degrees or slightly upwards. The apex of the embryo is prominently exsert and somewhat eccentric, the exsert portion being very sharply pointed and inclined towards the centre. The spire in the adult form consists of about eight gradually increasing whorls; the earlier spire-whorls are usually flat, occasionally very faintly convex, between the well-defined sutures,

becoming more convex anteriorly. Aperture elongate oval, somewhat effuse anteriorly, acute posteriorly, and with a short and very broad anterior canal. Outer lip thickened at the edge, slightly reflected outwardly and gently rounded off from within, ascending the penultimate whorl for a short distance, but barely reaching as high as the middle of that whorl. Outer lip has a fairly regular, convexly arched slope to the anterior canal, which it joins a little higher up than the opposite end of the columellar side. Inner lip thickest near the suture, where it forms a thickish enamel coating thinning out towards the columella. Columella comparatively long and slender, slightly twisted, and bearing at its upper part three strongly oblique plaits decreasing in strength posteriorly.

Earlier whorls ornamented with from about fifteen to twenty-five fine spiral threads, with narrower interspaces, the threads being stronger in the neighbourhood of the sutures than at the middle of the whorls, ultimately becoming obsolete anteriorly. The spiral ornament is crossed transversely by fine, close, and regular striæ parallel to the lines of growth, becoming more distinct as the spiral threads weaken and vanish. Body-whorl with very numerous striæ and slight undulations parallel to the lines of growth.

Dimensions—Length, 165 mm.; breadth, 67 mm.; length of aperture, 87 mm.; breadth of aperture, 40 mm.; breadth of anterior notch, 20 mm. The Table Cape representative in the present collection is a younger shell and has only attained the length of 110 mm. Young examples of this species are not at all uncommon, many examples of about 60 mm. in length and less being easily obtained at some of our Victorian localities. Taking the length as 100, the relative breadth varies from about 37 to 45, the latter being the above large example.

Locality.—Eocene beds of Table Cape, Tasmania. Common in the lower eocene beds at Spring Creek, near Geelong, also in the eocene clays of Curlewis, Bellarine Peninsula, Victoria.

Observations.—One of the adult specimens I have from Spring Creek, though very much the same as the above, still shows a few important characters which at present seem to warrant its recognition at least as a varietal form. Some of the principal features of this form being that the spire-whorls are a little more convex,

the penultimate whorl and the one preceding it are angulate or keeled about their middle line, the posterior slope being faintly concave, while the anterior slope is flat or slightly convex, the body-whorl is also shouldered, the aperture is narrower and less effuse, and the outer lip is not so distinctly reflected. In the main apparently similarly ornamented to the above on the earlier spire-whorls, but the body-whorl shows below the shoulder about eight or ten widely separated, obscure, very broad, and scarcely raised spiral ridges or bands, one of the strongest being near the anterior end of the whorl. The dimensions of a large example of this variety are: length, 157 mm.; breadth, 58 mm.; length of aperture, 90 mm.; breadth of aperture, 27 mm. It might be further mentioned that some of the young examples show a few widely separated spiral ridges about their periphery of a much stronger character than the earlier spiral threads. These young examples are also finely spirally threaded and grooved at their anterior end. The present species is somewhat related to *V. macroptera*, McCoy, but it is a very much more slender and flatter spired form, with a much smaller pullus, and no wing-like extension of the outer lip, which only slightly ascends the penultimate whorl, and is thickened at its outer edge. It also shows some relation to *V. pellita*, Johnston, but may be easily distinguished from that species by the smaller size of its pullus, its slender, elongate, and flat-whorled spire, and by its large, broad, and effuse aperture. Type in my own collection.

38. Voluta alticostata, Tate.

Id., Tate, Gast. H., 1889, p. 122, pl. v., fig. 7.

Observations.—A very fine entire representative of this species is in this collection, and as it has been compared with a perfect example of my own from Muddy Creek, the type locality of the species, there can be no doubt about its identity. However, as it is very much larger than any hitherto recorded example of the species, I think it well to record the dimensions, which are as follows:—Length, 185 mm.; breadth, 85 mm.; length of aperture, 110 mm.; breadth of aperture, 45 mm. A very much larger example of this species, being over a foot in length, is in the Melbourne National Museum, where it is labelled, though, as I think, erroneously, *Voluta hannafordi*, McCoy, and was obtained

from Muddy Creek. From the above there can be no doubt that this is the largest of our Australian Older Tertiary volutes as yet discovered.

39. Mitra dictua, T. Woods.

M. dictua, T. Woods, P.L.S.N.S.W., 1879, p. 8, pl. iii., fig. 7.
M. dictua, Tate, Gast. H., 1889, p. 137, pl. iv., fig. 9.

40. Mitra anticoronata, Johnston.

Id., Johnston, P.R.S.Tas., 1879, p. 34.

41. Ancillaria pseudaustralis, Tate.

A. australis, T. Woods (non. Sowerby), *fide* Tate, P.R.S.Tas., 1884, p. 209.

A. mucronata, T. Woods (non. Sowerby), P.R.S.Tas., 1874, p. 17.

A. mucronata, Johnston (non. Sowerby), Geo. Tas., 1888, pl. xxxi., fig. 12.

A. pseudaustralis, Tate, Gast. H., 1889, pp. 148, 149, pl. vi., fig. 13, and pl. vii., fig. 1.

Observations.—Not uncommon at Table Cape, but the abundant form which occurs is not the typical slender spired form so common in the lower beds at Muddy Creek and figured by Professor Tate on plate vii., fig. 1, in the work above referred to, but the very broad apically obtuse form recorded from a well-sinking in the Murray desert and from the River Murray cliffs, and figured by Professor Tate on plate vi., fig. 13.

42. Terebra additoides, T. Woods.

T. additoides, T. Woods, P.R.S.Tas., 1876, p. 95.
T. additoides, Tate, Gast. H., 1889, p. 163.

43. Terebra prægracilicostata, sp. nov. Plate II., fig. 9.

Shell small, narrowly elongate and very acute spiral, with small and convex embryonic whorls and rather flat and very slenderly costate spire-whorls, terminating with a narrow aperture and very short canal.

Apical angle about fifteen degrees. Embryo consists of about three smooth, regularly convex, gradually increasing whorls, the tip of which is central but not prominently exsert so far as the

present examination goes. Embryonic whorls succeeded by eight spire-whorls, which are slightly more convex posteriorly and become flatter anteriorly, with a moderately well-defined suture, but no well-marked subsutural groove or sulcus; anterior slope of body-whorl somewhat abrupt. Aperture narrow elongate-oval; outer lip thin and simple, somewhat thickened at the suture. Columella simple and slightly arched. Canal very short, comparatively wide, and a little upturned at the anterior end. At the base or anterior end of the shell a prominent ridge runs round from the anterior outer end of the canal just up to the columella.

Surface ornamented with very slender acute costæ, with much wider and shallow interspaces between. The interspaces become wider anteriorly, being about twice or slightly more than twice the width of the costæ on the body and penultimate whorls. The costæ are practically straight, very slightly elevated above the general surface of the shell, number twelve to a whorl and are smooth. Below the posterior suture of each whorl there is a tendency towards the development of a subsutural depression, which, however, has only affected the costæ, and the latter on this account appear faintly tuberculate in this region. The surface also shows fine lines of growth and striations parallel to the costæ, but the only spiral ornament consists of exceedingly faint and microscopic striations, which are not visible to the unaided eye.

Dimensions.—Length of eight whorls with embryo, 13 mm.; breadth of body-whorl, 3·5 mm.; length of aperture and canal, 3 mm.

Locality.—Eocene beds of Table Cape, Tasmania.

Observations.—This form seems at present sufficiently distinct from our previously described species of the genus to necessitate its record as new. It however shows some affinity with *T. additoides*, T. Woods, from beds of the same horizon, and with *T. leptospira*, Tate, from the eocene beds of Muddy Creek. From *T. additoides* it may be distinguished by its more slender and rapidly tapering spire, flatter whorls, much less numerous costæ (or plicæ as they are referred to in the description of that species), and the absence of the distinct subsutural band; and from *T. leptospira* it is also I believe distinct, but owing to the exceed-

ingly brief and vague description of this species I can only fall back on the accompanying figure for differential characters, and from this I judge that the present species differs in its embryonic characters, its more rapidly tapering spire, its slightly more convex whorls, and its much smaller number of different costæ or plicæ.

44. Semicassis sufflata, T. Woods.

Cassis sufflatus, T. Woods, P.R.S.Tas., 1876, pp. 93, 94.

Semicassis transenna, Tate, Gast II., 1889, p. 166, pl. viii., fig. 2.

Observations.—There seems no doubt that the shell described by Professor Tate under the name of *S. transenna* is the same species as that previously described by Tenison Woods under the name of *C. sufflatus*. The latter name should certainly stand, as it clearly has priority.

45. Cassidaria wilsoni, Tate.

Id., Tate, Gast. II., 1889, p. 169, pl. vii., fig. 14.

46. Marginella strombiformis, T. Woods.

M. strombiformis, T. Woods, P.R.S.Tas., 1876, p. 109.

M. strombiformis, Tate, Phil. Trans. S.A., 1878, p. 93.

M. strombiformis. Johnston, Geo. Tas., 1888, pl. xxxi., figs. 4, 4*a*.

47. Cypraea ovulatella, Tate.

Id., Tate, Gast. III., 1890, p. 208, pl. vi., figs. 7, 7*a*.

Observations.—The present example apparently differs only in size from that described by Professor Tate, being of nearly twice the dimensions given by him.

48. Cypraea archeri, T. Woods.

C. archeri, T. Woods, P.R.S.Tas., 1875, p. 23, pl. 1, fig. 9.

C. archeri, Tate, Gast. III., 1890, p. 205, pl. vi., fig. 1.

49. Cypraea platypyga, McCoy.

C. platypyga, McCoy, Prod. Pal. Vic., Dec. III., p. 39, pl. xxx., figs. 1–1*c*.

C. platypyga, Tate, Gast. III., 1890, p. 211.

50. Cypraea sphærodoma?, Tate.

Id., Tate, Gast. III., 1890, p. 209, pl. viii., fig. 5.

Observations.—It is with some hesitation that I record this species as occurring at Table Cape, owing to the incompleteness of the example before me, but after careful examination I have been unable to refer it to any other species.

51. Cypraea platyrhyncha, McCoy, var. angustior, var. nov. Plate IV., figs. 8 and 9.

C. platyrhyncha, McCoy, Prod. Pal. Vic., 1876, Dec. III., p. 40, pl. xxx., figs. 2–2*c*.

Observations.—As the common Table Cape shell shows some important departures from the type and usual form in the lower beds of Spring Creek, near Geelong, it seems to me advisable to regard these characters as of sufficient value for the introduction of a varietal name. Sir F. McCoy, when describing this species, has already remarked on some variation from the type form, for whereas the rostrum in the type is broad and flattened like a duck's bill, he has noticed narrower specimens, one or two which show a slight indication of the two anterior dorsal tubercles, and a variation in the number of teeth on the outer lip. The characters upon which I base this varietal name are the usually smaller size of the shell, the much more rapidly tapering and on that account narrower anterior end, the moderately strong development of the two anterior dorsal nodulations or tubercles, the less unequal growth and thickening of the two sides of the posterior canal, the direct effuseness over the spire of the posterior canal, the tendency to upturning of the anterior end and canal, and the stronger development and greater number of teeth on both lips. Sir F. McCoy's description of the mouth of *C. platyrhyncha* is as follows :—" . . . mouth narrow, flexuous, nearly edentulous, the posterior half and anterior fourth of both lips without teeth, the intervening quarter of the length of the outer lip having about twelve obtuse small teeth on the edge, the corresponding portion of inner lip with still smaller and fewer similar teeth, not extended as sulci over the base." In the present variety the anterior fourth of both lips is as above without teeth, but the remainder of the outer lip is toothed right up

to the posterior canal, and the teeth usually number about twenty-two; the inner lip in some specimens is also toothed for its full remaining length, with the same number of similar though smaller teeth, whereas in others they show a marked tendency to become obsolete at the posterior end. In one well-preserved example showing this tendency I have still been able to count sixteen distinctly visible teeth on this lip. All these points of difference are at first sight striking, and might be regarded as of specific value, but a close examination of a number of specimens will, I think, convince anyone that we are not dealing with more than an extreme form of *C. platyrhyncha*, McCoy.

Dimensions of var. angustior.—Length, 68 mm.; breadth, 33 mm.; height, 29 mm.; breadth at anterior end, 8 mm. Smaller specimens of about the following average dimensions also occur:—Length, 57 mm.; breadth, 28 mm.; height, 22 mm.; breadth at anterior end, 6·5 mm.

52. **Conus complicatus**, Tate.

Id., Tate, Gast. III., 1890, p. 195, pl. viii., fig. 8.

53. **Daphnella gracillima**, T. Woods.

Id., T. Woods, P.R.S.Tas., 1876, p. 106.

54. **Bela tenuisculpta**, T. Woods.

Daphnella tenuisculpta, T. Woods, P.R.S.Tas., 1876, p. 106.
Bela tenuisculpta, Tate, T.R.S.S.A., 1894, p. 221.

55. **Raphitoma columbelloides**, T. Woods.

Daphnella columbelloides, T. Woods, P.R.S.Tas., 1876, p. 105.
Pusionella columbelloides, Tate, T.R.S.S.A., 1894, p. 221.

56. **Bela woodsii**, Tate.

Cominella cancellata, T. Woods, P.R.S.Tas., 1876, pp. 107, 108.
Bela woodsii, Tate, Gast. I., 1888, pl. iv., fig. 3.

57. **Pleurotoma paracantha**, T. Woods.

Id., T. Woods, P.R.S.Tas., 1876, p. 105.

58. **Pleurotoma johnstoni**, T. Woods.

Id., T. Woods, P.R.S.Tas., 1876, p. 105.

Observations.—The Rev. J. E. Tenison Woods' description of this species is somewhat vague and difficult to grasp exactly, but I think that the present form represents his species; the specimens before me are however much larger than those indicated by his dimensions, having a length of 77 mm.; breadth, 22 mm.; length of aperture, 41 mm.; breadth of aperture, 9 mm.

59. **Pleurotoma wynyardensis**, sp. nov. Plate II., figs. 12 and 13.

Shell of small to medium size, somewhat narrow elongate-fusiform, aperture and canal about the same length as the spire; spire acute, made up of a rather small embryonic portion, succeeded by numerous, gradually increasing, convex, and more or less strongly costated whorls. Apical angle about twenty-five to thirty degrees. Embryo rather small, consisting of about one-and-a-half smooth convex whorls. Spire consisting of seven or eight regularly convex whorls, with their greatest convexity about the middle of each whorl, and with a well-impressed suture. Aperture oval; outer lip rather thin and smooth internally, with a well-defined broad but comparatively shallow sinus just below the suture, from the sinus the lip projects slightly forward with a regular convex arch, then curving downwards to join the anterior canal. Sinus about one to one-and-a-half millimetre broad, but usually only about half this measurement in depth. At the anterior end the aperture opens into a long, straight, slender and open canal, which is much longer than the aperture. Inner lip with a thin enamel coating. Columella simple and smooth, straight, slender, and gently tapering to the anterior end. Surface ornamented with oblique costæ, which are most highly elevated about the middle of each whorl, and fade off more rapidly towards the posterior suture than the anterior. Costæ usually nine to a whorl, an occasional example shows as many as eleven or twelve on the body-whorl. Strength of development of costæ somewhat variable, especially on the anterior whorls, where they are occasionally only just visible. The costæ are traversed by comparatively coarse and fine spiral threads. Of these there are four to six coarser and more prominent than the rest, situated in the anterior two-thirds of each whorl, especially prominent where they cross the costæ, more numerous, amounting to about eight or nine, on the body-whorl, with much broader interspaces between

each of which has a medial finer thread with a pair of still finer threads on either side of it. The posterior third is occupied by from about ten to fifteen very fine spiral threadlets, also the fine lines of growth of the sinus are in this space. Both costæ and spiral threads are traversed by the fine oblique forwardly directed lines of growth.

Dimensions.—Length, 27 mm.; breadth, 8 mm.; length of aperture, 6 mm.; breadth of aperture, 3 mm.; length of canal, 8 mm. Some of the young examples of this species in the collection have only attained the length of 13 mm.

Locality.—Not uncommon in the eocene beds of Table Cape, Tasmania, also in the lower beds of the lower eocene series at Spring Creek, near Geelong, Victoria.

Observations.—This species, as is commonly the case in the genus to which it belongs, shows a considerable range of variation, especially in the ornament. In the present form the costæ and spiral threads vary in number and in strength. In some examples the former become so weak on the anterior whorls that it would not be surprising, should examples subsequently turn up, in which the costæ had become altogether obsolete on the body-whorl. I am not at present acquainted with any living species which shows any marked affinity with the present form.

60. **Drilia crenularoides**, sp. nov. Plate III., figs. 6 and 7.

Shell moderately large, narrow-elongate, spire many-whorled and longer than the aperture and canal, whorls nodulosely costate, with a rather well marked subsutural concavity, sinus in this region well-defined, moderately broad and deep, canal rather short and straight.

Apical angle about twenty-five degrees. Embryonic whorls unfortunately missing. Spire consisting of about eight convex whorls, greatest convexity about the middle of each whorl, the posterior third of each whorl rather deeply concave immediately under the suture, which gives the appearance to this part of the shell of rather a strong overlap of the whorls, anterior two-thirds convex, most marked at the costæ.

Aperture oval, somewhat contracted posteriorly, and gradually drawn out anteriorly into a short, slightly curved and open canal, which is about the same length as the aperture. Outer lip thin and slightly crenulated at the outer edge with a very

distinct, broad and deep sinus just below the rather prominent subsutural band and situated in the concave posterior third. Sinus about half as deep again as broad, thence the outer lip projects prominently forward, then gently arched to join the anterior canal. Columella simple, slightly bent and tapering.

Posterior whorls ornamented with slightly oblique costæ, developed in the anterior two-thirds of the whorls and extending right up, though gradually fading, to the anterior suture, thus leaving the posterior third practically free from costulate elevations. On the anterior whorls the costæ fade sooner towards the anterior suture, though strongly elevated and prominent medially, giving rise to the appearance rather of a medial band of nodules or tubercles than to fully-developed costæ. Costæ or tubercles number about nine to a whorl. Spiral ornament consists of four or five strong spiral threads in the anterior two-thirds of each whorl, while the body-whorl shows about eight or nine, and one strong thread just adjacent to the posterior suture, making rather a prominent and characteristic subsutural band. On the posterior whorls the anterior group of threads are comparatively broad, with narrower grooves between, but anteriorly the grooves widen out till on the penultimate whorl the grooves or interspaces are broader than the threads, and become still more distinctly so on the body-whorl. As the grooves widen out much finer spiral threads become visible in this space, the interspaces on the body-whorl showing three of these finer intercalated threads. In the concave space between the subsutural band and the threads of the anterior portion of the whorl, which is occupied by the growth-lines of the sinus, there are two or three fine spiral threads, with still finer threads, just visible under a lens, on either side of them. The costæ and spiral ornament are both traversed by fine and close lines of growth, which by their marked sinuation and forward curvature clearly indicate the nature and position of the shell.

Dimensions.—Length, 24 mm. (without embryonic whorls); breadth, 8 mm.; length of aperture, 6 mm.; breadth of aperture, 3 mm.; length of canal, 6 mm.

Locality.—Eocene beds of Table Cape, Tasmania. An imperfect specimen from Spring Creek, Victoria, probably represents this species.

Observations.—This species recalls and apparently has some affinity to some of the forms of the living species, *D. crenularis*, Lamarck, from North Australia and Singapore, and the form to which it appears most closely related is that represented by Tryon in his Manual of Conchology, pl. x., fig. 69, from this it is separable principally by its narrower and slightly longer canal, more slender columella, fewer costæ, and different details of ornament.

61. Natica wintlei, T. Woods.

N. wintlei, T. Woods, P.R.S.Tas., 1875, p. 23, pl. i, fig. 3.
N. wintlei, Johnston, Geo. Tas., 1888, pl. xxix., fig. 10.
N. wintlei, Tate, Gast. IV., 1893, pp. 322, 323.

62. Natica subnoæ, Tate.

N. subnoæ, Tate, Gast. IV., 1893, p. 320, pl. vi., fig. 1.

63. Natica vixumbilicata, T. Woods.

N. ovata, T. Woods (*non* Hutton), P.R.S.Tas., 1875, p. 17.
N. vixumbilicata, T. Woods, *op. cit.*, 1876, p. 111.
N. vixumbilicata, Tate, Gast. IV., 1893, pp. 320, 321, pl. x., fig. 9.

64. Natica polita, T. Woods.

N. polita, T. Woods, P.R.S.Tas., 1875, p. 23, pl. i., fig. 4.
N. polita (*forma typica*), Tate, Gast. IV., 1893, p. 325.
N. polita, (*forma inflata*), Tate, *loc. cit.*

65. Natica, n. sp.

Observations.—This shell is only represented by one example in the present collection, and appears to be entirely distinct from any of our already recognised species; but taking into consideration the fact that most of our common fossil representatives of this genus are subject to no small amount of variation, I refrain from attaching a specific name and rearing up a new species upon this single specimen. The form now under examination may be said to show some affinity to *N. wintlei*, T. Woods, from the same beds, and to *N. aldingensis*, Tate, from the eocene beds of Aldinga, South Australia.

With some of the larger forms of *N. wintlei* it agrees somewhat in umbilical and apertural characters, but does not appear to have any funicular ridge or rib, a feature usually most noticeable in medium-sized specimens of that species. In the characters of this region it makes a closer approach to *N. aldingensis*, but the umbilicus is not so open or so deep. In the shape of the body-whorl it again approaches *N. aldingensis* rather than *N. wintlei*, but differs most markedly from both these species in its very short, small, and depressed spire of about the same number, though much more flattened and hidden whorls. I have not been able to make out any distinct spiral threading or ornament, but fine centrifugal lines of growth and parallel striæ are very well-marked on the spire and body-whorl.

66. Calyptræa subtabulata, Tate.

Trochita calyptræformis, Johnston (*non* Lamarck, *non* Deshayes) P.R.S.Tas., 1876, p. 86, and Geo. Tas., 1888, pl. xxix., figs. 14, 14*a*.

? Pileopsis navicelloides, Johnston, P.R.S.Tas., 1879, p. 39.

Calyptræa subtabulata, Tate, Gast. IV., 1893, p. 332, pl. vii., fig. 1.

67. Turritella warburtoni, T. Woods.

T. warburtoni, T. Woods, P.R.S.Tas., 1876, p. 99.

T. sturtii, T. Woods, *loc. cit.*

T. warburtoni, Tate, Gast. IV., 1893, pp. 337, 338, pl. viii., fig. 2.

T. sturtii, Tate, *loc. cit.*, pl. viii., fig. 6.

Observations.—Professor Tate's description of this species differs from the original description of Tenison Woods, noticeably in that the latter lays a certain amount of stress upon the presence of "*two smooth* conspicuous ribs at the lower part of each whorl, with others very fine and of varying size above;" whereas Professor Tate describes the species as bearing "two anterior ribs more or less granulose, each of the interspaces between the keels with two or three fine threads of varying size." It is evident from this that Professor Tate saw some variation in this species which he thought fit to draw attention to in the above manner. At the same time the fact has been overlooked

that the form described by Professor Tate under the name of *T. warburtoni* is intermediate between those described by Tenison Woods under the names of *T. warburtoni* and *T. sturtii*, the latter being characterised by Tenison Woods in the matter of ornament as follows :—"The three prominent ribs on the whorls are all granular, the larger two at the base of the whorl, and the third above and separated by a wide interval in which smaller ribs occur." Again, Professor Tate's description of *T. sturtii* differs from the original of T. Woods in that he remarks :—"Prominent ribs three, equidistant, of which the median and anterior ones are granulose, the posterior one often double, each interspace with about two fine spiral threads."

From the above remarks it can be readily seen that there is considerable variation in the ornamentation of these Turritellas, and Professor Tate's redescriptions of T. Woods' species, together with my own observations on a very large number of specimens (upwards of 150), constrains me to the belief that we are merely dealing with an extremely variable form, which would be better designated by the one name, *T. warburtoni*, T. Woods, than by an indefinite multiplication of species. The extreme difference in shape to which this species is subject is fairly well represented by Professor Tate's figures to Gastropoda, Part IV., pl. viii., figs. 2, 2*a*, 2*b*, and 6, 6*a*, 6*b*, but in a large series intermediate forms are not uncommon.

The apex is described by Professor Tate as consisting of "two-and-a-half smooth turns" in the one case (*T. warburtoni*) and "three small, smooth, rounded turns" in the other (*T. sturtii*). We are unable to compare this part of the description with that of T. Woods, as he simply says, in both instances, "apex always decollated."

As the specimens described by T. Woods under both these specific names were evidently imperfect examples, I cannot gain any reliable information as to the number of whorls. Professor Tate, however, states that *T. warburtoni* has fifteen whorls in a length of 9·5 mm., while T. *sturtii* has the same number of whorls in 12 mm. In my examination of apically perfect specimens I find considerable variation in the number of whorls in a definite length, and as would naturally be expected, the more acute varieties are those which possess the greatest number of

whorls. We have in this particular an exactly parallel case in the succeeding species, *T. murrayana*, and in the latter case it is extremely readily detected, as it is on a so much larger scale.

68. Turritella murrayana, Tate.

Torcula murrayana, Tate, P.R.S.Tas., 1884, p. 227.

Turritella murrayana, Tate, Gast. IV., 1893, pp. 340, 341, pl. viii., fig. 3.

Observations.—The variation to which this species is subject has already been dealt with to a certain extent by Professor Tate in his Part IV. of our Tertiary Gastropoda; but as my study of this collection of Table Cape Fossils has led to the consideration of forms varying beyond the limits already expressed, I think it well to include here the additional observations.

In the typical form, according to Professor Tate's description, there are twelve to fourteen whorls, an apical angle of about 15 deg., length 60 mm., breadth 17 mm. Professor Tate also notes that the Table Cape form is usually proportionately broader, the apical angle being as much as 18 deg. The specimens I now have under examination from the same locality show a much greater extreme in this direction, for in ten whorls the length is 86 mm. and the breadth 30 mm., while the apical angle is 22 deg. Another example of ten whorls, though still widely divergent from the type, shows a slight diminution in measurements from the preceding, in that its length is 70 mm., breadth 26 mm., and apical angle 21 degrees.

While dealing with this point it may not be out of place to record further variation in the opposite direction. In this case the specimens come from the eocene beds of Shelford, near Geelong, and are extremely slender, many-whorled forms, examples with sixteen whorls being 71 mm. in length, while only 15 mm. in breadth, and with an apical angle of only 12 degrees.

The above seems to my mind to give additional confirmation, if any were requisite, for the way in which I have dealt with *T. warburtoni*, T. Woods.

69. Turritella conspicabilis, Tate.

T. conspicabilis, Tate, Gast. IV., 1893, p. 339, pl. viii., fig. 7.

70. **Thylacodes rudis**, Tate.

T. rudis, Tate, Gast. IV., 1893, p. 343, pl. ix., fig. 8.

71. **Tenagodes occlusus**, T. Woods.

Tenagodus occlusus, T. Woods, P.R.S.Tas., 1876, p. 100.

72. **Potamides pyramidale**, Tate.

Id., Tate, P.R.S.Tas., 1884, p. 226.

73. **Potamides semicostatum**, Tate.

Id., Tate, P.R.S.Tas., 1884, p. 226.

74. **Rissoa dubia**, Johnston.

Id., Johnston, P.R.S.Tas., 1879, p. 33.

Observations.—Owing to the very brief description of this species it is a somewhat difficult matter to come to an absolutely definite conclusion; but the present specimen, after careful examination, I am unable to distinguish as distinct from Mr. Johnston's description, except that it is twice as large as the specimen of which he gives the dimensions.

75. **Astralium flindersi**, T. Woods.

A. (Calcar) *flindersi*, T. Woods, P.R.S.Tas., 1876, p. 95.

76. **Astralium ornatissimum**, T. Woods.

A. (Calcar) *ornatissimum*, T. Woods, P.R.S.Tas., 1876, p. 96.

77. **Astralium (Imperator) johnstoni**, sp. nov.

Imperator (Astralium) *imperiale?* R. M. Johnston, P.R.S.Tas., 1876, p. 90*c*.

Imperator hudsoniana, R. M. Johnston, Geo. Tas., 1888, pl. xxix., figs. 12, 12*a*.

Imperator tasmanica, R. M. Johnston, MS., *op. cit.*, p. 239.

Description.—Shell large, depressed trochiform, somewhat thick, consisting of a few flatly convex whorls, which are spirally ornate and strongly keeled, the keel bearing strong erect and forwardly projecting scales, and with a very deep umbilicus. Embryo

unknown, all the examples at present under examination being imperfect in this respect. Spire-whorls about four in number, rapidly increasing in size to the large and broad body-whorl, almost perfectly flat at first near the posterior suture, then flatly convex to the well-developed and characteristic keel, the latter being situated so close to the anterior suture that owing to its strong development and ornamentation the suture is completely hidden. Body-whorl keeled at the periphery, base almost flat, being slightly convexly rounded from the keel to the umbilicus. Aperture oval, nacreous internally, peristome almost continuous, but falls a little short at the posterior of the inner lip. Outer lip smooth internally, thin at the edge, and slightly crenulated at the ends of the coarse spiral threads; inner lip strongly reflected over the umbilicus. Umbilicus nearly circular, wide, and very deep, penetrating up the spire as far almost as the embryonic whorls, rather strongly angled by two revolving keels. The surface ornament consists of coarse and fine granulose or squamose spiral threads and a strong peripheral keel. The keel carries a number of stout, erect, forwardly projecting and very prominent scales, which are ornamented with fine threads in uniformity with those of the same degree of strength on the remainder of the shell. In a large specimen these peripheral scales number about twelve on the body-whorl, in smaller examples they are slightly less in number. Basal ornament consists of about six or seven coarse spiral threads, which bear numerous and comparatively coarse forwardly projecting scales, commonly, however, worn down to a more or less granulose appearance; intercalated between these are finer threads, which are similarly though not so coarsely ornamented. The spiral ornament is crossed by close, fine, and slightly raised lamellæ parallel to the lines of growth. Umbilicus partly margined by a revolving area, which only shows the lamellæ of growth, and partly by an area bearing spirally revolving threads similar to those above described.

Dimensions.—Height about 30 mm.; breadth to extremities of peripheral scales, 66 to 69 mm.; height of aperture, about 19 mm.; breadth of aperture, 27 mm.; width of umbilicus, 11 mm. Much smaller specimens occur having a basal diameter of from 32 mm. to 40 mm.

Locality.—Eocene, Table Cape, Tasmania. Also from the eocene ferruginous beds of Keilor (T. S. Hart), and Royal Park (Rev. Mr. Ramage), and from the eocene limestones (upper beds) of Moorabool Valley, at Maude.

Observations.—I have taken the liberty of describing and renaming this species owing to the very unsatisfactory and unrecognisable condition in which I find it. In the first place Mr. R. M. Johnston recorded with a doubt the occurrence of the living New Zealand species, *Astralium* (*Imperator*) *imperiale*, Chemnitz. This record in all probability refers to the present species, which, however, is undoubtedly distinct from its living analogue. When next we meet with an *Imperator* in Mr. Johnston's Geology of Tasmania, we find two figures on plate xxix. to which the name of *I. hudsoniana*, R. M. Johnston, is attached in the explanation of the plate; but upon looking up the list of Table Cape species given by the same author in the same work, the only *Imperator* there recorded is *I. tasmanica*, R. M. Johnston, MS. As I have been unable to find any description which goes with either of these names, and as the figures given of *I. hudsoniana* do not render its identification anything but a matter of extreme doubt, I have concluded to describe the shell and dedicate the species to Mr. R. M. Johnston.

The type specimens are in my own collection.

78. Liotia lamellosa, T. Woods.

L. lamellosa, T. Woods, P.R.S.Tas., 1876, pp. 96, 97.
L. lamellosa, Tate, *op. cit.*, 1884, p. 210.

79. Turbo etheridgei, T. Woods.

T. etheridgei, T. Woods, P.R.S.Tas., 1876, pp. 98, 99.

80. Turbo atkinsoni, sp. nov. Plate III., fig. 12.

Shell somewhat thick in the adult form, conical, nacreous internally, with a well-elevated spire; suture not well defined, being most distinct between the body and penultimate whorls. Base very slightly convexly rounded, thus giving rise to a somewhat abrupt convexity at the periphery of the body-whorl, most noticeable immediately above the mouth; the base as it ap-

proaches the anterior end of the mouth is more distinctly and regularly convex, and as a consequence the periphery of the body-whorl becomes less abruptly convexly rounded towards the outer lip of the shell.

Apical angle about sixty degrees. Whorls consisting of an embryonic portion of about a whorl and a half, succeeded by six rapidly increasing very slightly convex whorls. No umbilicus. Aperture oval, columella solid, arched and strongly nacreous, outer lip thick internally and bevelled off to a thin outer edge.

Spirally ornamented with strong, raised, rounded ridges, increasing from about three or four posteriorly to six on the body-whorl, separated from one another by a furrow about equal in breadth to the ridges. Both ridges and furrows very finely spirally striate and crossed transversely by close-set oblique lines of growth; at an average distance of about one millimetre the lines of growth become raised into lamellæ, which give rise to prominent, raised, forwardly projecting scales where they cross the spiral ridges. Base similarly ornamented with nine prominent, spiral, scaly ridges, but with the scales more numerous and closer together, also both ridges and furrows closely and minutely spirally striate.

Dimensions.—Type specimen, length, 28 mm.: breadth, 26 mm.; height of aperture, 8·5 mm.; breadth of aperture, 10 mm. Smaller specimen, height, about 25 mm.; breadth, 21 mm.

Locality.—Eocene beds of Table Cape, Tasmania. Three examples.

Observations.—This species differs from the previously described species, *T. etheridgei*, T. Woods, from these beds, to such an extent in shape, general aspect and ornament that I think it superfluous to enter into any detailed differential characters, and therefore refer to the above description in the hope that it may be found sufficient for the identification of the species. I am not at present acquainted with any other living or fossil species sufficiently closely related to the present fossil form to require any special remarks. Specific name in compliment to Mr. E. D. Atkinson, by whom it was collected from the Table Cape beds.

81. Thalotia alternata, T. Woods.

T. alternata, T. Woods, P.R.S.Tas., 1876, p. 97.

82. **Gibbula æquisulcata**, T. Woods.

G. æquisulcata, T. Woods, P.R.S.Tas., 1876, p. 98.

83. **Calliostoma tasmanica**, R. M. Johnston.

Zizyphinus tasmanicus, R. M. Johnston, P.R.S.Tas., 1879, p. 38.

84. **Calliostoma latecarina**, sp. nov. Plate III., figs. 10 and 11.

Shell small, trochiform, moderately thick, nacreous internally, strongly keeled at the periphery of the body-whorl, with a convex base below. Apical angle about sixty degrees. Apex small and somewhat obtuse, consisting of about one-and-a-half smooth, convex, embryonic whorls, the tip of which is central. The remainder of the shell consists of four somewhat flat to slightly convex and distinctly-shouldered whorls, the shouldering, owing to a marked flattening of the posterior slope in the neighbourhood of the suture, giving rise to the somewhat step-like appearance of the spire. The slope from the shoulder to the anterior suture on the spire-whorls usually only very slightly convex ; on the body-whorl convex to the strong keel, which runs out towards the lower part of the outer lip. Below the keel the base is convex to the aperture. Aperture quadrate, outer lip broken but probably thin at its outer edge ; inner lip nacreous, moderately thick, and reflected at the anterior end. Posterior slope between the shoulder and suture carries three fine spiral threads, the flat shallow interspaces between being about twice the width of the threads, and bearing about three much finer and just discernible spiral threads. Below the shoulder the interspaces become narrow and shallow spiral grooves, and the threads become broad and flat, about five or six of these strong threads on the spire-whorls, but on the body-whorl about three finer threads of the same character are noticeable on either side of the six stouter threads. By far the stoutest spiral band on the body-whorl is the keel, below which, that is on the base, there are eight or nine shallow spiral grooves, with broad flat ridges between, the latter tending to be subdivided into two anteriorly by the development of a finer groove along their middle.

Dimensions.—Length, 7 mm.; breadth, 6 mm.; breadth of aperture, 3 mm.

Locality.—Eocene beds of Table Cape, Tasmania.

85. **Delphinula imparigranosa**, sp. nov. Plate III., figs. 8 and 9.

Shell small, turbinate, convex basally, with a well-elevated spire consisting of a few convex, coarsely granulose whorls, somewhat thick and strong, with a wide and deep umbilicus.

Apical angle about seventy degrees. Embryo obtuse and broad, being about two millimetres across, and consisting of about two whorls, the second of which is distinctly angulose close to the anterior suture, and carrying one spiral band of fine granules between the angulation and the suture. Spire consists of about three rapidly increasing convex whorls, with an ill-defined suture. Aperture comparatively large and round; outer lip thick internally, but thin at the extreme outer edge, and slightly effuse at the four points where the four strongest spiral ridges of granules of the body-whorl cease, much more strongly effuse at the posterior and anterior of the aperture; inner lip very thin and slightly reflected towards the umbilicus, regularly arched on the aperture side, slightly biangulated by the presence of two ridges on the umbilical side. Umbilicus very wide and deep, only about half a millimetre narrower than the aperture, and penetrating a considerable distance beyond the posterior canal, and strongly margined by an acutely-angular granulose ridge running round from the anterior canal and joining the aperture as the second ridge below the suture.

Surface ornamented with coarse and fine granulose spiral ridges, traversed by very fine transverse striæ parallel to the lines of growth. There are three strong unequal granulose ridges to each whorl, the posterior ridge being made up of the coarsest and as a consequence smallest number of granules; the succeeding or middle ridge carries closer, slightly smaller, and therefore a larger number of granules, whilst those on the anterior ridge are still finer and more numerous. On the body-whorl the strongest granules become almost angular nodulosities. Further, between these variously granulose ridges there is a still finer intercalated one, with one or two even finer spiral threads

on either side of it. On the convex base of the body-whorl there is a fourth granulose ridge slightly finer than the third, and situated midway between it and the one margining the umbilicus, and on either side of this ridge there are three spiral threads, the middle one being the strongest, though only faintly granulose. The whole surface finely obliquely striate, the striæ being parallel to the outer margin of the aperture or to the lines of growth. Umbilicus with two faint spirally-angulose ridges and a few obscure intercalated threads and fine striæ parallel to the inner lip.

Dimensions.—Length, 8 mm.; breadth, 8 mm.; breadth of aperture, 3 mm.; length from suture to end of anterior canal, 5 mm.

Locality.—Eocene beds of Table Cape, Tasmania.

Observations.—At first I thought that this might possibly be *D. tetragonostoma*, T. Woods, but after careful consideration I have been unable to make it agree with the description of that species, the ornament particularly being markedly diverse from that expressed by the late Rev. J. E. T. Woods. The present species is, further, a much larger shell, though it is possible from the dimensions given of *D. tetragonostoma* that the latter species may have been founded on an immature shell. *D. tetragonostoma* is also stated to have some relation with the latticed Tasmanian *Liotias*, whereas the present form does not appear to me to show any such special resemblance.

86. Delphinula gibbuloides, T. Woods.

Solarium (*Torinia*) *gibbuloides*, T. Woods, P.R.S.Tas., 1876, pp. 97, 98.

Shell small, somewhat thick, broadly turbinate, somewhat depressed, with an obtuse apex, very large body-whorl, and a broad and deeply excavated umbilicus.

Apical angle about ninety degrees. Embryo obtuse, turbinate, consisting of about one-and-a-half smooth whorls, the second of which is slightly angulated. Spire-whorls three, flatly convex, with a deeply impressed suture between the earlier whorls, becoming less defined anteriorly. Body-whorl strongly keeled at the periphery, base convex to the well-elevated ridge margining the umbilicus. Aperture round; outer lip incomplete, smooth in-

ternally and probably thin at the outer edge; inner lip thin, slightly reflected towards the umbilicus and regularly concavely arched to the anterior canal, the latter being well-defined. Umbilicus very broad and deep, being a little broader than the aperture, and passing up more than half the height of the shell, strongly margined by a well-elevated ridge passing from the end of the anterior canal to a point a little below the suture of the body-whorl. Internally the umbilicus is finely striate and strongly angled by a revolving ridge, which starts from about the middle of the aperture, and a little higher up by another similar though very much fainter ridge.

Ornament consists first of the strong keel at the periphery of the body-whorl, but usually in juxtaposition to the anterior suture of the earlier whorls. This keel carries numerous erect, forwardly projecting spinose scales, which number about fifteen on the body-whorl. On the convex slope between the keel and the suture there are three unequally sized spiral bands of granules, the posterior band being made up of the coarsest granules. On the base between the keel and the thread margining the umbilicus is one prominent squamose spiral ridge with a much finer squamose thread on either side. Further, the shell is finely lamellosely-striate transversely.

Dimensions.—Length, 7 mm.; breadth, 8 mm.; breadth of aperture, 3 mm.

Observations.—After due consideration I have come to the conclusion that the shell I have described above is identical with that described by the late Rev. J. E. T. Woods under the name of *Solarium* (*Torinia*) *gibbuloides*, but as some of the features of the species have not already been very fully expressed, I take the opportunity of adding the above particulars in the hope that it may render its future identification less difficult. With regard to the generic location I prefer to place it under *Delphinula* as above, as its characters seem to point more clearly in that direction. In the original description it is stated that the shell is "conspicuously keeled, keel thin, finely granular, with irregular lines of rather larger granules above it." The herein-described form has very distinct forwardly-projecting scales on the keel and also on the succeeding ridge on the base, but not so prominent on the latter. These might, however, easily become worn or broken

off in such a manner as to leave the keel apparently granulose, and this may account for the above expression. In other respects I can see no difference between the original description and the form at present before me.

87. Haliotis ovinoides, McCoy.

H. ovinoides, McCoy, Prod. Pal. Vic., Dec. III., p. 24, pl. xxv., figs., 2, 2*b*.

88. Actæon puteolata, sp. nov. Plate IV., figs. 10, 11 and 12.

Shell small, oval, with a heterostrophe embryo, prominent and acute spire, somewhat elongate body-whorl, comparatively large and entire aperture, with a strong tooth near the posterior end of the columella, and a faint umbilical chink. Apical angle about thirty degrees. Embryo rather small, consisting of about one-and-a-half smooth convex whorls enrolled in one plane in the heterostrophe portion, which are partially hidden by being immersed in the succeeding whorl. Heterostrophe portion of embryo followed by about another half whorl, which is smooth and convex, and completes the embryonic whorls. Spire-whorls three to four, regularly convex, with a well-defined and slightly channelled suture; whorls gradually increasing at first but comparatively suddenly expanding into the much larger and somewhat elongate body-whorl. Aperture oval, entire, very little less than half the length of the shell, somewhat effuse anteriorly. Outer lip smooth internally, with a thin margin, the slight sutural channelling being most noticeable at its junction with the body-whorl. Inner lip concavely arched, reflected outwardly towards the anterior end. Columella bearing one stout oblique tooth, which is situated rather high up, being immediately opposite the very small and narrow umbilical chink, or slightly above the middle of the aperture. Spire-whorls ornamented with about twelve comparatively broad and flat spiral threads, with very narrow and shallow intervening grooves. On the body-whorl the spiral threads become more numerous, amounting to about twenty, and at the same time become considerably broader bands, and tend to be faintly subdivided by very much fainter, narrower, and

shallower spiral striæ or grooves than the principal ones. In the principal grooves very fine and close striations parallel to the lines of growth are distinctly visible under a lens, and as they do not appear to cross the spiral threads or bands they give rise to the rather characteristic appearance of pitting along these grooves.

Dimensions.—Type example, length, 4·5 mm.; breadth, 2·25 mm.

Locality.—Eocene beds of Table Cape, Tasmania.

Observations.—This species, which shows some relation to the shell previously described by the late Rev. J. E. T. Woods under the name of *Actæon scrobiculatus*, may possibly belong to the genus *Leucotina* of A. Adams, which was founded by that authority for the reception of living species in the Chinese and Japanese seas which are apparently of a somewhat similar type to our fossil form.

From *Actæon scrobiculatus* the present species may at once be separated, as it differs materially in shape and habit, having a relatively longer and more prominent spire, a more marked suture, shorter body-whorl, with one tooth-like plait towards the upper part of the columella instead of the strong obliquely twisted ridge towards the lower or anterior end of the aperture, and the distinct though small umbilicus.

89. Cylichna woodsii, Tate.

C. arachis, T. Woods (non Quoy and Gaimard), P.R.S.Tas., 1876, p. 102.

C. woodsii, Tate, P.R.S.Tas, 1884, pp. 211, 212 and 228.

90. Tugalia crassireticulata, sp. nov. Plate III., figs. 4 and 5.

Shell elongate oval, depressed patelliform, beak or umbo prominent and excentric posteriorly, situated at about one-third the length of the shell from the posterior margin. Greatest breadth (25 mm.) behind the beak across the middle line of the shell, narrowing much more rapidly anteriorly than posteriorly.

Margin coarsely denticulate, with a broad shallow sinus at the anterior end, otherwise almost perfectly flat; but close examination, when placed on a flat surface, shows a very slight lateral elevation, which is greatest at about the middle of each side, where it is very little more than about one millimetre.

Surface ornamented with coarse, gradually thickening ridges radiating in all directions from the umbo, alternate ridges slightly finer than the others, and with interspaces nearly as wide as the ridges. This ornament is crossed at distances of about one millimetre, or slightly less, by strong and regular concentric ridges, giving rise to a coarse reticulation over the whole surface. At the intersection of the radial and concentric ridging it is slightly nodulose when worn, but most likely somewhat squamose in the unworn condition.

Dimensions.—Antero-posterior diameter, 40 mm.; greatest breadth, 25 mm. at about 9 mm. in front of the umbo; height, 12 mm.; sinus, 5 mm. broad by about 1 mm. deep.

Locality.—Eocene beds of Table Cape, Tasmania. One example.

Observations.—This is the first species of this genus described from our Older Tertiary deposits, and it shows close relationship with the living *Tugalia parmophoidea*, Quoy and Gaimard, a not uncommon shell from the coasts of Tasmania, Victoria and South Australia. The present fossil species may however be distinguished from the living species, as it is of a different shape, being more regularly oval and its greatest breadth being anterior to the umbo; whereas the living species is broadest across or slightly posterior to the umbo, is proportionately broader and more suddenly rounded at the anterior end, and when placed on a flat surface the lateral margins are very much more highly and distinctly elevated. Further, the fossil species is much more coarsely ornamented and with coarser denticulations on the margin.

91. Entalis mantelli, Zittel.

Dentalium kicksii, McCoy, Woods, &c., see R. Etheridge, jun., Cat. Aust. Foss., p. 163.

Dentalium mantelli, Zittel, Pal. von Neu-Seeland, p. 45, pl. xiii., fig. 7, 1865.

Entalis mantelli, Tate, T.R.S.S.A., 1887, Scaphopoda, p. 190 (49 in Pamphlet).

92. Dentalium lacteum, Deshayes.

D. lacteum, T. Woods, P.R.S.Tas., 1874, p. 17.
D. lacteum, Tate, T.R.S.S.A., 1887 [1886], Scaphopoda, p. 193 (52 in Pamphlet).

LAMELLIBRANCHIATA.

93. Ostrea, sp.

Observations.—The specimens before me are not sufficiently well preserved, nor do they show sufficient characters to enable me to refer them to any definite specific name.

94. Placunanomia sella, Tate.

P. sella, Tate, Lam. I., 1886, p. 102, pl. v., figs. 1*a* to 1*c*.

95. Pecten yahlensis, T. Woods.

P. yahlensis, T. Woods, Trans. Phil. Soc. S.A., 1865, pl. i., fig. 4.
P. yahlensis, var. *semilævis*, McCoy, Prod. Pal. Vic., Dec. IV., pp. 13, 14, pl. xxxiv.
P. yahlensis, Tate, Lam. I., 1886, p. 110.

96. Pecten hochstetteri, Zittel.

P. hochstetteri, Zittel, Pal. von Neu-Seeland, p. 50, pl. xi., figs. 5*a* and 5*c* (non 5*b*, fide Tate), 1864.
P. pleuronectes, T. Woods (non Gmelin), Trans. Phil. Soc. S.A., 1865, pl. i., fig. 5.
P. hochstetteri, Hutton, Cat. Tert. Foss. N.Z., p. 30, 1873.
P. hochstetteri, Tate, Lam. I., 1886, p. 114.

97. Pecten foulcheri, T. Woods.

Pecten, sp., Sturt, Two Expeditions, p. 254, pl. iii., fig. 14.
P. foulcheri, T. Woods, Trans. Phil. Soc. S.A., 1865, pl. i., fig. 3.
P. foulcheri, Tate, Lam. I., 1886, p. 111.

98. Lima bassii, T. Woods.

L. bassii, T. Woods, P.R.S.Tas., 1876, p. 112.

L. bassii, Tate, Lam. I., 1886, p. 117, pl. v., fig. 8, and pl. viii., fig. 1.

99. Limatula jeffreysiana, Tate.

Lima (*Limatula*) *subauriculata*, T. Woods, (non Montfort), P.R.S.Tas., 1876, p. 113.

Lima jeffreysiana, Tate, P.R.S.Tas., 1884, pp. 213 and 230.

Lima (*Limatula*) *jeffreysiana*, Tate, Lam. I., 1886, p. 119, pl. iv., fig. 8.

100. Spondylus gæderopoides, McCoy.

S. gæderopoides, McCoy, Prod. Pal. Vic., Dec. IV., 1876, pp. 27, 28, pl. xxxviii., Dec. V., pl. xlv., figs. 1, 3.

S. gæderopoides, Tate, Lam. I., 1886, p. 121.

101. Nucula tenisoni, nom. mut.

Nucula tumida, T. Woods (non Hinds, non Phillipi), P.R.S.Tas., 1876, p. 111.

Nucula grayi, T. Woods (non D'Orbigny), P.R.S.Tas., 1877, p. 55.

Nucula tumida, Tate, Lam. I., 1886, p. 127, pl. vi., figs. 6*a*, 6*b*.

Observations.—I regret that I am at present unable to give as thorough an account of this species as I should like, but failing completeness the following are the facts that have been made out :—*Nucula grayi*, D'Orbigny, was recorded as a living Tasmanian shell by the late Rev. J. E. T. Woods in 1877, when he gave the following very brief description :—"Ovate, very transverse, acuminate at both ends, thin, inflated, very smooth, olive and shining. Very rare. Long Bay. Rev. H. D. Atkinson." This description seems to me to have an uncommonly Leda-like aspect and does not at all indicate to my mind a shell of the type of that now living in Port Phillip Bay, to which apparently, unfortunately, the name of *N. grayi* has become attached.

The original description as given by D'Orbigny in 1846 is as follows :—"N. testa ovali subtrigona lævigata crassa compressa, epidermide fuscoviridescenti ; latere buccali brevi, truncato,

complanato ; latere anali elongato subangulato. Longeur dix millimetres." I cannot regard this as identical with the shell described by Tenison Woods. I am also unable to make Sowerby's description of *N. grayi*, given in Reeve's Conchologia Iconica, fit our living species. The description given is as follows :—"Shell ovate, very transverse, slightly acuminated at both ends, thin, rather inflated, very smooth, olive ; posterior side produced ; dorsal area compressed, elevated sub-aliform, end acuminated ; anterior side a little produced, cuneated ; lunule short, defined." Recorded from South America by D'Orbigny and from New Zealand on the authority of Cuming. The Nucula at present living in Port Philip Bay is not at all uncommon when dredging about the neighbourhood of Brighton or Mordialloc. On several occasions living specimens have been obtained as well as numerous single valves. Having made very careful comparisons between this living species and our very common eocene and miocene, and, according to Professor Tate, also older pliocene fossil, I am forced to the conclusion that there is not the slightest difference between them worthy of the name, and I have therefore no hesitation whatever in again upholding their identity. A fact worthy of note, in my opinion, is that the Spring Creek fossils are those which show the most marked divergence from the living form, whereas those from the eocene beds of Muddy Creek and Mornington, which belong to a higher horizon in the series, according to the opinion held by Mr. T. S. Hall and myself, are absolutely identical, as is also the case with the miocene fossil, though it is noticeable that the latter reached somewhat larger dimensions than those hitherto obtained in the living state. The fossil form was first examined by the Rev J. E. T. Woods in 1876, when he described it as a new species under the name of *N. tumida*, remarking that it was "not unlike the Tasmanian *N. grayi*, Sow., but more tumid and conspicuously sulcate." Subsequently Professor Tate, when dealing with the Tertiary Lamellibranchs, accepted Tenison Woods' species and agreed with him as to its differences from the living Tasmanian species. Both the Rev. J. E. T. Woods and Professor Tate have, however, overlooked the fact that the name *Nucula tumida* had already been preoccupied by Mr. Hinds for a living shell obtained

whilst dredging in the Straits of Malacca.* So that under the circumstances it would hardly be wise to retain the name *N. tumida* for our fossil, as the living shell under that name is a very distinct species. Now, whatever may be the right name to apply to our living Nucula, I have very grave doubts about its identification with *N. gravi*, D'Orb., being correct, and I have up to the present been entirely unable to satisfy myself as to what it should be. Our fossil form, in my opinion, must participate in the same name as the living form, and as vagueness and uncertainty surrounds the latter, and as the former is obviously in want of a name, the simplest way out of the difficulty for the present, though perhaps not the wisest, is to propose for our common fossil, figured and described in the above quoted works, the new name of *Nucula tenisoni*, the specific name attached being a tribute to the late Rev. J. E. T. Woods, whose researches in Australian Tertiary Palæontology are well known to all colonial geologists.

102. Leda crebrecostata, T. Woods.

L. crebrecostata, T. Woods, P.R.S.Tas., 1876, p. 112.

Nuculana crebrecostata, R. Etheridge, jun., Cat. Aust. Foss., 1878, p. 155.

L. crebrecostata, Tate, Lam. I., 1886, p. 133, pl. v., figs. 5*a*, 5*b*.

103. Pectunculus cainozoicus, T. Woods.

Cucullea cainozoica, T. Woods, P.R.S.Tas, 1876, p. 111.

Pectunculus cainozoicus, Tate, Lam. I., 1886, p. 136, pl. x., figs., 8*a*, 8*b*.

Id., R. M. Johnston, Geo. Tas., 1888, pl. xxxi., figs. 13, 13*a*, 13*b*.

104. Pectunculus laticostatus, Quoy and Gaimard.

P. laticostatus, Quoy and Gaimard, Voy. de l'Astrol., vol. iii., p. 466, pl. lxxvii., figs. 4–6, 1835.

P. laticostatus, McCoy, Prod. Pal. Vic., Dec. II., 1875, p. 26, pl. xix., figs. 10–14.

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*P.Z.S., 1843, p. 98, and Voy. H.M.S. "Sulphur," Mollusca, 1844, p. 63, pl. xviii., fig. 6.

P. maccoyii, R. M. Johnston, P.R.S.Tas., 1884, p. 199, and Geo. Tas., 1888, p. 235, pl. xxxi., figs. 1–1*d*.

P. laticostatus, Tate, Lam. I., 1886. p. 137.

P. maccoyii, Tate, *loc. cit.*

105. Cucullæa corioensis, McCoy.

C. corioensis, McCoy, Prod. Pal. Vic., Dec. III., 1876, p. 32, pl. xxvii., figs. 3–5*b*.

C. corioensis, Tate, Lam. I., 1886, p. 144.

C. coriensis, R. M. Johnston, Geo. Tas., 1888, p. 235, pl. xxix., figs. 4, 4*a*.

106. Trigonia semiundulata, McCoy.

T. semiundulata, McCoy, Geo. Mag., vol. iii., p. 481, and Prod. Pal. Vic., Dec. II., 1875, p. 22, pl. xix., figs. 4, 5.

T. semiundulata, Tate, Lam. I., 1886, p. 145.

T. semiundulata, R. M. Johnston, Geo. Tas., 1888, p. 235, pl. xxix., fig. 5.

107. Crassatella oblonga, T. Woods.

C. oblonga, T. Woods, P.R.S.Tas., 1875, p. 25, pl. ii., fig. 11.

C. oblonga, R. M. Johnston, Geo. Tas., p. 234, pl. xxix., figs. 1, 1*a*.

Observations.—This species is also recorded by Professor Tate as occurring in the miocene beds at Muddy Creek, Victoria, and in the oyster beds of the North-west Bend, River Murray. My examination of the Table Cape specimens enables me, however, to assert positively that the Muddy Creek shells are very distinct indeed, and the differences are such that to my mind they necesitate the description and renaming of the Victorian species, which I hope to undertake in my next palæontological paper.

108. Crassatella aphrodina, T. Woods.

C. aphrodina, T. Woods, P.R.S.Tas, 1875, p. 24, pl. iii., fig. 12.

C. aphrodina, Tate, Lam. I., 1886, p. 147.

C. aphrodina, R. M. Johnston, Geo. Tas., p. 234, pl. xxix., fig. 2.

Observations.—There is only one specimen among the Crassatellas before me which seems to correspond with the figures and

descriptions as referred to above, and in the absence of sufficient material I am unable to speak very definitely, but am somewhat inclined to think that this is hardly a valid species, and that it may prove to be but a varietal form of *C. oblonga*, T. Woods.

109. Mytilicardia platycostata, R. M. Johnston.

M. platycostata, R. M. Johnston, P.R.S.Tas., 1879, p. 40.
M. platycostata, Tate, Lam. I., 1886, p. 150.

110. Cardita gracilicostata, T. Woods.

C. gracilicostata, T. Woods, P.R.S Tas., 1876, p. 112.
C. gracilicostata, Tate, Lam. I., 1886, p. 152, pl. ii., figs. 6, 8.

Observations.—This species was recorded by Mr. J. Dennant in 1888 as occurring in the older beds at Muddy Creek, Victoria [T.R.S.S.A., vol. xi., 1888, p. 50]: subsequently Mr. T. S. Hall and I recorded it in our paper on the Older Tertiaries of the Southern Portion of the Moorabool Valley [P.R.S.Vic, vol. iv., n.s.], the identification being made for us by Mr. Dennant. Upon looking up the Moorabool Valley specimens so-named, I find that they were wrongly identified, and ought to have been regarded as *C. polynema*. In view of this I cannot but feel some doubt about the Muddy Creek record, which should, I think, be further confirmed or else withdrawn from the lists. It is satisfactory, however, that I am now in a position to record the occurrence of typical examples of *C. gracilicostata* from the eocene beds at Birregurra, whence it was obtained in material kindly forwarded to my friend Mr. T. S. Hall by Mr. Alex. Purnell. Having before me undoubted examples of the species from Table Cape, its type locality, and having made careful comparisons to the minutest detail between these and the Birregurra shell, I have no hesitation whatever in giving this as the only Victorian locality as yet known to me.

111. Cardita scabrosa, Tate.

Id., Tate, Lam. I., 1886, p. 152, pl. ii., fig. 4.

Observations.—The validity of this species is, I think, a matter of extreme doubt, and further investigation may prove that it is but a small form of *C. gracilicostata*, T. Woods. My attention

was drawn to this shell by the fact that a Table Cape specimen had been so named in the collection of the Ballarat School of Mines, and upon examination I found it to be identical with a form in the Atkinson collection which I had regarded merely as a young and well-preserved example of *C. gracilicostata*. Further, upon going over the descriptions and figures of these two species given by Professor Tate, their extreme closeness, if not absolute identity, seems to be apparent.

112. Cardita tasmanica, Tate.

Id., Tate, Lam. I., 1886, p. 154, pl. xii., fig. 13.

113. Lucina planatella, Tate.

Id., Tate, P.R.S.Tas., 1884, p. 229, and T.R.S.S.A., 1886, pl. xii., fig. 11, and Lam. II., p. 146.

114. Diplodonta subquadrata, Tate.

Id., Tate, Lam. II., 1887, p. 147, pl. xiv., figs. 10*a*, 10*b*.
Id., R. M. Johnston, Geo. Tas., p. 234, pl. xxxii., figs. 14, 14*a*.

115. Chama lamellifera, T. Woods.

Id., T. Woods, P.R.S.Tas., 1876, p. 114.
Id., Tate, Lam. II., 1887, p. 149, pl. xiv., fig. 5*a*, 5*b*.

Observations.—Tenison Woods, in giving the dimensions of this species, says :—"Largest specimens about lat. 24 by 22 and 18 mm. thick." Professor Tate states that they rarely exceed twenty millimetres of diameter. Several examples in the present collection do not conform to these dimensions, and a special feature of the majority is the extreme thickening of the shell. There are six examples above the dimensions given by Tenison Woods, ranging for their antero-posterior diameter from 25 mm. to 38 mm., and giving an average of a little over 30·5 mm., for their dorso-ventral diameter from 22 mm. to 29 mm., or an average of 25 mm., and in the thickness of the shell they run from 2 mm. to 8 mm.

116. Chamostrea albida, Lamarck.

C. albida, Lamarck, Anim. Sans. Vert., vol. vi., p. 96, 1819.
C. crassa, Tate, P.R.S.Tas., 1884, p. 228.

C. albida, Tate, Lam. II., 1887, p. 149.

Observations.—A single left valve of this species has been already recorded from the eocene beds of Table Cape on the authority of Professor Tate, founded upon a specimen collected by Mr. R. M. Johnston. There is a single right valve in the present collection, the state of which gives rise to an element of doubt, and suggests the possibility that it may have accidentally become entangled in some of the detritus of the shore line. Upon questioning Mr. Atkinson as to where this shell was collected, he said that he could not be certain that it was obtained *in situ*, and thought that it might probably have been included from beach material. I shall be very glad to receive any further information which may tend to prove or disprove with certainty the occurrence of this species as a fossil in these beds. Additional colour is lent to this doubt by the presence in the collection of the shelly tube of a marine worm, a living species, evidently included among the fossils accidentally, for it is still in a very fresh condition, despite a certain amount of erosion suffered on the beach. Also by the record by Mr. R. M. Johnston of *Arca trapezia*, Deshayes, as a Table Cape fossil, subsequently, however, expunged from the list.

117. Cardium septuagenarium, Tate.

Id., Tate, Lam. II., 1887, p. 151.

Id., R. M. Johnston, Geo. Tas., p. 234, pl. xxxii., figs. 1, 15 and 16.

118. Chione allporti, T. Woods.

Venus allporti, T. Woods, P.R.S.Tas., 1875, p. 26, pl. iii., fig. 10.

Chione allporti, Tate, Lam. II., 1887, p. 154.

Venus allporti, R. M. Johnston, Geo. Tas., p. 234, pl. xxxii., figs. 2 and 3.

119. Chione multilamellata, Tate.

Id., Tate, Lam. II., 1887, p. 154.

120. Chione hormophora, Tate.

C. (*Timoclea*) *hormophora*, Tate, P.R.S.Tas., 1884, p. 230, and Lam. II., 1887, p. 155, pl. xv., figs. 1*a*–1*b*.

121. **Chione cainozoica**, T. Woods.

C. cainozoica, T. Woods, P.R.S.Tas., 1876, p. 113.

C. cainozoica, Tate, Lam. H., 1887, p. 156, pl. xvi., figs. 3*a*–3*b*.

C. cainozoica, R. M. Johnston, Geo. Tas., p. 233, pl. xxxii., figs. 8, 8*a*, 11 and 11*a*.

122. **Chione propinqua**, T. Woods.

C. propinqua, T. Woods, P.R.S.Tas., 1876, p. 113.

Observations.—The specimens attributed to Tenison Woods' species by Professor Tate as occurring in the "lower and upper beds at Muddy Creek, but common in the latter only," do not in my opinion belong to the same species as the Table Cape specimens, and on that account the Victorian fossil, which is a very characteristic miocene form, stands in need of a name. In order to clear up the confusion surrounding this species I intend, in my next paper, to redescribe and rename the Victorian miocene fossil, with full particulars as to the points wherein it differs from the Table Cape species.

123. **Cytherea tenuis**, Tate.

C. tenuis, Tate, Lam. H., 1887, p. 159, pl. xiv., fig. 16.

C. eburnea ?, Johnston (non Tate), Geo. Tas., p. 233, pl. xxxii., figs. 9, 9*a*.

Observations.—The shell recorded and figured by Mr. R. M. Johnston as *Cytherea eburnea*, Tate, does not appear to be Professor Tate's species, but may probably represent *C. tenuis*, Tate.

124. **Dosinia densilineata**, sp. nov. Pl. IV., figs. 5, 6 and 7.

Shell orbicular, thin to thick, varying from about ·5 mm. or less in young shells to 3 mm. in thickness in the adult form; fairly convex, most marked in the umbonal region, maximum convexity situated about one-third the length of the umbo-ventral diameter from the dorsal margin in about the middle line of the shell. Umbones well defined, regularly convexly incurved obliquely towards the anterior end, from which they are situated about one-third the length of the shell.

Lunule elongate cordate, deeply depressed, finely and closely lamellose. The shell immediately anterior to the umbo and in

the neighbourhood of the lunule is markedly concave to a little beyond the lower end of the lunule, thence the anterior margin is regularly convex and protruding well forward before joining the convex ventral margin; post-dorsally flat on the dorsal surface, but the margin is slightly convexly rounded to meet the ventral margin with which it forms a very obtuse angle.

Externally the valves are ornamented with very numerous close-set concentric ridges, which are flat medially, but on account of being set somewhat obliquely appear slightly acutely elevated towards the umbo, becoming distinctly lamellose anteriorly and posteriorly, the lamellæ being directed towards the ventral margin and being most highly elevated along the posterior and anterior slopes of the valve. The concentric ridges become slightly broader towards the ventral margin, the intervening grooves are comparatively shallow and very much narrower than the ridges, usually considerably less than one-half their width, and becoming broader as the ridges become lamellose. The number of concentric ridges in more than half a dozen specimens of about the same dimensions as *Dosinia johnstoni*, Tate, namely, 29 mm. by 27 mm., average forty-nine in ten millimetres from the ventral margin; in specimens of larger dimensions they become gradually less in number, and in the largest specimen yet to hand, which measures 62 mm. by 57 mm., we have only eighteen concentric ridges.

Both ridges and grooves very finely, regularly, and closely concentrically striate, the striæ of the grooves becoming distinctly lamellose ventrally and laterally, usually more distinct at the posterior end. Internally the hinge is thick and strong in the adult form, with a well-defined and deep ligamental area post-dorsally; the hinge of the right valve bearing three strong cardinal teeth, the middle one being slightly bifid, whilst the posterior one is more distinctly so: there are also two rudimentary anterior lateral teeth at the base of the lunular area; the left valve also carries three strong cardinal teeth, the middle one only being slightly bifid, and one strong anterior lateral tooth. The pallial sinus is very broad at the base and deeply protruding into the shell horizontally and vertically beyond the centre of the valve, apex usually convexly rounded, occasionally acutely angular.

Dimensions.—Average dimensions of the Table Cape specimens: Antero-posterior diameter, 29 mm.; umbo-ventral diameter, 27 mm.; thickness through both valves, 15 mm.

Average dimensions of Spring Creek specimens:—Antero-posterior diameter, 50 mm.; umbo-ventral diameter, 45 mm.; thickness through single valve, 12·5 mm.

The largest specimen yet to hand is from the Spring Creek beds, which gives the following measurements:—Antero-posterior diameter, 62 mm.; umbo-ventral diameter, 57 mm.; thickness through the single valve, 15 mm.

Locality.—Eocene beds of Table Cape, Tasmania. Seven double valves and a single valve. Common in the lower eocene sandy beds of Spring Creek, near Geelong, and the lower beds of Maude, Moorabool Valley; also from the eocene limestone at Waurn Ponds (McCann's Quarry).

Observations.—This species is obviously closely related to *Dosinia johnstoni*, Tate, better proof of which we could not have than the fact that Professor Tate himself has recorded this very characteristic miocene species as occurring in the eocene beds of Table Cape and Spring Creek. The eocene and miocene shells seem to me however to be sufficiently distinct, after long and minute study, to warrant the description and the application of a new name to the eocene form.

In the first place, an important difference between the herein-described species and *D. johnstoni*, Tate, and one which the most casual observer can hardly fail to detect at first sight, is the very much closer, finer, and even more regular concentric ridging. In Professor Tate's description of *D. johnstoni* he states that the concentric ridges are "separated by linear deep sulci (about twenty in a breadth of ten millimetres measured from the ventral margin)." As the Table Cape shells are not very far removed in dimensions from those given by Professor Tate for *D. johnstoni*, they will serve as a reliable basis upon which the contrast of the concentric ornamentation may be indicated. These Tasmanian examples give an average of forty-nine grooves in the 10 mm. from the ventral margin as against the above. In the examination of the Table Cape examples a noticeable feature is that as the specimens increase in dimensions the concentric ridges tend to become slightly less in number. This latter feature

is still further brought out, and to a much more marked degree, by the larger shells from Spring Creek, thus in the largest specimens (62 mm. by 57 mm.) yet to hand from this locality we have only eighteen concentric ridges in the ten millimetres from the ventral margin. In addition, the lunule of *D. densilineata* is larger, longer and more depressed, the umbo is more markedly incurved and very much more inflated, and situated further back from the anterior margin. Viewed from the dorsal margin the outline is much more convex medially and flatter laterally. These characters seem to me ample to distinguish this shell as a good species. During the study of this species I have not neglected to compare it with many actual examples of living species of the genus. In the National Museum, Melbourne, there are upwards of forty species of Dosinia, which, through the kindness of Mr. W. Kershaw, I have had an opportunity of examining, and I take occasion now to tender him my best thanks. Of the living species hitherto examined, that which seems to me closest related to *D. densilineata*, particularly the larger Spring Creek representatives, is *D. lamellata*, Reeve, from North Australia, but our fossil species differs from this mainly in that the antero-posterior diameter is proportionately longer, and that the anterior and posterior slopes are flatter, these characters giving a very different aspect to the shell. Further, the lunule of *D. densilineata* is much longer and somewhat flatter, though about the same breadth, the umbo is more inflated, and the concentric ridging is stouter in the umbonal region and not finely lamellose as in the recent species; medially the ornament is somewhat similar in both the fossil and recent species, consisting of flat concentric ridges becoming distinctly lamellose laterally, also lamellosely ornamented near the ventral margin, but the intervening grooves are shallower in the fossil shell. Mr. T. S. Hall and I have also recorded this species as *D. johnstoni* from the eocene beds of Maude, and I now take this opportunity of correcting that record. In view of the above it should now stand as *D. densilineata*. A further point worthy of note in a Tasmanian representative of this species lent me by the Ballarat School of Mines is that when somewhat slightly decorticated exceedingly fine, close, and regular radial riblets are rendered visible. I have also been able to determine with certainty this

feature in some of the Victorian shells, but owing to their good state of preservation it is rarely noticeable; on the other hand, even with worn and decorticated examples of *D. johnstoni*, I have hitherto been entirely unable to detect anything of this kind in that species. The type of this species is in my own collection.

125. **Tellina cainozoica**, T. Woods.

Id., T. Woods, P.R.S.Tas., 1876, p. 113.
Id., Tate, Lam. II., 1887, p. 164, pl. xviii., fig. 5.

126. **Zenatiopsis fragilis**, sp. nov. Plate IV., figs. 3 and 4.

Shell very thin and fragile, elongate oblong, much depressed, anterior end very short, posterior end much elongated.

Dorsal margin straight or slightly concave, anterior margin regularly convex to about the anterior extremity, still convex but more gradually so to meet the ventral margin, which is straight or slightly convex and parallel to the dorsal margin from a point slightly posterior to a line passing through the umbo for a distance slightly in excess of half the full length of the shell, thence the margin has a more gradual slope up to the posterior extremity than at the anterior end, thence more rapidly convex to join the dorsal margin. Anterior gape commences immediately anterior to the umbos, while the posterior gape commences slightly posterior to the umbos, the ventral margins of the valves being in contact. Valves very slightly convex, greatest convexity situated at the intersection of the antero-posterior diameter and a line perpendicular to it and passing through its middle point; from this point the convex slope is more marked dorsally than ventrally and only just appreciable anteriorly and posteriorly. Umbo, though small, is prominent, acute and incurved, and situated about one-sixth the length of the shell from the anterior extremity. Surface ornamented with numerous shallow concentric corrugations of the shape above indicated, and fine, close-set, concentric striations, with a few very faint radial striations from the umbo posteriorly.

Dimensions.—Type, antero-posterior diameter, 33 mm.; dorso-ventral diameter, 12 mm.; thickness through both valves, 4 mm. Largest specimen yet to hand measures 46 mm. by 17 mm., with a thickness through both valves of 7 mm.

Locality.—Eocene beds of Table Cape, Tasmania. Two double valves and a right valve.

Observations.—This species has been confounded by Mr. R. M. Johnston (Geo. Tas., p. 233) and Professor Tate (Lam. II., 1887, p. 172) with *Zenatiopsis angustata*, Tate, from which however it may be distinguished by its much greater delicacy, its different shape, straight or concave dorsal margin, parallel ventral margin, and the absence of the general posterior attenuation present in that species.

127. Myodora australis, R. M. Johnston.

Id., R. M. Johnston, P.R.S.Tas., 1879, p. 40.

Id., Tate, Lam. II., 1887, pp. 174, 175, pl. xvii., figs. 10*a*, 10*b*.

128. Myodora brevis, Sowerby.

Pandora brevis, Sowerby, App. to Stutchbury's Sale Cat., p. 3, fig. 2.

Myodora brevis, E. A. Smith, Voy. Chall. Zoo., vol. xiii., 1885, Lamellibranchs, p. 64.

Myodora æquilateralis, R. M. Johnston, P.R.S.Tas., 1879, p. 40.

Myodora æquilateralis, Tate, Lam. II., 1887, p. 176, pl. xvii., fig. 8.

129. Corbula ephamilla, Tate.

C. sulcata, McCoy (non Lamarck), A.M.N.H., 1866, and Exhibition Essay, 1866, p. 19.

C. sulcata, T. Woods (non Lamarck), P.R.S.Tas., 1874, p. 16.

C. ephamilla, Tate, P.R.S.Tas, 1884, pp. 213 and 229; also Lam. II., 1887, p. 176, pl. xvii., figs. 13*a*–13*c* and 14.

Observations.—Sir Frederick McCoy states of this species:—"The only other excessively common living species of shell in our miocene or oligocene beds is the *Corbula sulcata*, Lam., of the tropical seas of the west coast of Africa, whence I have procured living specimens, so that, as in the other cases of identity of species spoken of, I might not run the chance of misleading my readers by erroneous identifications based on comparisons with figures or descriptions only." Professor Tate, however, in the face of this very clear decision, says, when naming and describing our fossil, he has "no means of ascer-

certaing what amount of reliance is to be placed on McCoy's determination."

In the National Museum, Melbourne, there are six specimens labelled *Corbula sulcata*, Lam., from the west coast of Africa, which are most likely to be the specimens above mentioned by Sir F. McCoy. Through the kindness of Mr. W. Kershaw, of the Museum, I have been enabled to examine these specimens closely and compare them critically with actual examples of our fossil species, and I have no hesitation in expressing that in my opinion our common and widely ranging fossil is specifically distinct from *C. sulcata*, Lam., and therefore, as far as the present investigation goes, *C. ephamilla*, Tate, should stand for our fossil.

130. Panopæa agnewi, T. Woods.

Lyonsia agnewi, T. Woods, P.R.S.Tas., 1875, p. 25, fig. 13.
Panopæa agnewi, Tate, Lam. H., 1887, p. 179.

131. Solecurtus legrandi, T. Woods.

S. legrandi, T. Woods, P.R.S.Tas., 1875, p. 25, fig. 14.
S. legrandi, Tate, Lam. H., 1887, p. 181, pl. xvii., fig. 15.
S. legrandi, R. M. Johnston, Geo. Tas., p. 233, pl. xxxii., fig. 18.

BRACHIOPODA.

132. Waldheimia grandis, T. Woods.

W. grandis, T. Woods, Trans. Phil. Soc. S.A., 1865, pl. ii., fig. 1.
W. gambierensis, R. Etheridge, jun., A.M.N.H., 1876, vol. xvii., p. 19, pl. ii., fig. 4.
W. grandis, Tate, Trans. Phil. Soc. S.A., 1880, p. 13, pl. xi., figs. 3 and 4.

133. Waldheimia garibaldiana, Davidson.

Terebratula, sp., Sturt, Two Expeditions in S.A., vol. ii., pl. iii., fig. 15, 1834.
Terebratula compta, T. Woods (non Sowerby), Geo. Obs. in S.A., p. 74, wdct., 1862.

Waldheimia garibaldiana, Davidson, Geologist, vol. v., p. 466, pl. xxiv., fig. 9, 1862.

Waldheimia imbricata, T. Woods, Trans. Phil. Soc. S.A., 1865, fig. 3, and P.R.S.N.S.W., 1878, p. 79, fig 1.

Waldheimia garibaldiana, R. Etheridge, jun., A.M.N.H., vol. xvii., p. 17, pl. i., fig. 2, 1876.

Waldheimia macropora, McCoy, Prod. Pal. Vic., Dec. V., pl. xliii., figs 4 and 6.

Waldheimia garibaldiana, Tate, Trans. Phil. Soc. S.A., 1880, p. 7, pl. xi., figs. 1*a*–1*c*.

Waldheimia garibaldiana, Johnston, Geo. Tas., p. 232, pl. xxxiii., fig. 13.

134. Terebratula vitreoides, T. Woods.

T. vitreoides, T. Woods, P.R.S.N.S.W., 1878, p. 78, figs. 4*a*–4*d*.

T. vitreoides, Tate, Trans. Phil. Soc. S.A., 1880, p. 5, pl. viii., figs. 5*a*, 5*b*, and pl. x., figs. 7*a*, 7*b*.

T. vitreoides, Johnston, Geo. Tas., p. 232, pl. xxxii., fig. 14.

135. Terebratulina scoulari, Tate.

T. scoulari, Tate, Trans. Phil. Soc. S.A., 1880, p. 19, pl. viii., figs. 3*a*–3*d*.

T. scoulari, Johnston, Geo. Tas., p. 232, pl. xxxiii., fig. 2.

136. Terebratella tepperi, Tate.

T. tepperi, Tate, Trans. Phil. Soc. S.A., 1880, p. 21, pl. ix., figs. 8*a*–8*c*.

T. tepperi, Johnston, Geo. Tas., p. 232, pl. xxxiii., fig. 6.

137. Magasella compta, Sowerby.

Terebratella compta, Sowerby, in Strezlecki's Phys. Desc. of N.S.W., etc., 1845, p. 297, pl. xix., fig. 4.

Terebratella compta, T. Woods, Trans. Phil. Soc. S.A., 1865, fig. 4, *a*—*e*.

Terebratella compta, R. Etheridge, jun., A.M.N.H., 1876, p. 19, pl. ii., fig. 5.

Magasella compta, Tate, Trans. Phil. Soc. S.A., 1880, p. 23, pl. x., figs. 6*a*–6*e*.

Magasella woodsiana, Tate, *op. cit.*, pp. 24, 25, pl. x., figs. 3*a*–3*d*.

Observations.—This is a somewhat variable species, and after examining 162 specimens from various localities I cannot see that any useful purpose is served in retaining *M. woodsiana* as specifically distinct from the other forms, as there are so many gradations between them that it becomes a matter of impossibility to separate them into two distinct species.

138. Rhynchonella squamosa, Hutton.

R. squamosa, Hutton, Cat. Tert. Moll. N.Z., p. 37, 1873.

R. lucida, McCoy, etc., non. Gould, see R. Etheridge, jun., Cat. Austr. Foss., 1878, p. 151.

R. squamosa, Tate, Trans. Phil. Soc. S.A., 1880, p. 27, pl ix., figs. 9*a*, 9*b*, also Trans. Roy. Soc. S.A., 1885, p. 94.

R. squamosa, Johnston, Geo. Tas., p. 233, pl. xxxiii., fig. 12.

ECHINODERMATA.

139. Conoclypeus rostratus, Tate.

C. rostratus, Tate, P.R.S.N.S.W., 1893, p. 194, pl. xiii., fig. 1.

140. Lovenia forbesi, Woods and Duncan.

Var. *woodsi*, R. Etheridge, jun.

Spatangus hoffmanni, Sturt (non Goldfuss), Two Exped. in S.A., 1834, pl. iii., fig. 10.

Spatangus, sp., Forbes, "Lectures on Gold," etc., London, D. Bogue, 1852.

Spatangus forbesi, McCoy, M.S.

Hemipatagus forbesi, McCoy, M.S.

Spatangus forbesi, T. Woods, Geo. Obs. in S.A., 1862, p. 75, woodcut.

Hemipatagus forbesi, Woods and Duncan, A.M.N.H., 1864, ser. 3, vol. xiv., p. 165, pl. vi., fig. 3, *e*–*f*.

Hemipatagus forbesi, Laube, Akad. d. Wiss. Wien, 1869, vol. lix., p. 193, figs. 4–4*b*.

Hemipatagus woodsi, R. Etheridge, jun., Q.J.G.S., 1875, vol. xxxi., p. 445, pl. xxi., figs. 1, 7.

Hemipatagus woodsii, Johnston, P.R.S.Tas., 1876, p. 116.

Lovenia forbesi, Woods and Duncan, Q.J.G.S., 1877, vol. xxxiii., p. 56, pl. iv., figs. 5 to 8.

Lovenia forbesi, McCoy, Prod. Pal. Vic., Dec. VI., 1879, pp. 37–40, pl. lx., figs. 1–4.

Sarsella forbesi, Pomel, Theses par A. Pomel, Class. method. Ech. viv. et foss., Alger, 1883, p. 28.

Lovenia forbesi, Woods and Duncan, Q.J.G.S., 1887, vol. xliii., pp. 424 to 426.

Observations.—This very common echinoid has given rise to more controversy and difference of opinion than any other of the Australian Tertiary Echinoids, and as a consequence there is still a great amount of confusion existing as to its correct generic position, and as to the rightful author of the specific name. With regard to the latter nothing could be more clearly expressed than Professor P. M. Duncan's views on the subject in 1887, where it is distinctly shown that Woods and Duncan should be regarded as the authors of the species, Professor Duncan himself including T. Woods' name on account of the assistance rendered to him by the latter when describing the species. Sir F. McCoy states "that it is impossible to divide this species into two as suggested by Mr. Etheridge, jun. (*L. woodsi* and *L. forbesi*), from the number of primary tubercles in the posterior lateral interambulacra, although I notice that those with the more numerous tubercles are more common in the Murray Cliffs and more rare near Melbourne, and that they are less pentagonal from a slightly greater proportional length and less protuberant sides, and have the apex usually farther from the posterior end and the posterior ridge stronger." The form of this species occurring at Table Cape comes in the same group as the specimens from the River Murray Cliffs.

141. Cyclaster archeri, T. Woods.

Echinolampas, sp., T. Woods, Geo. Obs. in S.A., 1862, p. 77, woodcut.

Hemiaster archeri, T. Woods, Trans. Phil. Soc. S.A., 1867, figs. *2a–2d*.

Micraster brevistella, Laube, Akad. d. Wiss. Wien, 1869, vol. lix., p. 192, fig. 8

Micraster brevistella, R. Etheridge, jun., Q.J.G.S., 1875, vol. xxxi., p. 447, figs. 11 and 12.

Micraster brevistella, Johnston, P.R.S.Tas., 1876, p. 116.

Brissopsis archeri, Tate, T.R.S.S.A., 1884, p. 41.

Micraster archeri, Tate, T.R.S.S.A., 1891, p. 277.

Cyclaster lycoperdon, Bittner, Akad. d. Wiss. Wien, 1892, p. 360, pl. iv., figs. 1, 2.

? Cyclaster morgani, Cotteau (*fide* Tate).

ZOANTHARIA.

142. **Flabellum distinctum,** Edwards and Haime.

143. **Placotrochus deltoideus,** Duncan.

144. **Deltocyathus italicus,** Edwards and Haime.

List of species recorded from Table Cape in addition to the foregoing. Those marked with an asterisk seem to me to require confirmation, and those marked † I have seen from the Ballarat School of Mines Museum.

CEPHALOPODA.

1. Aturia australis, McCoy.

GASTROPODA.

†2. Murex camplytropis, Tate.
3. Murex legrandi, Johnston.
4. Triton crassicostatus, Tate.
5. Epidromus tasmanicus, Johnston (Triton).
6. Fusus craspedotus, Tate.
7. Fusus dictyotis, Tate.
*8. Buccinum fragile, T. Woods.
*9. Voluta allporti, Johnston.
*10. Voluta agnewi, Johnston.
*11. Voluta hannafordi, McCoy (V. alticostata, Tate, may have been mistaken for this species).
*12. Voluta macroptera, McCoy.
13. Marginella octoplicata, T. Woods.
14. Marginella wentworthi, T. Woods.

15. Marginella micula, Tate, var.
†16. Ancillaria hebera, Hutton.
17. Columbella cainozoica, T. Woods.
18. Columbella oxleyi, T. Woods.
19. Cancellaria etheridgei, Johnston.
20. Terebra simplex, T. Woods.
21. Bela pulchra, Tate.
22. Pleurotoma pullulascens, T. Woods.
23. Pleurotoma sanderloides, T. Woods.
24. Mangelia gracilirata, T. Woods.
†25. Borsonia marginata, T. Woods (Thala).
*26. Cypræa eximia, G. B. Sowerby.
27. Trivia avellanoides, McCoy (syn., T. europæa, T. Woods, &c., non Montfort, T. minima, T. Woods).
28. Erato minor ?, Tate.
29. Erato duplicata, Johnston.
30. Crepidula hainsworthi, Johnston.
31. Calyptropsis umbilicata, Johnston, sp. (syn., Crepidula umbilicata, Johnston).
32. Crossea sublabiata, Tate (syn., Crossea labiata, T. Woods).
33. Scalaria (Acrilla) inornata, Tate.
34. Turritella tristira, Tate.
35. Turritella acricula, Tate.
36. Thylacodes conohelix, T. Woods (Vermetus).
37. Leiostraca johnstoniana, Tate (syn., Eulimella subulata, T. Woods, non Donovan).
38. Turbonilla pagoda, T. Woods.
39. Turbonilla liræcostata, T. Woods.
40. Odostomia microlirata, Johnston (syn., Syrnola bifasciata, T. Woods).
41. Mathilda transenna, T. Woods (Turritella).
42. Pyramidella roberti, T. Woods.
43. Pyramidella sulcata, Johnston.
44. Pyramidella polita, Johnston.
45. Rissoa stevensiana, T. Woods.
46. Rissoina varicifera, T. Woods.
47. Rissoina johnstoni, T. Woods.
48. Rissoina tateana, T. Woods.

49. Liotia roblini, Johnston (syn., Liotia discoidea, T. Woods, non Reeve).
50. Adeorbis lævis, Johnston.
51. Gibbula crassigranosa, T. Woods.
52. Gibbula clarkei, T. Woods.
53. Cantharidus ? josephi, T. Woods (Trochus).
54. Eumargarita keckwicki, T. Woods (Margarita).
55. Calliostoma blaxlandi, T. Woods (Zizyphinus).
56. Calliostoma atomus, Johnston (Zizyphinus).
57. Euchelus woodsii, Johnston.
58. Delphinula tetragonostoma, T. Woods.
59. Megatebennus malleata, Tate (Fissurellidæa), (syn., Fissurella concatenata, T. Woods, non Crosse).
60. Emarginula transenna, T. Woods.
61. Actæon scrobiculata, T. Woods.
62. Ringicula lactea, Johnston.

LAMELLIBRANCHIATA.

63. Pecten polymorphoides, Zittel.
64. Pecten lucens, Tate.
65. Pecten (Amusium) zitteli, Hutton (syn., Amusium atkinsoni, Johnston).
66. Limea transenna ?, Tate (syn., ? Cucullæa minuta, Johnston).
*67. Spondylus pseudoradula ?, McCoy.
68. Crenella globularis, Tate.
69. Nucula atkinsoni, Johnston (Portlandia).
70. Nucula fenestralis, Tate.
71. Leda huttoni, T. Woods.
72. Leda prælonga, Tate.
73. Leda apiculata, Tate.
*74. Limopsis aurita, Brocchi (probably L. insolita, Sow.).
75. Limopsis belcheri, Adams and Reeve.
76. Arca pseudonavicularis, Tate.
77. Barbatia celleporacea, Tate.
78. Trigonia tubulifera, Tate.
79. Crassatella communis, Tate (syn., C. astartiformis, Tate).
80. Carditella lamellata, Tate.

*81. Cardita trigonalis, Tate.
82. Cardium pseudomagnum, McCoy.
83. Chione dimorphophylla, Tate.
84. Cytherea eburnea, Tate.
*85. Psammobia hamiltonensis, Tate.
86. Psammobia æqualis, Tate.
87. Phragmorisma anatinæformis, Tate.
88. Aspergillum, sp.

BRACHIOPODA.

89. Waldheimia furcata, Tate.
90. Waldheimia johnstoniana, Tate.
91. Waldheimia corioensis, McCoy.
92. Waldheimia pectoralis?, Tate.
93. Waldheimia tateana, T. Woods.
94. Waldheimia taylori, R. Etheridge, jun.
95. Terebratulina lenticularis, Tate.
96. Terebratulina triangularis, Tate.
97. Terebratulina davidsoni, R. Etheridge, jun.
98. Terebratella woodsii, Tate.

ZOANTHARIA.

99. Flabellum duncani, T. Woods.
100. Flabellum gambieriense, Duncan (syn., ? F. pedicellare, Tate).
101. Flabellum victoriæ, Duncan.
102. Placotrochus elongatus?, Duncan.
103. Notocyathus excisus, Duncan (Sphenotrochus).
104. Notocyathus viola, Duncan (Caryophyllia).
105. Conotrochus maccoyi, Duncan.
106. Heliastræa tasmaniensis, Duncan.
107. Antillia lens, Duncan.
108. Thamnastræa sera, Duncan.
109. Thamnastræa tasmaniensis, Duncan?.
110. Palæoseris woodsi, Duncan (Trochoseris)
111. Balanophyllia australiensis, Duncan.
112. Dendrophyllia duncani, T. Woods.
113. Dendrophyllia epitheca, T. Woods.
114. Astrangia tabulosa, Tate.

P.S.—The Geological Survey of Victoria subdivided the Spring Creek beds, near Geelong, into three, and applied the terms Lower, Middle, and Upper Miocene to these subdivisions. The examinations of this section made by Mr. T. S. Hall and myself enable us to recognise at present only two distinct palæontological zones, and we are of the same opinion as Messrs. Tate and Dennant that the Survey's so-called upper beds cannot be separated from their middle beds. I draw attention to the above in order that there may be no misinterpretation of the earlier portion of this paper, where I have referred to the so-called middle beds at Spring Creek and their probable equivalents, the clay beds of this portion of the section at Spring Creek having yielded a very fair collection of gastropods and lamellibranchs, which has very materially assisted in determining its equivalents elsewhere.

EXPLANATION OF PLATES.

Plate II.

Fig. 1.—Voluta halli, sp. nov., adult specimen, natural size.
,, 2.—Voluta halli, young example, natural size.
,, 3.—Voluta halli, embryonic whorls of an unusually tumid young example, natural size.
,, 4.—Peristernia murrayana, var. costata, nov., natural size.
,, 5.—Latirofusus cingulata, sp. nov., twice natural size.
,, 6.—Latirofusus cingulata, enlarged ornament.
,, 7.—Trophon selwyni, sp. nov., natural size.
,, 8.—Lyria semiacuticostata, sp. nov., natural size.
,, 9.—Terebra prægracilicostata, sp. nov., twice natural size.
,, 10.—Peristernia semiundulata, sp. nov., natural size.
,, 11.—Peristernia semiundulata, enlarged ornament.
,, 12.—Pleurotoma wynyardensis, sp. nov., natural size.
,, 13.—Pleurotoma wynyardensis, enlarged ornament.

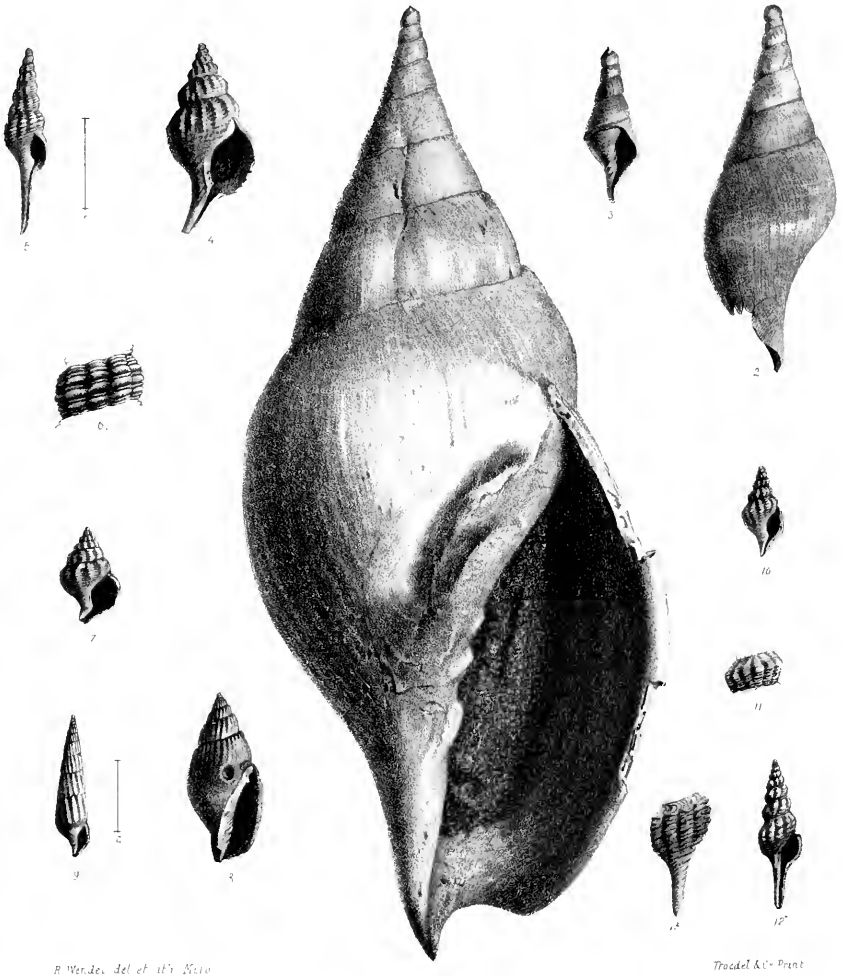
Plate III.

Fig. 1.—Voluta atkinsoni, sp. nov., adult specimen, natural size.
,, 2.—Pyrula altispira, sp. nov., front view, natural size.

Fig. 3.—Pyrula altispira, back view of smaller specimen, natural size.
„ 4.—Tugalia crassireticulata, sp. nov., dorsal aspect, natural size.
„ 5.—Tugalia crassireticulata, side view, natural size.
„ 6.—Drillia crenularoides, sp. nov., natural size.
„ 7.—Drillia crenularoides, enlarged ornament.
„ 8.—Delphinula imparigranosa, sp. nov., back view, twice natural size.
„ 9.—Delphinula imparigranosa, umbilical aspect, twice natural size.
„ 10.—Calliostoma latecarina, sp. nov., back view, twice natural size.
„ 11.—Calliostoma latecarina, front view, twice natural size.
„ 12.—Turbo atkinsoni, sp. nov., natural size.

Plate IV.

Fig. 1.—Voluta spenceri, sp. nov., adult specimen, natural size.
„ 2.—Voluta spenceri, embryonic whorls of another specimen, natural size.
„ 3.—Zenatiopsis fragilis, sp. nov., left valve, natural size.
„ 4.—Zenatiopsis fragilis, right valve of smaller example, natural size.
„ 5.—Dosinia densilineata, sp. nov., left valve, natural size
„ 6.—Dosinia densilineata, front view of double valves, natural size.
„ 7.—Dosinia densilineata, right valve of large example, natural size.
„ 8.—Cypræa platyrhyncha, var. angustior, nov., dorsal aspect, natural size.
„ 9.—Cypræa platyrhyncha, var. angustior, nov., ventral aspect, natural size.
„ 10.—Actæon puteolata, sp. nov., front view, four times natural size.
„ 11.—Actæon puteolata, back view, four times natural size.
„ 12.—Actæon puteolata, embryo enlarged.



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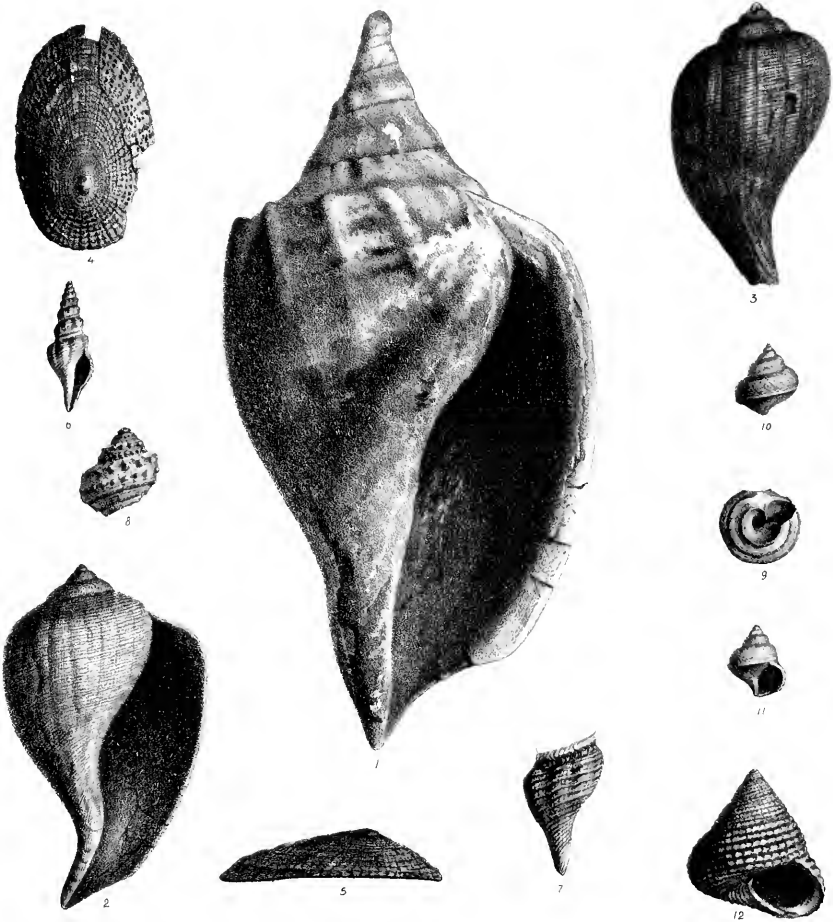
Troedel & Co. Print.



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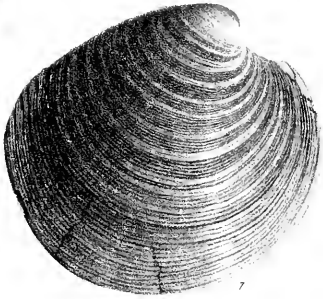

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Art. VIII.—*Remarks on the Proposed Subdivision of the Eocene Rocks of Victoria.*

By T. S. Hall, M.A.

(Demonstrator and Assistant Lecturer in Biology in the University of Melbourne),

And G. B. Pritchard

(Lecturer in Geology in the Working Men's College, Melbourne).

[Read December 12th, 1895.]

Last year we contributed a paper to this Society in which, when discussing the older tertiary rocks of Maude, (1) we indicated what we believed to have been the general order of succession of the eocene rocks of Victoria. During the present year a paper by Professor Ralph Tate and Mr. J. Dennant (2) has appeared, in which our conclusions are objected to and a number of arguments are brought forward in opposition to them. The number and variety of the interpretations of the succession of the rocks in question already advanced show the difficulty of the subject, and an historical account of the various views held has been given by one of us elsewhere (3).

Before considering the objections of Messrs. Tate and Dennant it will be better perhaps to state briefly the steps by which we arrived at our conclusions. For a fuller statement of the case reference must be made to our former article (1). We recognised three horizons, characterised by differences in their fauna, and as types of these horizons we took those deposits which had been most fully elaborated, namely, Lower Muddy Creek, Waurn Ponds, and Spring Creek. We found that where the "Muddy Creek" and "Waurn Ponds types" occurred together, the latter was the underlying deposit, and that beds of the "Waurn Ponds type" in several places overlay the older volcanic rock. At Maude we found that the latter rock was underlain by a series of beds which, on palæontological grounds, we correlated with the Spring Creek beds. As a further confirmation of our view we calculated the percentage of recorded living species in the

Muddy Creek and in the Spring Creek beds and found the result to point in the same direction, namely, that the Spring Creek beds are older than those of Muddy Creek.

The force of some of the objections raised to our views by Messrs. Tate and Dennant, especially as regards the value of the polyzoal rock as a bench mark, cannot be gainsaid, but there are others which we are not at all prepared to allow. We are still of opinion that the Spring Creek series is older than the Muddy Creek one, and that the older volcanic rock is older than the Muddy Creek beds and younger than part, at any rate, of the Spring Creek series.

As a matter of convenience we shall consider Messrs. Tate and Dennant's objections in the order in which they appear in their paper.

In the first place (2, p. 116) the following sentence occurs in their paper :—"At Maude, as is well known, tertiary deposits occur both above and below a layer of basalt, which has been described by the survey as a subsequent intercalation, but this reading is disputed in the article referred to," that is, in our paper. From this passage it would, we think, naturally be concluded that the volcanic rock of this section was regarded by the officers of the survey as of more recent date than the marine beds with which it is intercalated, and that it was in opposition to their views that we regarded it as contemporaneous. In other words, it was open to doubt if it really represented the older volcanic, and that any conclusions we might draw from our view of the case were to be received with caution. But the word "subsequent" does not appear, as far as we can find, in any of the references to the section. As a matter of fact our views on this point are in complete accord with those of the survey, and it was by means of this very section that the age of the older volcanic rock was determined by Selwyn for the colony generally. What we did differ from the survey on was a very minor point. The officers state in effect that after the main flow of basalt, of about 100 feet in thickness, a period of quiescence followed, during which a thin bed of limestone was deposited. Then a thin sheet of basalt was poured out, covering the limestone and metamorphosing it, and that then the deposition of limestone and other marine beds was resumed. We hold that there is only one

sheet of basalt, and that the intercalated limestone does not exist, the appearances being due to deposition as a littoral deposit on a bouldery basalt bottom. It is evident that on the main question, the age of the volcanic rock, we are in agreement with the survey in considering it the "older basalt."

The authors then say that we placed the Spring Creek section lower than the Muddy Creek beds and some others "from its slightly lower percentage of recent species." This is however only a partial statement of our reasons for so doing. Our main reason was stratigraphical, and it was by the latter means that we arrived at our conclusion in the first place, and we took the percentage as a piece of confirmatory evidence.

In calculating our percentage for Muddy Creek we stated that "at least ten recent species are now known from these beds" (1, p. 191). Messrs. Tate and Dennant (2, p. 116) say that eight and not ten are "recorded to have living representatives." It is quite possible that the authors are not prepared to accept as correct all the recent species which are recorded from the lower beds at Muddy Creek. We went carefully through the literature once more, and find that our statement was below the mark; we should have said not ten but eleven. Of these nine are to be found recorded, both as occurring in the lower beds and as being recent species, by Messrs. Tate and Dennant. The tenth has been recorded as occurring by them and has been recorded as recent by us, while the eleventh was recorded from Muddy Creek by one of us, and is an acknowledged recent species.

We are not aware that any of these records have been publicly withdrawn or contradicted, and we give the list with some of the references.

Recorded Living Species in the Lower Beds of Muddy Creek.

	Record in Lower Beds of Muddy Creek.	Record living.
Crepidula unguiformis, Lamk.	4. p. 330	4. p. 330
Capulus danieli, Crosse	4. p. 334	4. p. 334
Hipponyx antiquatus, Linn.	4. p. 329	4. p. 329
Dentalium lacteum, Deshayes	5. p. 52 6. p. 223	5. p. 52

	Record in Lower Beds of Muddy Creek.	Record living.
Ostraea hyotis, Linn.	7. p. 49	7. p. 53
Placunanomia ione, Gray	9. p. 20	8. p. 9
Pectunculus laticostatus, Q. & G.	10. p. 16	8. p. 44
Nucula tenisoni, Pritchard	as *N. tumida* 6. p. 224 10. p. 16	as *N. grayi* 1. p. 190
Limopsis aurita, Brocchi	7. p. 50	8. p. 41
Limopsis belcheri, Ad. & R.	7. p. 50	8. p. 41
Saxicava arctica, Linn.	2. p. 113	5. p. 38

On the following page of the Correlation Paper (p. 17) Messrs. Tate and Dennant state that the number of species passing up from the eocene of Muddy Creek and of Spring Creek into younger deposits is distinctly opposed to our view of the succession. As in the last instance, however, we must take exception to the figures on which they base their calculations. They state that thirty species from Muddy Creek and sixteen from Spring Creek pass up into the miocene. Taking the published papers of Messrs. Tate and Dennant as our authorities, and counting the species recorded as miocene, or in a few cases as younger, and which also occur in the eocene beds, we find our results are widely different from those just quoted. The number of mollusca recorded as passing up from the eocene of Muddy Creek into younger deposits is not thirty but seventy-two, and in the case of Spring Creek, not sixteen but thirty-nine. These records, however, require revision, as although some of the genera have been critically examined since some of the records were made, still the probably incorrect ones have not been expunged, and some species have been recorded with doubt, owing to the imperfect condition of the specimens. In the case of two of the Spring Creek records, namely, *Chione propinqua* and *Dosinia johnstoni*, one of us has elsewhere given reasons for considering them as distinct from the miocene species, and has renamed them. When we reject the species which, after carefully considering the matter, we think should be omitted on the grounds above stated, we obtain for Muddy Creek sixty-eight, and for Spring Creek thirty-three. We are, however, met by a fresh difficulty, and that is what is the total number of molluscan species hitherto obtained

from the two localities. Messrs. Tate and Dennant say they have 649 from Muddy Creek. We believe that we have 326 from the lower beds at Spring Creek. Basing our calculations on these figures, we get about 10 per cent. passing up at Spring Creek and about 10·5 at Muddy Creek, a result which is of little value one way or the other.

We must admit that we were incorrect in grouping together the polyzoal limestones we mentioned in our paper, and that they properly should be associated with the molluscan beds and worked out by their aid. The echinoderms, brachiopods, and pectens, which constitute the bulk of the larger fossils they contain, are practically the same in the beds we specified. But when, as at Upper Maude, we have gastropods and lamellibranchs other than pectens associated with them, we are, as pointed out by Messrs. Tate and Dennant, on surer ground. Last Easter we were fortunate in finding a block of limestone in the quarry *débris* at Waurn Ponds, which contained, amongst other forms, lamellibranch casts similar to those we recorded from North Belmont, and which induced us to place the latter deposit on the same horizon as Spring Creek. Upon the evidence of the brachiopods, echinoderms and pectens we associated the Upper Maude beds with those of Waurn Ponds, but at the same time mentioned that the gastropods from the Clyde section really corresponded with those from calcareous clays overlying and interbedded with the polyzoal limestone at Batesford, and it is consequently with the latter and not with the Waurn Ponds series that the Upper Maude beds should be associated. The Batesford limestones are, it will be remembered, in turn overlain by the richly fossiliferous clays of the Southern Moorabool valley (13).

As a correct reading of the Spring Creek section has an important bearing on the whole question, we may briefly restate the opinions that have been held on the subject. Daintree, who had charge of the survey party in the district, at first recognised two divisions in the beds, the upper comprising everything as far down as the hard band, which we identify as that forming the top of Bird Rock. He distinguished them in his report as Upper and Lower Miocene (11). A short time afterwards the coralline or polyzoal limestone, which he regarded as passing over the top of the clays and sands, was separated from the lower beds, and a

triple series was thus distinguished, which was stated to show sufficient palæontological differences to justify the application of the names Upper, Middle, and Lower Miocene (12).

Subsequently Messrs. Tate and Dennant stated (6) that the polyzoal limestone merged into the upper series of clays, sands, and hard limestone bands, and that no palæontological distinction other than that caused by change of sediment existed. In their last paper (2) they have admitted that there are two zones at Spring Creek, but still refer the whole of the series to one epoch, namely, eocene.

The result of our examination of the section is to confirm the observations of Messrs. Tate and Dennant on these three points. Consequently, instead of the three subdivisions of the survey, we have only two, as their two upper divisions merge laterally.

Hitherto most of the collecting has been done in the lower zone, with the exception of echinoderms, brachiopods and a few pectens, which have been gathered from the polyzoal limestone, and from what Messrs. Tate and Dennant term the echinoderm rock. The molluscan lists and the calculations deduced from them have been founded on the material contained in the beds at or about the level of those of Bird Rock.

On our last two visits to Spring Creek we carefully searched the beds above the echinoderm rock at Fisherman's Steps and along the accessible portions of the cliffs towards Rocky Point, where similar beds overlie the limestones. As already pointed out by Messrs. Tate and Dennant, the most interesting point about the beds is the occurrence of a large percentage of forms not hitherto recorded from the section. Many of these are new, others have only been recorded from Table Cape, while some are common species at others of our eocene sections, which we have grouped with Lower Muddy Creek. It is these last that are specially of interest in considering the question of the general sequence of the Victorian beds. If the Spring Creek series occupied an intermediate position between the Lower Muddy Creek series and the miocene, we should expect the fauna of the higher of the two zones at Spring Creek to be still more closely allied to the miocene, and less so to that of the Lower Muddy Creek series than is that of the lower zone.

This, however, is not the case. The forms that now appear for the first time, or are common instead of rare as in the lower zone, are typical eocene species, which are common at such beds as Mornington. From this horizon we note eleven species recorded for the first time from Spring Creek section, which are common at Mornington, and four which, though previously recorded for the lower beds, are uncommon or even rare, while occurring frequently in what we regard as higher beds elsewhere.

A recent visit to Maude has enabled us to increase our list of species from the lower beds, and the decided affinity of the fauna to that of Spring Creek will be seen on examination of the table showing the occurrence of the fossils at Spring Creek, Muddy Creek, and Mornington.

TABLE SHOWING THE OCCURRENCE OF LOWER MAUDE FOSSILS AT OTHER LOCALITIES.

Lower Maude Fossils, with Corrections and Additions.	Spring Creek.	Lower Muddy Creek.	Mornington.
Zoantharia.			
Placotrochus elongatus, Dunc.	X	X	X
Notocyathus australis, Dunc.	X	X	X
„ excisus, Dunc.	X	X	X
Deltocyathus italicus, Ed. and H. (to replace Bathyactis discus)	X	X	-
Echinodermata.			
Eupatagus rotundus, Dunc. (to replace Maretia anomala)	X	-	-
Monostychia sp.	-	-	-
Fibularia gregata, Tate	X	-	-
Fibularia n. sp. (?)	-	-	-
Scutellina patella, Tate	X	X	X
Annelida.			
Serpula, sp.	-	-	-
Brachiopoda.			
Magasella compta, Sow.	X	X	-
Terebratulina scoulari, Tate	X	X	X
Rhynchonella squamosa, Hutton	-	X	-
Crania, sp.	-	-	-

Lower Maude Fossils, with Corrections and Additions.	Spring Creek.	Lower Muddy Creek.	Mornington.
Crustacea.			
? Lepas, sp.	X	-	-
Lamellibranchiata.			
Ostræa, sp.	-	-	-
Dimya dissimilis, Tate	X	X	X
Pecten consobrinus, Tate, var.	X	-	-
,, foulcheri, T. Wds.	X	X	X
,, eyrei, Tate	X	-	-
Hinnites corioensis, McCoy	-	X	-
Spondylus gæderopoides, McCoy	X	-	-
Limopsis insolita, Sow.	X	-	-
,, belcheri, Ad. and R.	X	X	X
Pectunculus cainozoicus, T. Wds.	X	X	-
Cucullæa corioensis, McCoy	X	X	X
Trigonia tatei, Pritchard	-	-	-
Cardita mandensis, Pritchard	-	-	-
Carditella, n. sp.	X	-	-
Cardium pseudomagnum, McCoy	X	-	-
Lucina leucomomorpha, Tate	X	X	-
Dosinia densilineata, Pritchard	X	-	-
Mactra, n. sp.	-	-	-
Diplodonta, n. sp.	-	-	-
Chama lamellifera, T. Wds.	X	X	X
Myadora tenuilirata, Tate	X	X	X
Corbula ephamilla, Tate	X	X	X
,, pyxidata, Tate	X	-	X
Gastropoda.			
Turritella conspicabilis, Tate	X	-	-
,, gemmulata, Tate	X	X	-
,, sp.	X	-	-
Mathilda transenna, T. Wds.	X	X	-
Natica wintlei, T. Wds.	X	-	-
Tenagodes occlusus, T. Wds.	X	X	X
Odostomia, sp.	-	-	-
Rissoina, sp.	-	-	-
Tinostoma, sp.	-	-	-
Solariella, sp.	-	-	-
Cylichna exigua, T. Wds.	X	X	-
,, sp.	X	-	-
Scutus, n. sp.	-	-	-
Scaphopoda.			
Entalis subfissura, Tate	X	X	X
Pisces.			
Otoliths	-	-	-

Of the thirty-seven species of Mollusca enumerated, twenty-six are described; of these, twenty-three occur at Spring Creek, fifteen at Muddy Creek, and ten at Mornington, while three additional undescribed species occur at Spring Creek, and do not, as far as we are aware, occur at either Muddy Creek or Mornington.

Additions and corrections to the list of species from Waurn Ponds (1, p. 184):—

Notocyathus australis, Dunc.
Deltocyathus italicus, Ed. and H.
Eupatagus murrayensis, Laube, instead of E. murrayanus.
Eupatagus rotundus, Dunc.
Cassidulus florescens, Gregory, instead of Echinobrissus, n. sp.
Terebratulina lenticularis, Tate.
Terebratulina davidsoni, R. Eth., jun.
Placunanomia sella, Tate, instead of P. ione, Gray.
Pecten consobrinus, Tate, var., instead of P. subbifrons, Tate.
Pecten eyrei, Tate, instead of n. sp.
Pecten peroni, Tate.
Hinnites corioensis, McCoy.
Limatula jeffreysiana, Tate.
Nucula tenisoni?, Pritchard.
Leda apiculata, Tate.
Pectunculus cainozoicus, T. Wds.
Trigonia semiundulata, McCoy.
Cardita polynema?, Tate.
Chione halli, Pritchard.
Chione cainozoica, T. Wds.
Dosinia densilineata, Pritchard.
Mactra howchiniana, Tate.
Natica wintlei?, T. Wds.
Turritella conspicabilis?, Tate.
Voluta halli, Pritchard.
Entalis mantelli, Zittel.
Pleurotoma, sp.

This brings the Waurn Ponds list up to seventy-two species.

Revised and extended list of fossils from the limestone of Batesford (see 13, p. 18):—

Placotrochus deltoideus, Dunc.

Placotrochus elongatus, Dunc.
Flabellum gambierense, Dunc.
Isis, sp.
Chelæ of crustacea.
Cidaroid plates and spines.
*Psammechinus woodsii, Laube.
Scutellina patella, Tate.
Clypeaster gippslandicus, McCoy.
Monostychia australis, Laube.
Pericosmus gigas, McCoy.
Pericosmus, sp.
Waldheimia garibaldiana, Davidson.
*Waldheimia divaricata, Tate.
*Waldheimia macleani, Tate.
Waldheimia furcata, Tate.
Terebratula vitreoides, T. Wds.
Terebratulina davidsoni, R. Eth., jun.
*Terebratulina scoulari. Tate.
Magasella compta, Sow.
Rhynchonella squamosa, Hutton.
*Crania quadrangularis, Tate.
Ostræa, sp.
Pecten murrayanus, Tate.
Pecten polymorphoides, Zittel.
Pecten consobrinus, Tate, var. replaces P. subbifrons, Tate.
Pecten, sp.
Limatula jeffreysiana, Tate.
Spondylus pseudoradula, McCoy.
Septifer fenestratus, Tate.
Pectunculus cainozoicus, T. Wds.
Nucula, sp.
Dosinia densilineata, Pritchard.
Mactra howchiniana, Tate.
Tenagodes, sp.
*Patella, n. sp.
Casts of trochoid shells.
Lamna, sp.
*Vertebral epiphyses, probably of a whale.

Those marked by an asterisk were collected by Mr. J. Mulder.

List of Fossils from the clay bed in the upper part of the Batesford limestone :—

Placotrochus deltoideus, Dunc.
Placotrochus elongatus, Dunc.
Flabellum gambierense, Dunc.
Notocyathus excisus, Dunc.
Notocyathus viola, Dunc.
Notocyathus australis, Dunc.
Deltocyathus italicus, Ed. and H.
Rhynchonella squamosa, Hutton.
Crania, n. sp.
Limopsis belcheri, Ad. and R.
Limopsis aurita, Brocchi.
Cucullæa corioensis, McCoy.
Crassatella dennanti, Tate.
Cardita delicatula, Tate.
Corbula ephamilla, Tate.
Typhis laciniatus, Tate.
Murex lophoessus, Tate.
Murex velificus, Tate.
Murex asperulus, Tate.
Ricinula purpuroides, Johnston.
Ranella prattii, T. Wds.
Triton woodsii, Tate.
Nassa tatei, T. Wds.
Voluta hannafordi, McCoy.
Mitra othone, T. Wds.
Marginella propinqua, Tate.
Marginella micula, Tate.
Ancillaria semilævis, T. Wds.
Genotia angustifrons, Tate.
Pleurotomidæ, five species.
Conus acrotholoides, Tate.
Conus extenuatus, Tate.
Conus dennanti, Tate.
Trivia avellanoides, McCoy.
Cassidaria gradata, Tate.
Natica polita, T. Wds.

Natica hamiltonensis, T. Wds.
Natica substolida, Tate.
Natica (Sigaretopsis) subinfundibulum, Tate.
Turritella platyspira, T. Wds.
Thylacodes conohelix, T. Wds.
Eulima danæ, T. Wds.
Cerithium crebarioides, T. Wds.
Astralium johnstoni ?, Pritchard.
Trochidæ, 7 species.
Entalis subfissura, Tate.
Entalis mantelli, Zittel.

Limestone Fossils from Spring Creek.

Those marked with an asterisk were obtained from the limestones near the mouth of Spring Creek only ; those without any indicating mark from the limestone at Rocky Point and its continuation to Fisherman's Steps. Those with a dagger are common to both limestones.

Graphularia senescens, Tate.
Holaster australiæ, Duncan.
Eupatagus laubei, Dunc.
,, retundus, Dunc.
†Lovenia forbesii, Woods and Dunc.
Cassidulus florescens, Gregory.
Monostychia australis, Laube.
Fibularia gregata, Tate.
†Scutellina patella, Tate.
*Echinobrissus vincentianus, Tate.
†Cyclaster archeri, T. Wds.
*Linthia ? sp.
Psammechinus woodsi, Laube.
Paradoxechinus novus, Laube.
Antedon, sp.
*Waldheimia divaricata, Tate.
,, insolita, Tate.
†Magasella compta, G. B. Sow.
†Terebratulina davidsoni, R. Eth., jun.
†Terebratella woodsi, Tate.

Anomia, sp.
Dimya sigillata, Tate.
*Pecten foulcheri, T. Wds.
„ polymorphoides, Zittel.
„ n. sp. ? aff. eyrei.
Limatula crebresquamata, Tate m.s.
*Patella, n. sp.
Gastropod casts at Rocky Point.

Fossils from the Upper Clays at Spring Creek.

Those marked with an asterisk are common at Mornington and other similar beds, but not hitherto recorded from the lower zone at Spring Creek. Those marked with a dagger are common in the upper zone and at Mornington, etc., but though recorded from the lower zone are far from common.

Placotrochus deltoideus, Dunc.
Flabellum distinctum, Ed. and H.
Flabellum duncani, T. Wds.
Flabellum, sp.
Bathyactis discus, T. Wds.
Graphularia senescens, Tate.
Waldheimia insolita, Tate.
Waldheimia divaricata, Tate.
Dimya dissimilis, Tate.
Dimya sigillata, Tate.
Pecten hochstetteri, Zittel.
Pecten murrayanus, Tate.
Pecten foulcheri, T. Wds.
Pecten consobrinus, Tate, var.
Pecten eyrei, Tate.
Pecten peroni, Tate.
Limatula crebresquamata, Tate, m.s.
Spondylus gæderopoides, McCoy.
*Spondylus pseudoradula, McCoy.
Modiola, sp.
Nucula tenisoni, Pritchard.
Nucula atkinsoni, Johnston.
Leda crebrecostata, T. Wds.

Leda apiculata, Tate.
Leda, n. sp.
Limopsis insolita, G. B. Sow.
Limopsis belcheri, Ad. and R.
Limopsis multiradiata, Tate.
Pectunculus cainozoicus, T. Wds.
Pectunculus laticostatus, Q. and G.
Fossularca, n. sp.
Cucullaea corioensis, McCoy.
Trigonia semiundulata, McCoy.
Crassatella halli, Tate m.s.
Cardita polynema, Tate.
Cardita delicatula, Tate.
Cardita, n. sp.
Carditella lamellata, ? Tate.
†Chama lamellifera, T. Wds.
Cardium pseudomagnum, McCoy.
*Cardium antisemigranulatum, McCoy.
Chione halli, Pritchard.
Chione pritchardi, Tate, m.s.
Chione cainozoica, T. Wds.
Chione, sp.
Dosinia densilineata, Pritchard.
Myochama trapezia, Pritchard.
†Corbula ephamilla, Tate.
Corbula pyxidata, Tate.
Solecurtus ellipticus, Tate.
*Typhis evaricosus, Tate.
Typhis maccoyi, T. Wds.
Muricidea, sp.
Triton tortirostris, Tate.
Ricinula purpuroides, Johnston.
Latirofusus, sp.
Clavella, n. sp.
Peristernia semiundulata, Pritchard.
Voluta anticingulata, McCoy, var. persulcata.
Voluta halli, Pritchard.
Voluta stephensi, Johnston.
*Mitra othone, T. Wds.

Mitra, n. spp., 2.
Marginella propinqua, Tate.
*Marginella micula, Tate.
Oliva adelaidæ, Tate.
Ancillaria pseudaustralis, Tate.
*Ancillaria hebera, Hutton.
Ancillaria ligata, Tate.
Ancillaria, sp. n.
*Columbella clathrata, Tate, m.s.
Columbella, n. sp.
Cancellaria etheridgei, Johnston.
Pleurotoma paracantha, T. Wds.
Pleurotoma, n. spp., 2.
Genotia fontinalis, Tate.
Raphitoma columbelloides, T. Wds.
Borsonia, sp. n.
Pleurotomidæ, 9 spp.
Conus extenuatus, Tate.
Cypræa leptorhyncha, McCoy.
†Erato australis, Tate.
*Erato minor, Tate.
Natica wintlei, T. Wds.
Natica vixumbilicata, T. Wds.
Scalaria mariæ, Tate.
Scalaria, sp. n.
Turritella septifraga, Tate.
Turritella conspicabilis, Tate.
Turritella warburtoni, T. Wds.
*Turritella acricula, Tate.
*Turritella acricula, Tate, var.
Turritella aldingæ, Tate.
Syrnola, n. sp.
*Liotia roblini, Johnston. (Recorded by Messrs. Tate and Dennant).
Calliostoma, 2 spp.
Cylichna, sp.
Entalis mantelli, Zittel.
Entalis subfissura, Tate.
†Dentalium aratum, Tate.

Aturia australis, McCoy.
Sepia, n. sp.

Of the 105 species of mollusca in the above list sixty-seven are known from the lower beds, while thirty-eight are not previously recorded from Spring Creek. Of the latter, fifteen are apparently new species, and as far as we are aware are not known elsewhere. Of the remainder which are specifically known eleven are common at Mornington and in deposits at several other places which we have associated with it. Six occur at Aldinga, five at Table Cape, and one at River Murray cliffs.

Summary.

In our previous paper we undoubtedly attached too much importance to the polyzoal limestones, and incorrectly grouped together some which, as shown by the associated mollusca, should be placed on different horizons. Thus far we admit the force of the objections raised by Messrs. Tate and Dennant.

In default of molluscan fauna the position of most of the polyzoal rocks we mentioned is at present doubtful, but the Waurn Ponds and North Belmont limestones should be associated with the Spring Creek beds, while those at Upper Maude and Batesford are closely allied, and should be referred together to the Southern Moorabool Valley beds, which we have grouped with those of Lower Muddy Creek.

The fact that the upper of the two zones at Spring Creek is more nearly allied to the Muddy Creek beds than is the lower is another piece of evidence, the importance of which cannot be overlooked.

We are unable to accept as correct the figures on which Messrs. Tate and Dennant base the calculations adverse to our view of the succession of the beds.

On the main point in our earlier paper, namely, the relative position of the Spring Creek, Muddy Creek, and older volcanic rocks, our views are unchanged, and are based in part on the faunal agreement of the Lower Maude beds with those of Spring Creek, and in part on a comparison of the fossils of the two Spring Creek zones with those of other deposits.

LITERATURE.

1. The Older Tertiaries of Maude, with an Indication of the Sequence of the Eocene Rocks of Victoria, by T. S. Hall and G. B. Pritchard. Proceedings of the Royal Society of Victoria, 1894.

2. Correlation of the Marine Tertiaries of Australia, by Professor Ralph Tate and J. Dennant, F.G.S., Part II., Victoria (continued). Transactions of the Royal Society of South Australia, 1895.

3. The Present State of our knowledge of the Older Tertiaries of Southern Australia, by G. B. Pritchard. Australasian Association for the Advancement of Science. Brisbane, 1895.

4. The Gastropods of the Older Tertiary of Australia, Part IV., by Professor R. Tate. Transactions Royal Society of South Australia, 1893.

5. The Lamellibranchs of the Older Tertiary of Australia, Part II., by Professor R. Tate. Transactions Royal Society South Australia, vol. ix., 1887.

6. Correlation of the Marine Tertiaries of Australia, Part I., by Professor R. Tate and J. Dennant. Transactions Royal Society of South Australia, 1893.

7. Notes on the Muddy Creek Beds, etc., by J. Dennant, F.G.S. Transactions of the Royal Society of South Australia, 1888.

8. The Lamellibranchs of the Older Tertiaries of Australia, Part I., by Professor R. Tate. Transactions of the Royal Society of South Australia, vol. viii., 1886.

9. Remarks on the Tertiaries of Australia, together with a Catalogue of Fossils, by G. B. Pritchard. South Australian School of Mines, Adelaide, 1892.

10. The Eocene Deposits of Shelford, by J. Dennant. The Geelong Naturalist, vol. iv., p. 10.

11. Report on the Geology of the District from Bacchus Marsh to Bass Straits (twenty quarter sheets enumerated) and Point Addis, by Richard Daintree. Victorian Public Lands Circular, vol. ii., May 21, 1863.

12. Geological Survey of Victoria (quarter sheet, 28 S.E. Marginal notes). Daintree and Wilkinson.

13. Notes on the Lower Tertiaries of the Southern Portion of the Moorabool Valley, by T. S. Hall and G. B. Pritchard. Proceedings of the Royal Society of Victoria, 1891.

Art. IX.—*Observations with Aneroid and Mercurial Barometers and Boiling Point Thermometers.*

By Thomas Walker Fowler, M.C.E., F.R.G.S.

[Read 10th October, 1895.]

In connection with engineering and general survey work, as well as in geographical investigations, it is frequently convenient to determine, approximately, the attitudes of different points from observations of barometric pressure at such points. Various instruments are used for this purpose, the most convenient and portable being, undoubtedly, the aneroid barometer, and the most trustworthy, the mercurial barometer of either the Fortin, or syphon type provided that the tube be of large bore. The latter requirement causes the instrument to be very heavy and neither portable nor convenient. Boiling-point thermometers form a third-class of instruments much less convenient than aneroid barometers, but decidedly more portable than mercurial ones even of small bore, as all mercurial barometers are very liable to damage from destruction of the vacuum through careless handling as well as from fracture of the tube. Delicate and fragile thermometers, undoubtedly, require careful handling, but much less so than mercurial barometers.

From 20th August last up to the present time, the writer made a series of observations for the purpose of determining the relative accuracy of instruments of the classes mentioned. They were made at his residence in Upper Hawthorn, Melbourne, the approximate altitude above sea level being 200 feet, and during the observations the atmospheric pressure varied considerably, the maximum recorded being 30·048 inches, and the minimum 29·020 inches.

For use as a Standard the Acting Government Astronomer (Mr. Baracchi), kindly placed at the writer's disposal a pedestal mercurial barometer of the Fortin type, made by Newman & Son, and numbered 122. The diameter of the tube is marked 0·380 inch. The adjustment of the fiducial point is made by raising

or lowering it, and the graduated scale by means of an adjusting screw instead of by altering the level of the mercury in the cistern as in the instruments of a more recent type. The attached thermometer is placed opposite the graduated scale at the upper end of the tube which is the only portion exposed. The distance from the thermometer bulb to the tube is $\frac{3}{16}$ inch. The instrument is one of those used in connection with Professor Neumayer's Meteorological Investigations in Victoria, and reads by vernier to 0·002 inch, and by estimation to 0·001 inch. The vacuum appears to be good. There is little doubt that the attached thermometer is more rapidly affected by variations of temperature than the mercury in the tube, and hence that the correction for temperature applied may at times have been incorrect to the extent of, say, 0·005 inch as a maximum (equivalent to a temperature error of 2 deg.). Probably the maximum reading error did not exceed 0·004 inch, and the writer is of opinion that differences of pressure as indicated by this barometer might be relied on to about 0·006 inch. The writer had not the opportunity of investigating for himself the correction for index error, nor did it seem necessary, as it would equally affect the whole of the observations and leave the differences unaltered.

No correction was applied for capillary depression, but the height of meniscus was measured several times and found to vary from 0·051 inch to 0·040 inch, corresponding to variations in the capillary depression of 0·002 inch, according to Guyot's Tables, page 340.

The instruments compared with the Standard barometer were as follows:—

1st. A Watkin 4½ inches Patent Aneroid, marked "Jewelled and Compensated, No. 161, Kilpatrick & Co., London and Melbourne." This instrument is graduated to 0·01 inch and can easily be read to 0·002 inch. It was made by Hicks, of London, and is the property of the Melbourne University.

2nd. A 2½ inches Aneroid, marked "Jewelled and Compensated, Kilpatrick & Co., London and Melbourne," and graduated to 0·05 inch and easily read to 0·01 inch. This aneroid was made by Short & Mason.

3rd. A $1\frac{3}{4}$ inch Aneroid, marked "Compensated, Kilpatrick & Co., London," graduated to 0·05 inch and easily read to 0·01 inch. This Aneroid was made by Barker & Co., of London.

The Aneroids, 1, 2 and 3, were altered by having a disk fixed to the end of the index and perpendicular to the plane of the dial for the purpose of eliminating parallax as suggested by Admiral Wharton in his "Hydrographical Surveying."

4th. A Mountain Mercurial barometer of the Gay Lussac syphon type, with verniers reading to 0·001 inch. The frame is marked Troughton & Simms, London, and the tube was made and filled by Yeates of Melbourne in December, 1894. The external diameter of the tube is 0·25 inch, and probable internal diameter 0·15 inch. A similar tube was in the frame when obtained by the writer, though, probably, that originally issued with it was larger. Its external diameter cannot however have exceeded 0·50 inch in any part, and portions of it must have been much less. The attached thermometer is fixed to the middle of the frame, and the outer portion of the bulb is exposed.

5th. A Boiling-point thermometer, marked 1,013,848, Kilpatrick & Co., Hicks' patent fixed zero K, C, 95, and graduated on stem from 193° to 213°·5 Fahr., the divisions being to 0°·05, and the length of the graduations $18\frac{5}{8}$ inch. The bore of the tube is fairly fine, and the external dimensions of the bulb are: length 2·25 inches, diameter 0·3 inch. The total length of the thermometer (which was made by Hicks) is 23·5 inches. It was placed in a steam jacketed tube attached to a copper boiler, and the distance from the bottom of the bulb to the water-level was never less than 5 inches. When the observations were in progress a glass tube manometer, filled with water, was attached to the apparatus at the level of the bulb, but the pressure indicated never exceeded 0·003 inch of mercury. During each boiling-point observation about two cubic inches of water were evaporated, and care was taken to have a considerable quantity of water left in the boiler.

The Observatory tests of the aneroids and boiling-point thermometer are given in Appendix A.

The results of every observation taken are given in the Appendix B. It will be noticed that the Watkin aneroid

behaves in a most eccentric manner, and that its variations are but very slightly indicated by the air pump test made at the Observatory on 20th December, 1894. The $1\frac{3}{4}$ inch aneroid worked very much better, but did not behave as it did under the air pump, whilst the $2\frac{1}{2}$ inch aneroid shows very well with the exception of one discordant observation, and its behaviour is very similar to what it was under the air pump.

Taking the whole of the results they fully justify (so far as they go) Mr. Edward Whymper's conclusion, "that the test which is usually applied of comparing for brief periods (minutes or hours) aneroids with mercurial barometers under the air pump is of little or no value in determining the errors which will appear in aneroids used at low pressure for long periods (weeks or months)."—"How to use the Aneroid," page 9.

The behaviour of the small bore Mountain mercurial is at first sight very peculiar, but is, undoubtedly, due to varying capillary action in the small instrument. No measurements of the heights of the meniscus were taken, but it was apparent that these were continually varying both in upper and lower limbs though principally in the latter where the meniscus at times entirely disappeared, and at other times exceeded considerably that in the upper limb. In every case the instrument was well tapped prior to taking a reading. It would appear that the readings of this barometer could be depended on to about 0·03 inch, and the error would be independent of altitude.

The boiling-point experiments resolve themselves into two sections, one taken with a glass spirit lamp, which was not sufficiently powerful to maintain a good supply of steam, and the other with a brass lamp which generated steam with ease. As might be expected the boiling points given by the former are all lower than those given by the latter. One of the observations (that on the 26th August, 4 p.m.) should undoubtedly be rejected, as the apparatus was at the time undergoing alterations and consequently the bulb was exposed to a mixture of air and steam instead of pure steam. Taking the second set of observations (sixty-seven in number), the maximum difference in the correction to standard is 0·048 inch as against 0·068 inch with the Mountain mercurial.

It may be mentioned that of eighty-one observations in all, thirty were taken with Yan Yean water, and the rest with rain water, but no perceptable difference in pressure was indicated from the alteration.

So far as they go the observations tend to show that pressures determined from boiling points are fairly trustworthy. It remains to be seen, however, how much the index error of the thermometer will vary with time, and this can only be done by repeating the experiments after the lapse of some years. Further the writer has not had the opportunity of applying the method at [illegible] altitudes, though determinations of the height of

After the word "giving" on line 13, page 173, insert, "1016 feet,".

levelling. The first [illegible]
mometers much less sensitive than that described above. The aneroid barometers gave the following heights for the same mountain. Watkin (two observations) 1057 feet and 1082 feet. The $2\frac{1}{2}$ inch (two observations) 961 feet and 1042 feet; and the $1\frac{3}{4}$ inch (one observation) 927 feet.

Boiling-point thermometers are condemned emphatically by Mr. Whymper as the result of his experiments on the Andes, but the apparatus used by him seems to be much less sensitive than that used by the writer. Boiling-point thermometers are generally graduated from about 180 degs. to 212 degs., and are about 12 inches long, the bulbs are placed close to the water of which the supply is very limited, and the heating arrangements appear to be of a meagre character. In some experiments made by the writer with a Greiner Boiling-Point apparatus, constructed about 1860, and filled with water so as to just touch the bottom of the bulb, the water had all boiled away before the "pumping" action of the thermometer had ceased. Mr. Whymper's experiments were made with Henderson's apparatus, in which the heating agent is a composition candle. The writer has not used this apparatus, but questions its ability to give a full supply of steam at a high altitude.

behaves in a most eccentric manner, and that its variations are but very slightly indicated by the air pump test made at the Observatory on 20th December, 1894. The $1\frac{3}{4}$ inch aneroid worked very much better, but did not behave as it did under the air pump, whilst the $2\frac{1}{2}$ inch aneroid shows very well with the exception of one discordant observation, and its behaviour is very similar to what it was under the air pump.

Taking the whole of the results they fully justify (so far as they go) Mr. Edward Whymper's conclusion, "that the test which is usually applied of comparing for brief periods (minutes or hours) aneroids with mercurial [illegible]

[illegible] the small bore Mountain mercurial is at first sight very peculiar, but is, undoubtedly, due to varying capillary action in the small instrument. No measurements of the heights of the meniscus were taken, but it was apparent that these were continually varying both in upper and lower limbs though principally in the latter where the meniscus at times entirely disappeared, and at other times exceeded considerably that in the upper limb. In every case the instrument was well tapped prior to taking a reading. It would appear that the readings of this barometer could be depended on to about 0·03 inch, and the error would be independent of altitude.

The boiling-point experiments resolve themselves into two sections, one taken with a glass spirit lamp, which was not sufficiently powerful to maintain a good supply of steam, and the other with a brass lamp which generated steam with ease. As might be expected the boiling points given by the former are all lower than those given by the latter. One of the observations (that on the 26th August, 4 p.m.) should undoubtedly be rejected, as the apparatus was at the time undergoing alterations and consequently the bulb was exposed to a mixture of air and steam instead of pure steam. Taking the second set of observations (sixty-seven in number), the maximum difference in the correction to standard is 0·048 inch as against 0·068 inch with the Mountain mercurial.

It may be mentioned that of eighty-one observations in all, thirty were taken with Yan Yean water, and the rest with rain water, but no perceptable difference in pressure was indicated from the alteration.

So far as they go the observations tend to show that pressures determined from boiling points are fairly trustworthy. It remains to be seen, however, how much the index error of the thermometer will vary with time, and this can only be done by repeating the experiments after the lapse of some years. Further the writer has not had the opportunity of applying the method at considerable altitudes, though determinations of the height of Arthur's Seat made by him with boiling thermometers were fairly satisfactory, four determinations giving 1016 feet, 981 feet and 986 feet respectively, as against 996 feet determined by spirit levelling. The first three observations were taken with thermometers much less sensitive than that described above. The aneroid barometers gave the following heights for the same mountain. Watkin (two observations) 1057 feet and 1082 feet. The $2\frac{1}{2}$ inch (two observations) 961 feet and 1042 feet ; and the $1\frac{3}{4}$ inch (one observation) 927 feet.

Boiling-point thermometers are condemned emphatically by Mr. Whymper as the result of his experiments on the Andes, but the apparatus used by him seems to be much less sensitive than that used by the writer. Boiling-point thermometers are generally graduated from about 180 degs. to 212 degs., and are about 12 inches long, the bulbs are placed close to the water of which the supply is very limited, and the heating arrangements appear to be of a meagre character. In some experiments made by the writer with a Greiner Boiling-Point apparatus, constructed about 1860, and filled with water so as to just touch the bottom of the bulb, the water had all boiled away before the "pumping" action of the thermometer had ceased. Mr. Whymper's experiments were made with Henderson's apparatus, in which the heating agent is a composition candle. The writer has not used this apparatus, but questions its ability to give a full supply of steam at a high altitude.

Appendix A.

Corrections to reading of Boiling-point thermometer as per Kew Certificate. Corrections to nearest 0°·05.

From 194° to 205° (tested at 8 points on scale)	+0°·15
At 212° - - - - -	+0°·10

Corrections to Aneroids as per tests at Melbourne Observatory.

Pressure.	Watkin.	$2\frac{1}{2}$ inch.	$1\frac{3}{4}$ inch.
30·5	+0·07	+0·07	...
30·0	+0·10	0·00	+0·17
29·0	+0·10	−0·08	+0·05
28·0	+0·05	−0·15	−0·02
27·0	−0·23	−0·27	−0·09
26·0		−0·31	−0·14
25·0	...	0·33	−0·20
24·0	...	−0·33	...

APPENDIX B.

Results of Observations expressed as corrections to make Observed readings of instruments agree with that of Standard. Barometer pressure corresponding to boiling point by Guyot's Tables.

Date.	Time.	Standard Mercurial at 32 degrees.	Mountain Mercurial Correction.	Aneroid Corrections.			Boiling Point Thermometer Correction.
				Watkin.	2½ inch.	1¾ inch.	
		″	″	″	″	″	″
Aug. 20	8 a.m.	29·484	−0·058	...	...	−0·136	...
21	8 a.m.	29·491	−0·043	...	...	−0·129	...
22	8 a.m.	29·640	0·051	...	...	−0·080	−0·044
	9 p.m.	29·473	−0·060	...	...	...	−0·053
23	4·45 p.m.	29·427	−0·061			−0·123	−0·046
24	9 a.m.	29·422	0·060	−0·055	−0·068	−0·128	...
	9.50 a.m.	29·401	−0·064	...	...	...	−0·048
	1 p.m.	29·284	−0·053	...	...	.	−0·035
	2.40 p.m.	29·207	−0·045	...	..	...	−0·037
	4 p.m.	29·169	−0·046	...	...	...	−0·040
	6 p.m.	29·129	−0·042	...	...	...	−0·045
25	9.15 a.m.	29·139	0·046	+0·027	−0·091	−0·121	...
	10 a.m.	29·149	−0·037	...	...	...	−0·048
	4.45 p.m.	29·174	−0·040	...	...	...	−0·053
26	8.15 a.m.	29·274	−0·025	−0·022	−0·076	−0·116	−0·045
	4 p.m.	29·277	0·028	...	...	...	+0·004
	6.30 p.m.	29·298	0·016	...	...	...	−0·045
27	8 a.m.	29·141	−0·051	+0·027	−0·089	−0·049	−0·044
	7.45 p.m.	29·134	−0·026	...	...	...	−0·069

APPENDIX B—*(Continued).*

Date.		Time.	Standard Mercurial at 32 degrees.	Mountain Mercurial Correction.	Aneroid Corrections.			Boiling Point Thermometer Correction.
					Watkin.	2½ inch.	1¼ inch.	
Aug.	28	8 a.m.	29·281	0·038	−0·023	−0·079	−0·119	−0·097
		8.30 p.m.	29·535	0·013	...	..		−0·049
	29	8.30 a.m.	29·731	−0·040	−0·275	−0·029	−0·039	−0·060
		8 p.m.	29·742	−0·044	...	...	...	−0·061
	30	9.15 a.m.	29·596	−0·064	−0·148	−0·134	−0·164	...
		9.45 a.m.	29·581	−0·065	...	...	...	−0·056
		8 p.m.	29·586	0·021	−0·231	−0·044	−0·094	−0·033
	31	8.30 a.m.	29·770	−0·045	−0·321	−0·030	−0·050	...
		8.45 a.m.	29·777	0·045	...	...	...	−0·061
		6 p.m.	29·671	−0·. 67	...	...	...	−0·061
Sept.	1	9.15 a.m.	29·685	−0·053	−0·343	−0·035	−0·075	...
		9.45 a.m.	29·685	0·051	...	...	...	−0·059
		3 p.m.	29·664	...	...	...	...	−0·055
		6.45 p.m.	29·674	...	...	...	...	−0·070
	2	8.15 a.m.	29·513	−0·059	−0·079	−0·057	−0·087	...
		8.45 a.m.	29·498	...	...	...	...	−0·062
		1 p.m.	29·279	...	−0·028	...	...	−0·058
		8.15 p.m.	29·083	...	+0·017	...	..	−0·061
		11.15 p.m.	29·020	...	+0·031	...		−0·060
	3	8 a.m.	29·204	−0·042	+0·011	−0·096	−0·146	...
		8.15 a.m.	29·209	...	...	...	...	−0·052
		8 p.m.	29·290	...	+0·013	...	...	−0·053
	4	8 a.m.	29·262	−0·041	−0·022	−0·098	−0·138	...
		8.20 a.m.	29·269	...	...	...	...	−0·062
		5 p.m.	29·246	..	...	...	..	−0·061
		8 p.m.	29·240	...	...		...	−0·056
	5	8 a.m.	29·354	−0·041	−0·026	−0·076	−0·126	...
		9.25 a.m.	29·397	...	..	...	...	−0·064

APPENDIX B—*(Continued).*

Date.		Time.	Standard Mercurial at 32 degrees.	Mountain Mercurial Correction.	Aneroid Corrections.			Boiling Point Thermometer Correction.
					Watkin.	2½ inch.	1¾ inch.	
			"	"	"	"	"	"
		8 p.m.	29·570	...	...	...	...	−0·067
Sept.	6	8.30 a.m.	29·628	−0·039	−0·099	−0·052	−0·092	...
		10 a.m.	29·535	...	...	...	...	−0·058
		8 p.m.	29·579	...	...	...	...	−0·070
	7	8.30 a.m.	29·642	−0·049	−0·149	−0·038	−0·078	...
		9.15 a.m.	29·656	...	...	...	...	−0·064
		2.45 p.m.	29·609	...	...	...	...	−0·069
		7.30 p.m.	29·646	...	...	...	...	−0·074
	8	9.30 a.m.	29·410	−0·049	−0·023	−0·070	−0·130	..
		10.30 a.m.	29·413	...	...	...	...	−0·066
		4 p.m.	29·396	...	...	...	...	−0·071
		9 p.m.	29·438	...	...	...	...	−0·070
	9	8.30 a.m.	29·206	−0·044	+0·006	−0·104	−0·144	...
		10.15 a.m.	29·176	...	...	...	...	−0·068
		5.30 p.m.	29·208	...	...	...	...	−0·065
		9·30 p.m.	29·332	...	...	...	...	−0·070
	10	8.15 a.m.	29·619	−0·048	−0·151	−0·051	−0·061	...
		8·45 a.m.	29·636	...	...	...	...	−0·066
		8 p.m.	29·741	...	...	...	...	−0·074
	11	8 a.m.	29·818	−0·041	−0·385	−0·022	−0·062	...
		8.30 a.m.	29·857	...	...	...	...	−0·065
		9 p.m.	29·799	...	...	...	...	−0·075
	12	8.30 a.m.	29·722	−0·059	−0·341	−0·048	−0·088	..
		10.15 a.m.	29·667	...	...	...	...	−0·065
		9.15 p.m.	29·876	...	...	...	...	−0·076
	13	8.30 a.m.	29·955	−0·033	−0·439	−0·015	−0·045	...
		10 a.m.	29·944	...	...	...	...	−0·073
	15	9.15 a.m.	29·438	−0·050	−0·035	−0·082	−0·112	...

N

APPENDIX B—*(Continued).*

Date.	Time.	Standard Mercurial at 32 degrees.	Mountain Mercurial Correction.	Aneroid Corrections.			Boiling Point Thermometer Correction.
				Watkin.	2½ inch.	1¼ inch.	
		"	"	"	"	"	"
Sept. 16	8.20 a.m.	29·491	−0·023	−0·061	−0·059	−0·079	...
	10 a.m.	29·458	...	...	...	...	−0·074
17	8 a.m.	29·374	−0·040	−0·037	−0·076	−0·096	...
18	8.15 a.m.	29·455	−0·020	−0·045	−0·065	−0·095	...
	5.15 p.m.	29·562	...	...	...	...	−0·075
19	9.15 a.m.	29·764	−0·052	−0·293	−0·026	−0·066	...
	9.45 a.m.	29·766	...	...	...	...	−0·067
	8 p.m.	29·833	..	...	...	...	−0·077
20	8.30 a.m.	29·866	−0·050	−0·378	−0·024	−0·064	...
	9.30 a.m.	29·866	...	...	...	...	−0·068
	7.45 p.m.	29·842	...	...	...	...	−0·074
21	8.30 a.m.	29·897	−0·043	−0·406	−0·023	−0·033	...
	10 a.m.	29·895	...	...	...	...	−0·069
22	9 a.m.	29·849	−0·055	−0·402	−0·021	−0·031	...
	12 noon	29·831	...	...	...	...	−0·063
23	5 p.m.	29·768	−0·066	−0·340	−0·042	−0·063	...
24	8 a.m.	29·873	−0·040	−0·390	−0·027	−0·027	...
	9 p.m.	29·844	...	...	...	..	−0·078
25	8 a.m.	29·823	−0·051	−0·385	−0·037	−0·047	..
	8.5 a.m.	29·820	...	...	...	...	−0·072
	7.45 p.m.	29·738	.	...	...	...	−0·089
26	8.15 a.m.	29·757	−0·050	−0·345	−0·043	−0·073	...
	9.45 a.m.	29·755	...	...	...	...	−0·066
	9 p.m.	29·748	...	...	...	...	−0·070
27	8.15 a.m.	29·840	−0·048	−0·386	−0·030	−0·060	...
	9.40 a.m.	29·843	.	...	.	...	−0·073
28	8.30 a.m.	29·933	−0·033	−0·460	−0·017	−0·037	..
	10 a.m.	29·925	...	...	...	...	−0·074

APPENDIX B—*(Continued).*

Date.	Time.	Standard Mercurial at 32 degrees.	Mountain Mercurial Correction.	Aneroid Corrections.			Boiling Point Thermometer Corrections.
				Watkin.	2½ inch.	1¾ inch.	
		"	"	"	"	"	"
Sept. 29	9.15 a.m.	30·022	−0·032	−0·476	−0·008	−0·018	...
	2.15 p.m.	29·964	...	...	...	...	−0·077
	9.45 p.m.	30·029	...	...	...	...	−0·084
30	8 p.m.	29·859	−0·062	−0·404	−0·031	−0·071	...
	9 p.m.	29·855	...	...	...	...	−0·085
Oct. 1	8 a.m.	29·768	−0·061	−0·352	−0·052	−0·082	...
2	8 a.m.	29·542	−0·040	−0·110	−0·078	−0·128	...
	9.15 p.m.	29·693	...	...	...	...	−0·081
3	8.45 a.m.	29·861	−0·053	−0·381	−0·039	−0·069	...
	10.45 a.m.	29·873	...	...	...	...	−0·079
	8.30 p.m.	29·982	...	...	...	...	−0·089
4	8.15 a.m.	30·048	−0·024	−0·462	+0·008	−0·012	...
	9.30 a.m.	30·018	...	...	...	...	−0·077
5	8.15 a.m.	29·831	−0·076	−0·401	−0·039	−0·059	...
	10.30 a.m.	29·788	...	...	...	...	−0·080
	6 p.m.	29·646	...	...	...	...	−0·086
6	9.30 a.m.	29·568	−0·058	−0·160	−0·072	−0·122	...
	11 a.m.	29·553	...	...	...	...	−0·072
7	8 a.m.	29·309	−0·049	−0·027	−0·101	−0·151	...
	10 a.m.	29·244	...	...	...	...	−0·075
8	8.15 a.m.	29·490	−0·046	−0·067	−0·080	−0·100	...
9	8.45 a.m.	29·689	−0·041	−0·241	−0·061	−0·091	...

REMARKS.—Boiling points up to and including 27th August, at 8 a.m. with glass spirit lamp which did not give a plentiful supply of steam. Subsequent ones with a brass lamp which keeps better steam. Yan Yean water used till 2nd September inclusive. All subsequent observations with rain water.

Art X.—*Observed Variations in the Dip of the Horizon.*

[Abstract of paper read before the Royal Society of Victoria, on 13th June, 1895.]

By Thomas Walker Fowler, M.C.E., F.R.G.S., F.G.S.

The observations recorded in the table herewith were made with a 12 inch Theodolite, by Troughton & Simms, reading by verniers to 10″. The elevation of the horizontal axis was 132 feet above mean sea level as determined by spirit levelling, and a few days tide gauging the range of tide observed varying from 6′ 6″ to 10′. The station was (approximately) in latitude 38° 22′ S. Longitude 144° 46′ E., and the observations were taken in part by the writer and in part by engineering students of the Melbourne University. From the instrument station good views could be obtained to the south over part of Bass Strait (average depth about 35 fathoms), and to the north over part of Port Phillip Bay (average depth about 5 fathoms) as well as to Arthur's Seat, distant 9 nautical miles to the eastward, and elevated 996 feet above mean water level of Port Phillip Bay as determined by spirit levelling. The angles of elevation were taken to a point on the look-out tower 20 feet above the summit, or 1016 feet above mean water level of Port Philip Bay.

The observations were taken during very hot weather, when the difference between air and sea temperatures was large. The sea temperature to the south (in Bass Strait) was about 67°, that to the north (in Port Phillip Bay) was not observed, but, no doubt was higher.

The normal dip under average temperature and pressure would be 0° 11′ 20″ as against the maximum and minimum observed of 0° 21′ 35″ and 0° 5′ 5″ respectively. Reference may be made to "Raper's Navigation," pages 61 and 194, for further observations on this point.

The altitude of point sighted to on Arthur's Seat, according to the smallest observed angle, is 1003 feet; according to the largest observed angle 1043 feet; and according to the mean angle 1031

feet as against 1016 feet as determined by spirit levelling. These altitudes are computed with co-efficient of refraction = 0·083. Using the lower values quoted by American writers these altitudes would be increased by two feet. Reference may be made to Appendix XVI. "U.S. Coast and Geodetic Survey Report for 1876" for interesting information about somewhat similar observations. The American observations, as well as the writer's, give for observations taken from the lower station a difference of elevation greater than the true one. This can be explained on the assumption that the path of the ray between the stations is not a circular curve but one whose radius of curvature is greater at the higher station than at the lower one. As the air is denser at the lower station this is to be expected.

Attention may be directed to the remarkably small variations in the observed angles of elevation to Arthur's Seat compared with the large variations in the dip of the horizon.

The observations support the following deductions, which are not however advanced as new :—That under abnormal conditions the dip may differ greatly from the ordinary tabular value, that it may be unequal in different parts of the horizon, and that it may vary very rapidly especially in the afternoon. That at comparatively moderate angles of elevation the abnormal refraction is greatly diminished and that under unfavourable conditions of the atmosphere, altitudes determined by angles of *elevation* of about one degree observed from moderate distances are quite as reliable as elevations determined from a few barometric observations.

OBSERVED DIPS, ETC.

Date.	Time.	Air Temp.	Watkin Aneroid.	Dip South.	Dip North.	Elevation Arthur's Seat.	Remarks.
				° ′ ″	° ′ ″	° ′ ″	
Feb. 12	3.45 p.m.	93·8	29·958	0 9 15	0 11 0	0 53 5	Instrument normal.
	4.15 p.m.	93·8	29·955	0 7 37½	0 13 35	0 53 0	Instrument reversed.
	5 p.m.	94·3	29·943	0 8 55	8 8 45	0 53 25	Instrument normal.
	5.15 p.m.	92·5	29·938	0 11 25	0 9 25	Covered with haze	Instrument reversed.
13	9.40 a.m.	82·8	30·061	0 8 40	0 8 50	0 52 40	Instrument normal.
	10.15 a.m.	84·4	30·052	0 8 50	0 8 15	0 52 10	Instrument reversed.
	12.15 p.m.	91·8	30·033	0 7 30	0 5 5	0 52 45	Instrument normal.
	12.30 p.m.	92·4	30·032	0 7 25	0 5 25	0 52 55	Instrument reversed.
	3.15 p.m.	96·7	30·008	0 21 35	0 8 55	0 51 5	Inst. normal. Temp. when sighting to A. Seat 88°
	3.25 p.m.	82·0	30·008	Covered with haze		0 53 35	Instrument reversed.
14	4 p.m.	81·0	30·008	0 11 30	Covered with haze		Inst. normal. Cool S. wind. Hazy.
15	3 p.m.	88·4	22·920	Haze	0 7 30	Haze	Instrument normal.
	3.5 p.m.	81·8	29·910	Haze	0 9 25	Haze	Instrument reversed.
17	12 noon	86·0	29·540	0 9 30	0 9 50	0 53 15	Instrument normal. North wind. No sun.
	12.15 p.m.	86·0	22·540	0 10 10	0 9 30	0 53 0	Instrument reversed. North wind. No sun.
March 1	10.45 a.m.	69·0	29·919	0 12 5	0 12 5	0 52 50	Instrument normal.
	11 a.m.	69·0	29·919	0 10 15	0 11 45	0 53 5	Instrument reversed.

Art. XI.—*Note on a Victorian Host of the Larval Stages of the Liver Fluke (Distoma hepaticum).*

By Thomas Cherry, M.D.

[Read 12th December, 1895.]

During the last six months I have made frequent examination of snails from various parts of the colony, with the view of discovering the intermediate host of the common sheep fluke—*D. hepaticum*. The snails have been procured through the Stock Department and have come chiefly from the western and north-western districts. Nothing of importance was revealed by the dissections made during the winter, but about a fortnight ago a large specimen of *Bulinus tenuistriatus* was found containing a very large number of rediæ and cercariæ. Since that time the same forms have been found in several snails of the same species, as well as minute white bodies which I believe to be the sporocysts. The cercariæ correspond in every particular to the measurements and description given by Thomas in the Q. Journ. Mic. Science., Vol. XXIII. The snails from which I have so far obtained these larval forms have been sent from the head waters of the Wimmera. They are very numerous in the creeks and swamps, and this species is perhaps the commonest and most widely distributed species of snail in Victoria. A number of specimens of *Limnæa venustula* from the same creeks have been examined, but have been found free of the larval fluke. Investigations as to the occurrence of similar forms in other parts of Victoria are being continued at the University, and experiments will be carried out with the view of determining their identity with *D. hepaticum*. The above species of snail appears to be a different species from that in which Dr. Cobb discovered the larval forms, as reported by the *Age*, 2nd Nov., 1895. I am indebted to Mr. G. B. Pritchard for identifying the snails.

Note.—Since the above paper was read I have observed the same rediæ and cercariæ in specimens of *B. tenuistriatus* from all the southern and western parts of the colony.

ANNUAL REPORT OF THE COUNCIL

For the Year 1894-95.

The Council of the Royal Society herewith presents to the Members of the Society the Annual Report and Balance Sheet for the Year 1894.

The following Meetings were held, and Papers read during the Session:

March 8.—"Observations made at Sydney with Kater's Invariable Pendulums during January and February, 1894," by E. F. J. Love, M.A. "Description of some Birds' Eggs from North Queensland," by Dudley Le Souëf. "Notes on some Lancefield Graptolites," by G. B. Pritchard. (1) "Note on the presence of Peripatus insignis in Tasmania," and (2) "Preliminary Notes on some Tasmanian Earthworms," by Professor W. Baldwin Spencer, M.A.

April 12.—An adjourned discussion on Mr. Love's paper on "Kater's Pendulums," etc., in which Professor W. C. Kernot, M.A., C.E.; R. L. J. Ellery, C.M.G., F.R.S., F.R.A.S; Pietro Baracchi, F.R.A.S.; Thos. W. Fowler, C.E.; and E. F. J. Love, M.A, took part "Land Irrigation—Principles Governing its Economic Application," by Isaac Tipping, C.E.

May 10.—"The Geology of Castlemaine, with a Subdivision of the Lower Silurian Strata, and a list of Minerals," by T. S. Hall, M.A. "On the Sugar Strength and Acidity of Victorian Musts," by W. Percy Wilkinson.

June 14.—"A Demonstration explanatory of the Modern Theories of the Coagulation of the Blood, and the Action of Snake Venom on the Blood," by J. W. Barrett, M.D. "Geological Notes on the Country between Strahan and Lake St. Clair, Tasmania," by C. G. W. Officer, B.Sc., Lewis J. Balfour, and E. G. Hogg, M.A.

July 12.—"The Best Form for a Balance-Beam," by Professor W. C. Kernot. "Australian Species of Anathia," by Dr.

MacGillivray, M.A., etc. "Aboriginal Rock Paintings and Carvings in New South Wales," by R. H. Mathews. "Note on the Occurrence of Fossil Bones at Werribee," by G. B. Pritchard. "A New Stone Making Fungus *(Laccocephalum basilapiloides)*," by D. McAlpine and J. G. O. Tepper.

August 9.—"The Entomogenous Fungi of Victoria, Part I., *Isaria oncoptere*," by D. McAlpine and W. H. F. Hill. "Cremation and Burial in Relation to Death Certification," by H. K. Rusden. "A Demonstration of Joly's Melting Apparatus and Joly's Steam Calorimetre," by Professor T. R. Lyle, M.A. "A Demonstration of a New Micrometric Machine to be used in the Measurement of the Astrograph Star Plates, and in Determining the Size of the Star Discs, for the Estimation of Stellar Magnitudes," by R. L. J. Ellery, C.M.G., F.R.S., F.R.A.S.

September 13.—"An Attempt to Estimate the Population of Melbourne at the Present Time," by James Jamieson, M.D. "The Older Tertiaries of Maude, with an Indication of the Sequence of the Eocene Beds of Victoria," by T. S. Hall, M.A., and G. B. Pritchard. "A Molluscan Genus new to, and another forgotten from, Australia," by C. Hedley (communicated by G. B. Pritchard). "An Exhibition of a New Automatic Recording Compass," by A. Foster Smith.

November 8.—"Contributions to the Palæontology of the Older Tertiary of Victoria, *Lamellibranchs*, Part I.," by G. B. Pritchard. (1) "Notes on Birds." (2) "The Gymnorhinæ or Australian Magpies, with a description of a New Species," by A. J. Campbell. "Preliminary Notes on certain Marsupials from Central Australia," by Professor W. Baldwin Spencer, M.A. "Australian Fungi," by D. McAlpine.

December 13.—"Some Quantitative Laws in Incubation and Gestation," by Alex. Sutherland, M.A. "Preliminary Account of certain Lizards from Central Australia," by A. H. S. Lucas, M.A., and C. Frost. "A Monograph of the Tertiary Polyzoa of Victoria," by Dr. MacGillivray, M.A., etc. "Catalogue of Non-Calcareous Sponges collected by J. Bracebridge Wilson, Esq., in the Neighbourhood of Port Phillip Heads, Part I.," by Professor Arthur Dendy, D.Sc.

During the course of the year, three Members, one Country Member, and ten Associates have been elected, and eight Members, one Country Member, and four Associates have

resigned. Professor Arthur Dendy, D.Sc., has been elected a Corresponding Member of the Society.

The Librarian reports as follows :—

"During the past twelve months, 1236 books and parts of periodicals have been received. The applications made by the Sub-Librarian for copies of volumes or parts of volumes missing from various series of publications have met with much success. Owing to lack of funds, very little binding has been done during the year, though it will be necessary to incur some expense in connection with this if the library is to be maintained in an efficient state. The whole library has been carefully inspected by the Sub-Librarian, with the view of making a catalogue, which will be of service to members of the Society."

During the year the following publication has been issued :— "Proceedings," Vol. VII., New Series.

There has been no lack or falling off, but rather an increase in the number of Memoirs presented to the Society, and with a diminished income the Council is feeling the difficulty of adequately publishing the work which is brought before it.

There is at the present moment a new Volume of the Transactions in the press, which the Council has decided to devote to the publication of Dr. MacGillivray's monograph on the "Fossil Polyzoa of Victoria." It will be illustrated by twenty-two quarto lithographic plates, executed by Mr. Wendel, whose admirable and conscientious work has been of no little benefit to the Society during the past few years.

The work entrusted to the Gravity Survey and Port Phillip Biological Committees still continues to make progress, and both Committees hope to publish valuable results during the course of the coming year.

It is gratifying to notice that, though there has been an unavoidable slight falling off in the number of Members, the interest taken in the Monthly Meetings has been more than maintained, whilst the publication of Memoirs has been on a somewhat larger scale than that of the past one or two years.

Whilst there is no lack of material constantly available for publication, the nature and amount of this must depend entirely upon the financial position of the Society, and in increasing the stability of this, the Council relies upon the cordial support of the Members and Associates.

The Honorary Treasurer in Account with the Royal Society of Victoria.

Dr.				Cr.		
To Balance from 28th February, 1894 ...			£188 18 4	By Printing and Stationery	£156	8 9
„ Government Grant—				„ Rates	3	10 0
Balance of Vote 1893-94	£60	0 0		„ Gas and Fuel	7	16 10
Instalments for 1894-95	50	0 0		„ Salary, etc., of Assistant Secretary ...	100	0 0
			110 0 0	„ Hall-keeper's Allowance	4	10 0
„ Entrance Fees			16 16 0	„ Collector's Commission	16	15 8
„ Subscriptions—				„ Gratuity to Collector	5	0 0
Members ..	£79	14 0		„ Insurance	4	0 0
Country Members ..	9	9 0		„ Postages	19	2 8
Associates ...	32	11 0		„ Repairs	8	8 0
Arrears	48	6 0		„ Books and Periodicals	4	14 0
			170 0 0	„ Freight	6	12 6
„ Rent of Rooms			8 15 0	„ Refreshments	4	15 8
„ Sale of Transactions			16 8 9	„ Binding	3	19 3
„ Interest			17 0 0	„ Gravity Survey Expenses	3	16 0
				„ Incidentals	8	8 1
				„ Balance (28th February, 1895) ...	170	0 8
			£527 18 1		£527	18 1

Dr. PUBLISHING AND RESEARCH FUND. Cr.

To Fixed Deposit in Bank	£300	0	0	By Fixed Deposit in Bank of Australasia	£300	0	0
„ Interest on same	13	10	0	„ Interest transferred to General Account	13	10	0
	£313	10	0		£313	10	0

Compared with the vouchers and Bank Pass-book and Cash-book, and found correct,

C. R. BLACKETT,
Hon. Treasurer.

H. MOORS,
JAS. E. GILBERT, } *Auditors.*

28th February, 1895.

REPORTS OF COMMITTEES.

(1) House Committee.

The Committee, consisting of Mr. C. R. Blackett, F.C.S., Hon. Treasurer, Professor Kernot, M.A., C.E., President, and H. K. Rusden, Esq., Vice-President, inspected building and grounds on February 8th, 1895, at 4 p.m. Found house in good order and well-kept, but paint on window sashes, doors, etc., very old, and in places wood exposed and perishing. In the grounds the fence, though continually repaired by custodian, together with the main gate, very old; at the south side fence nearly falling.

Had window-sashes and front door painted with two coats of paint, a room in the cottage repapered, spouts and all gutters on roof of hall examined and cleaned, at a cost of £4 2s. 6d. Nothing has been done to fence except pickets continually renewed by custodian.

Mr. Love has sent an estimate of cost for shelving which must be put up in Library owing to the quantity of books received.

Except the above, no expense has been incurred during the past year owing to lack of funds.

C. R. Blackett.

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(2) Antarctic Exploration Committee.

Your Sub-Committee has to report holding two meetings during the past twelve months. No active steps have been possible, but the project has developed interesting and encouraging phases. The steam whaler, "Antarctic," of Tousberg, Captain Christensen, left Melbourne for the Antarctic in October, 1894, as the result of the interest created in the region by the active agitation of the Committee during the past ten years. The vessel reached 74° S.L., and the crew landed, being the first persons known to have trodden the mainland. The results of the visit have been published with a chart of the

voyage. Some low forms of vegetable life were secured, and a small collection of birds and fishes also. The seals killed bore wounds, which the whalemen declared could have been inflicted by polar bears, or, by an animal similarly armed. The wounds were large deep gashes, always found on the lower part of the back. Meteorological observations were made, and records of sea temperatures taken. Mr. E. C. Borchgrevinck, a surveyor, joined the ship as a seaman, and has been the means of recording the information of scientific value which has come to hand, and his services were performed under grave disadvantage and deserve our recognition.

The accounts of the voyage have kindled new interest in the project throughout the world, and we hear rumours of early expeditions starting from Great Britain, America and Germany.

It is to be hoped that the influence of the learned societies of Great Britain, now being exerted to get the Royal Navy to despatch an expedition fully equipped for scientific research, will be crowned with success at an early date.

G. S. Griffiths.

(3) Gravity Survey Committee.

Your Committee has only a brief report to present this year. Since the date of the last report the secretary has returned from England, where he secured sets of swings with the new half-second pendulums at the Observatories of Greenwich, Kew, and Cambridge. Since his return he has been occupied, in conjunction with Mr. Baracchi, in the making of a new set of observations for comparison with those taken last year. These observations, as well as those made in England, are now undergoing reduction.

It is hoped that the determination of correcting factors may be completed in the course of the summer, so that no further difficulty may hinder the extension of the survey throughout Australia.

Your committee desires to be re-appointed.

E. F. J. Love.

(4) Port Phillip Biological Committee.

There is little to report with regard to the work of the Port Phillip Biological Committee during the past year.

Dr. Dendy has continued his researches with regard to the Sponges, and has issued his second instalment of the catalogue of non-calcareous forms.

Mr. Sykes has apparently completed his investigations on the Polyplacophora, the results of which he is communicating to the Malacological Society, London. It is a matter of much regret that owing to lack of funds, these results cannot be published by the Royal Society of Victoria.

Mr. Pritchard is still at work upon the Gastropoda and Lamellibranchiata. It is hoped that during the course of the year reports will be received from naturalists who have been for some time at work upon various parts of the collection.

The Committee desires to place on record its sense of the great loss sustained by the society in the death of Mr. Bracebridge Wilson, M.A., F.L.S. It is to the long continued labours of Mr. Wilson that the society owes almost entirely the large collection of Port Phillip Biological specimens which it has been enabled to distribute to various naturalists for investigation. Mr. Wilson's labours have resulted already in the acquisition of much knowledge with regard to the fauna and flora of Port Phillip Bay, his knowledge of and personal acquaintance with which were unrivalled. The whole of Mr. Wilson's vacations were spent on board his yacht dredging in the bay and along the coast, and all his results were placed unreservedly at the disposal of the Society, his only anxiety being that they might lead on to the full determination of the fauna and flora of the Port Phillip Bay and the Victorian coast.

The Royal Society of Victoria.

LIST OF MEMBERS,

WITH THEIR YEAR OF JOINING.

Honorary Members.

Agnew, Hon. J. W., M.E.C., M.D., Hobart, Tasmania ...	1888
Clarke, Colonel Sir Andrew, K.C.M.G., C.B., C.I.E., (*President*, 1855 *to* 1857), London.	1854
Forrest, Hon. J., C.M.G., Surveyor-General, West Australia.	1888
Hector, Sir James, K.C.M.G., M.D., F.R.S., Wellington N.Z.	1888
Liversidge, Professor A., F.R.S., University, Sydney, N.S.W.	1892
Neumeyer, Professor George, Ph.D., Hamburg, Germany	1857
Russell, H. C. Esq., F.R.S., F.R.A.S., Observatory, Sydney, N.S.W.	1888
Scott, Rev. W., M.A., Kurrajong Heights, N.S.W. ...	1855
Todd, Sir Charles, K.C.M.G., F.R.A.S., Adelaide, S.A. ...	1856
Verbeek, Dr. R. D. M., Buitenzorg, Batavia, Java ...	1886

Life Members.

Barkly, His Excellency Sir Henry, G.C.M.G., K.C.B. (*President*, 1860 *to* 1863), Carlton Club, London.	1857
Bosisto, Joseph, Esq., C.M.G., M.L.A., Richmond ...	1857
Butters, J. S., Esq., Empire Buildings, Collins-street West	1860
Eaton, H. F. Esq., Treasury, Melbourne	1857
Elliott, J. S., Esq., Elsternwick	1856
Elliott, Sizar, Esq., Asling-street, Brighton Beach ...	1856
Fowler, Thomas W., Esq., M.C.E., 317 Collins-street ...	1877
Gibbons, Sydney W., Esq., F.C.S., c/o Mr. Lewis, 341 Bourke-street.	1854
Gilbert, J. E., Esq., Money Order Office, G.P.O., Melbourne	1872

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